Ownership Structure and Synergistic Takeover: Implications on Corporate Governance*

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Abstract

This paper examines the managerial disciplinary role of takeover motivated by pursuit of operational synergies, and explores how this governance function interacts with the ownership structure of target firms. We model a firm in which the manager has private information about the state of economy and may hide her under-provision of effort by misreporting the state to shareholders. The presence of bidders who search for operational synergies alleviates this agency problem, since the managerial misreport makes the firm undervalued and, thus, a more attractive takeover target. Our analysis shows that, while the control premium required by controlling shareholders reduces the likelihood of takeover incidence, it strengthens the managerial disciplinary effect of takeovers for high-synergy potential targets , i.e., targets that tend to offer large operational synergies to potential acquirers. Our analysis provides a number of novel empirical predictions on the correlation between the firm's synergy potential, ownership structure and other governance mechanisms, such as managerial compensation and monitoring function of large shareholders. We also discuss policy implications regarding the social optimality of ownership concentration.

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1 Introduction

The nature of the optimal corporate ownership has been a longstanding question in corporate governance literature. While large controlling shareholders can address managerial agency problems by monitoring management and alleviating the free-riding problem in takeovers (see e.g., Grossman and Hart (1980), Demsetz and Lehn (1985), Shleifer and Vishny (1986), Burkart et al. (1997) and Maug (1998)), they may also expropriate other stakeholders by influencing management or deterring efficient takeover to maintain their private control benefits (Stulz (1988)). Empirical evidence about the effect of controlling shareholders, for example a founding family, on firm performance is also inconclusive.[1] Amid the ongoing debate, this paper provides a new perspective on the role of *controlling* shareholders in the market disciplinary mechanism, and how it interacts with the firm's potential synergy characteristics and internal governance mechanisms. While the use of performance pay and internal monitoring are easily justified by the extant literature, the disciplinary effects of the market for corporate control are less obvious. To our knowledge, this is the first research attempt to explore this interaction in one setting.

This paper contributes the literature by considering the managerial disciplinary effect of a synergistic takeover (for example vertical or horizontal integration), initiated by bidders who seek operational synergy from acquiring the target firm.[2] This market disciplinary mechanism is practically relevant, and, more importantly for our research purposes, it complements the managerial monitoring function of controlling shareholders who may lack operational expertise relative to the bidders.

The managerial agency problem is relevant even in family firms. Founders do not hold more than 15% of the CEO positions on average. Fahlenbrach (2009) points out that founder CEOs hold 10.6% of CEO positions, while Anderson and Reeb (2003a) point out that ap-

[1]See for example Bertrand and Schoar (2006) who review the empirical studies on family ownership.

[2]Schwert (2000) find no significant difference, in economic terms, between hostile and friendly takeovers. Kini et al. (2004) find no significant relationship between the target firm's CEO turnover and the hostility of takeover in the 1990s.

proximately 15% of the CEOs positions are held by founders, 30% are held by descendants while the absolute majority of approximately 55% are held by the professional managers. Consistent results are found in Villalonga and Amit (2009). Bidders that operate in the same industry, for example, will be able to observe the state of the demand to assess the synergistic improvements. In contrast, the absence of family owners from the operational aspects of running the firm suggests their lack of operational expertise vis-a-vis the manager.[3] Descendant-managed firms may be subject to the same agency problem if one of the heirs is in control of corporate policies while others remain only as (non-controlling) shareholders. The analysis shows that the managerial disciplinary effect of synergistic takeover is affected by both the firm's potential operational synergy with other firms and the control premium required by controlling shareholders. We show that, surprisingly, the control benefit can *strengthen*, not *weaken*, the disciplinary effect.

Why does the private benefit of controlling shareholders, which increases the takeover premium, *strengthen* the market disciplinary mechanism? To answer the question intuitively, suppose that the manager has no anti-takeover defence. In this case, the manager can secure herself from the takeover threats only by increasing the market value of the firm, and, therefore, the takeover threat can discipline the manager. In firms which offer high synergy potential to the acquirers, however, the manager may find it too costly to increase the market value enough to deter the synergistic takeover. The control premium required by controlling shareholders can complement the market disciplinary mechanism in this circumstance, and, specifically, reduce the profitability of synergistic takeover and make the acquirers' bidding choice more sensitive to current market value. That is, it allows the managers of firms that offer high operational synergies to reduce the takeover threat significantly by increasing the market value. As shown below, the effect of the ownership structure on the disciplining function of synergistic takeover also interacts with other governance mechanisms such as managerial compensation and internal monitoring by controlling shareholders.

[3]Strictly speaking, family ownership should not be used as a measure of family control.

Formally, our model is built on the setting of Scharfstein (1988), who examines the managerial disciplinary effect of takeover threat. We consider a setting in which the firm with a large controlling shareholder is looking to employ a professional manager. In general, the shareholders may have the necessary capital but lack the expertise to run the growing firm. We abstract away from the succession problem in the family firm as this has already been addressed by previous literature (see for example Burkart et al. (2003) and Ellul et al. (2010)). Rather, we assume that the founder is no longer fit to manage a growing firm or that the descendant is not available/willing to take on the role. There are other reasons why a family firm may want to employ an outsider. For example, a professional manager may take on the role as a mentor to one of the heirs or simply be employed to resolve an internal conflict between the heirs in the succession decision. Alternatively, families may want to reduce the conflict of interest with minority shareholders and delegate the managerial role to an outsider.[4]

We consider an all-equity firm operated by a professional manager who does not hold ownership. Our model is that of post-contractual adverse selection, where the information between the shareholders and the manager is initially symmetric but incomplete. After the contracting stage, but before deciding on the effort choice, the manager learns about the state of nature and consequently makes a public report. Since the shareholders do not observe the state directly, this gives rise to a conflict of interest because the manager can provide insufficient effort and attribute poor performance to bad luck.[5]

The agency problem can be mitigated by a market disciplinary mechanism. We consider potential acquirers who observe the state and assess the synergy from that will result from acquiring the firm. In the spirit of Scharfstein (1988), we assume that the incumbent manager is replaced after the takeover, and, thus, lose the opportunity to get information rent. The existence of takeover threat disciplines managerial misreporting since the undervalued firms

[4]This will be optimal if the value of their holdings increases as a result.

[5]The current family firm theories only consider a moral hazard setting, and have abstracted away from the problems arising due to adverse selection. However, shirking is present in our model and the agency problem arises due to the manager's informational advantage, which provides a rich setting for the analysis.

attract more takeover attempts. The synergistic takeover, however, does not fully address the agency problem due to the possibility of negative operational synergy that deters the acquirer from bidding for undervalued targets.

We next turn to the analysis of how the managerial disciplinary effect of synergistic takeover is associated with ownership structure. The model considers two mutually exclusive ownership structures, namely, dispersed ownership and concentrated ownership, which differ in the presence of controlling shareholders (e.g., family owners). More specifically, we model controlling shareholders as those who have private benefits of control (e.g., amenity potential of family owners) which are not directly at the expense of minority shareholders.[6] In the takeover market, the controlling shareholders require a higher premium as a reward for giving up their control benefit, and, thus, reduce the incidence of takeovers relative to the dispersed ownership firms.[7]

Notwithstanding their negative effect on the incidence of synergistic takeover, the controlling shareholders can strengthen the managerial disciplinary effect of a takeover in firms that offer acquirers large operational synergies.[8] Intuitively, the market value increase from truthfully reporting the favorable state, by itself, may not deter significantly the takeover attempts for these firms since acquirers still find the operational synergy more than offsets high stock price. The control premium required by controlling shareholders makes truthful managerial reporting (and the corresponding market value enhancement) more effective in reducing the likelihood of a takeover. Specifically, the control premium increases the manager's opportunity cost of misreporting and, in turn, it reduces the information rent that shareholders forgo to the manager. This intuition also implies that the existence of controlling shareholders diminishes the market disciplinary mechanism in firms that provide low

[6]See Demsetz and Lehn (1985), Burkart et al. (2003), Almeida and Wolfenzon (2006), Ellul et al. (2010) for other papers that consider the private control benefit of large shareholders.

[7]See Barclay and Holderness (1989), Nenova (2003), Dyck and Zingales (2004) and Burkart and Panunzi (2006) for the relevant empirical evidence.

[8]Technically, our model shows that the necessary and sufficient condition for the complementarity of ownership concentration and market disciplinary mechanism is the log-convexity of the distribution function of potential operational synergy.

operational synergies to potential acquirers since the control premium, by itself, substantially reduces the probability of takeover attempts and makes the manager sufficiently entrenched even without truthful reporting.

The analysis also provides implications for the relationship between ownership structure and other governance mechanisms, such as managerial compensation and the monitoring function of controlling shareholders. We show that the disciplinary effect of synergistic takeover reduces the information rent paid to the manager and, thus, it diminishes managerial incentive pay. This implies that managerial pay-performance sensitivity is negatively associated with ownership concentration in firms which offer high operational synergies.[9] Furthermore, our analysis also shows that, in high synergy potential firms in which controlling shareholders strengthen the market disciplinary mechanism, monitoring function of controlling shareholders can complement the market disciplinary mechanism, and, thus, ownership concentration increases the operating efficiency even further.[10]

Finally, the analysis also offers policy implications for the social optimality of concentrated ownership structure. Some regulators criticize the role of controlling shareholders in corporate governance and advocate breaking up concentrated ownership structures to facilitate the market for corporate control.[11] We show that the presence of controlling shareholders strengthens the managerial disciplinary mechanism in high synergy potential firms, and, furthermore, their internal monitoring functions can complement the market disciplinary mechanism in these firms. Though the control premium required by controlling shareholders may deter even valuable takeovers, our findings suggest that regulators should approach very cautiously the dismantling of concentrated ownership structures, in particular, in high synergy potential firms. Our analysis also shows that, in high synergy potential firms, con-

[9]Consistent with this prediction, Li et al. (2015) show that pay for performance sensitivity of professional CEOs is lower in firms with concentrated shareholders, and the effects are strongest in firms controlled by families.

[10]Using French data, Sraer and Thesmar (2007) find that outside CEOs tend to outperform among family firms. Li et al. (2015) show that pay-performance sensitivity of professional CEOs decreases with ownership concentration, and the effects are strongest in family-controlled firms.

[11]For example, the European Commission has considered breaking up controlling ownership structures (Burkart and Panunzi (2006)) to facilitate the market for corporate control.

trolling shareholders monitor the manager more intensively if they are to sell out the firm at a lower price in an unfavorable state, e.g., industry downturns. Thus, for example, in high-tech industries where firms tend to offer large growth opportunities and more concentrated ownership structure, policy makers may consider a policy that facilitates the market for corporate control in industry downturns to encourage internal monitoring of controlling shareholders.

The analysis contributes to the literature of ownership structure and agency problem in corporations. On one hand, controlling shareholders or managerial ownership alleviate the agency problems that arise from the separation of ownership and control (e.g., Shleifer and Vishny (1986)). On the other hand, controlling shareholders expropriate other minor shareholders by influencing the management (e.g., Stulz (1988)). Our model suggests that while controlling shareholders entrench the manager from takeover threat and reduce the minor shareholders' value, it can mitigate the managerial agency problem by complementing the disciplinary effect of synergistic takeover and enhance the firm value.

The analysis also contributes to the literature that examines the managerial disciplinary effect of takeovers. Previous studies focus on disciplinary takeovers such as leveraged buyout or hostile takeovers (e.g., Scharfstein (1988), Shleifer and Vishny (1997), Morck et al. (1988)). Due to the operational expertise of potential bidders, this market disciplinary mechanism can complement the monitoring functions of large shareholders. Furthermore, our analysis provides a new perspective on the relationship between the firm's operational characteristics and governance mechanisms: the market disciplinary mechanism is affected by the firm's operational characteristics that determine their operational synergy with other firms.

Finally, this paper contributes to the literature that studies the effect of managerial entrenchment on firm performance. While most papers focus on the destruction of firm value by managerial entrenchment, an exception is Almazan and Suarez (2003), who show that managers may not exert effort due to the concern that they will be replaced by better talented managers, and weak governance can be used as a commitment mechanism for the manager's job security.[12] Our analysis complements their finding and provides a new economic channel through which managerial entrenchment can enhance firm value.

The paper is organized as follows. Section 4.2 describes the model setup. Section 4.3 analyzes the case of dispersed ownership, and Section 4.4 presents the case of concentrated ownership, and compares it with dispersed ownership case. Section 4.5 concludes.

2 Model setup

we consider an all-equity firm that operates in a risk-neutral economy where the market rate of return is normalized to zero. The firm is run by a manager who has no wealth, limited liability and zero reservation utility. In this setting, we consider a synergistic takeover market in which firms engage in mergers and acquisitions to gain operational synergies, and analyze how the possibility of synergistic takeover affects managerial actions, and how it interacts with the ownership structure of the firm.

2.1 Firm, information, and ownership structure

The firm's assets in place yield the cash flow net of costs, $V = \theta e R$, determined by: (i) a binary state of industry (e.g., industry-wide profitability shock) $\theta \in \{\theta_L, \theta_H\}$, where $0 < \theta_L < \theta_H$, (ii) the manager's effort choice $e \in [0, 1]$, and (iii) the revenue stream $R > 0$. While R and the realized net cash flow V are publicly observable in this setting, the realized state of industry θ and the effort choice e are not observed by shareholders. Regarding θ, shareholders have a common prior that $\theta = \theta_L$ with probability $1-\eta$, and θ_H with probability η, while the manager observes the realized state before choosing e. Regarding the choice of e, the manager incurs a private cost $C(e) = \frac{1}{2}ce^2$.

To present the key intuition succinctly, we consider a binary *ownership structure* of the firm, denoted by $k \in \{C, D\}$, which stand for *concentrated* and *dispersed* ownership, respec-

[12] In an analysis of employee level, Sraer and Thesmar (2007) show that French family firms isolate employees from external shocks, and pay them less than non-family firms.

tively. The two ownership structures differ only in the existence of controlling shareholders (e.g., family owners). Specifically, *dispersed ownership* structure corresponds to the case in which shareholders are atomistic, while *concentrated ownership* structure contains controlling shareholders who hold controlling blocks and gain a private benefit of control $B > 0$.[13]

Admittedly, we abstract from several aspects associated with controlling shareholders to focus our analysis on the effect of ownership structure on the market disciplinary mechanism. First, in our baseline model, we do not consider the managerial monitoring function of controlling shareholders.[14] We relax this assumption and extend the model to explicitly consider the role of their managerial monitoring function in Section 4.2. Second, controlling shareholders in our setting gain the private benefit of control without expropriating the minor shareholders in the incumbent business. As shown below, however, the control benefit indirectly affects the minor shareholders' value by increasing the takeover premium.

2.2 Synergistic takeover and market disciplinary mechanism

In this setting, we consider the managerial disciplinary effect of synergistic takeover market in which firms seek opportunities to gain operational synergies from acquiring other firms. In the spirit of Scharfstein (1988), we focus on the case in which the firm faces the possibility of being offered takeover bids from potential acquirers, but do not consider extending takeover bids to other firms, i.e., the firm is always a potential target in the takeover market. Specifically, the firm provides potential acquirers with a operational synergy $\pi \in [\underline{\pi}, \overline{\pi}]$ drawn from a distribution function $H(x) \equiv Prob(\pi < x)$, where $H(\underline{\pi}) = 0$ and $H(\overline{\pi}) = 1$, with a density function $h(x) > 0$. The distribution function $H(\cdot)$ is a common prior before the realization of π.

Following Scharfstein (1988), we consider a stylized model of takeover: first, the bidder observes the realized state of industry θ and the realized operational synergy π before ex-

[13]These benefits, e.g., the amenity potential of family firms, differ from the usual interpretation of private benefits that are directly at the expense of minority shareholders (see Demsetz and Lehn 1985).

[14]See, e.g., Anderson and Reeb (2003a), Anderson and Reeb (2003b) and Villalonga and Amit (2006) for the information advantage of founding families relative to other shareholders.

tending an offer to the target firm; second, the incumbent manager leaves the target firm without any severance pay at the occurrence of takeover, and the acquirer manages it to maximize the firm's value; finally, as detailed in section 2.3, the takeover price is determined by the managerial employment contract in which shareholders commit to selling the firm at no less than a specified price.[15] The bidders can buy the firm at the specified minimum price since it is publicly known.[16]

This stylized setting, while simplifying our analysis, reflects a key feature of synergistic takeover markets. The acquirers in synergistic takeovers seek operational synergies from acquiring target firms and, thus, they are likely to have superior information about the target firm's operational environment (i.e., θ) relative to the target firm's shareholders including controlling shareholders, who hire professional managers. As shown below, this informational advantage of acquirers allows even controlling shareholders to utilize the managerial disciplinary effect of synergistic takeover in a manner that is beneficial for them.

2.3 Contracts and sequence of events

The sequence of events unfolds as follows. At $t = 0$, shareholders offer a contract to the manager, who decides whether to accept it. By the generalized revelation principle (Myerson 1982), we focus on a direct revelation contract, $\Gamma = [W(\hat{\theta}, V), P(\hat{\theta})]$, where $\hat{\theta} \in \{\hat{\theta}_L, \hat{\theta}_H\}$ corresponds to the manager's message sent to shareholders regarding θ, $W(\cdot)$ to the managerial compensation, and $P(\cdot)$ is the minimum price at or above which shareholders commit to selling the firm to takeover bidders.

At $t = 1$, the manager and potential acquirers observe θ, and the manager reports $\hat{\theta}$ to shareholders. At $t = 2$, the potential acquirer observes π and buys the firm at $P(\hat{\theta})$ if it finds the deal profitable. If the firm is sold, the incumbent manager leaves and the acquirer

[15] In an unreported analysis, we also consider a case in which shareholders do not set a committed selling price at the contracting stage. The main results are qualitatively consistent with those in this setting if the acquirer takes all surplus arising from a takeover.

[16] In our setting, the minimum price can be also inferred by the rational bidders if there exists a stock market where incumbent shareholders trade immediately after acquiring the new information.

chooses effort e. Otherwise, the incumbent manager chooses e.[17] At $t = 3$, cash flow is realized and contracts are fulfilled. The sequence of events is summarized in Figure 1.

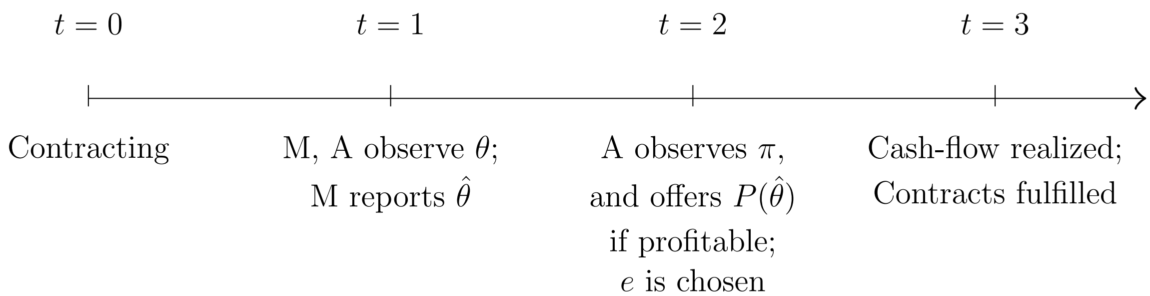

Figure 1: Timeline

3 Dispersed ownership firms

In this section, we examine the firm owned by dispersed shareholders who do not have a private benefit of control. To clearly present the role of each governance mechanism, we start by analyzing the first-best case in which shareholders observe θ and, thus, the realized net cash flow V is perfectly informative about the managerial choice of effort e, and then examine the case in which dispersed shareholders do not observe θ and e without considering the possibility of takeover bids. Finally, we consider the full model with the possibility of takeover bids.

3.1 Benchmark 1: observable θ (the first-best case)

In the analysis of the first best case, we do not consider the takeover market since it does not affect the expected value of net cash flow V. If shareholders observe θ at $t = 1$, they

[17] In our setting, the manager exerts effort after the takeover stage, and, thus, we do not consider the possibility that the manager provides insufficient effort due to concern about being fired after the takeover (e.g., where the effort is sunk). See Almazan and Suarez (2003), who examine how the severance pay and the board structure mitigate this managerial undereffort problem.

can infer the managerial effort choice e from the realized net cash flow V, and, thus, do not have to pay information rent to the manager. Without the loss of generality, we focus on a contract that compensates for the managerial effort cost for a specified effort level or pays nothing for all other effort choices. Then, for each possible state θ_i ($i = L, H$), shareholders determine the effort choice e_i and the managerial wage ω_i that solve the following problem:

$$\max_{\langle e_i,\omega_i\rangle} \mathbb{E}(V) = \eta(\theta_H e_H R - \omega_H) + (1-\eta)(\theta_L e_L R - \omega_L), \tag{1}$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL$_{\text{FB}}$}$$
$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH$_{\text{FB}}$}$$

where the constraints ensure that the manager does not choose zero effort given her limited liability (i.e., the wage should be nonnegative). Solving the problem, we find that the first-best effort level e_i^* and corresponding managerial wage ω_i^* are determined as:

$$e_i^* = \frac{\theta_i R}{c} \quad \text{and} \quad \omega_i^* = \frac{(\theta_i R)^2}{2c}. \tag{2}$$

3.2 Benchmark 2: unobservable θ and no takeover bid

We turn to the case in which dispersed shareholders do not observe θ. Before solving for the optimal contract, let us discuss the managerial agency problem that arises in this setting. Suppose that shareholders assume that the manager will truthfully report about the state (i.e., $\hat{\theta} = \theta$) and offer the first best wage in (2), i.e., after receiving $\hat{\theta} = \hat{\theta}_i$ ($i = L, H$), shareholders pay ω_i^* if $V = \theta_i e_i^* R$, and zero otherwise. Then, if the manager underreports the favorable state θ_H as $\hat{\theta} = \hat{\theta}_L$, she can receive the wage ω_L^* by exerting effort

$$\underline{e}^* \equiv \frac{\theta_L}{\theta_H} e_L^* < e_L^*.$$

Intuitively, shareholders cannot tell whether the low outcome is due to the unfavorable state of industry or to managerial shirking, and, given the first-best wage contract, the manager has incentives to shirk and underreport the state of industry. Formally, given the first best wage contract, the manager gains strictly positive *ex post* utility by underreporting the state:

$$\omega_L^* - \frac{1}{2}c\underline{e}^{*2} = e_L^{*\,2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] > 0.$$

That is, in contrast to the first-best case, the manager gains an information rent in a favorable state. In the presence of managerial agency problems, the optimal contract should balance the trade-off between reducing the information rent and increasing the managerial effort.

Now we formally solve for the optimal compensation contract $W(\hat{\theta}, V)$ in this setting. Without loss of generality, we focus on the contract which, for each report $\hat{\theta}_i$ $(i = L, H)$, pays non-zero wage ω_i only if a specified net cash flow V_i is realized (i.e., pays nothing for any other net cash flows). Then, the dispersed shareholders' problem can be written as:

$$\max_{\langle e_i, \omega_i \rangle} \mathbb{E}(V^{DN}) = \eta(\theta_H e_H R - \omega_H) + (1-\eta)(\theta_L e_L R - \omega_L), \tag{3}$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL$_{\text{DN}}$}$$

$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH$_{\text{DN}}$}$$

$$\omega_L - \frac{1}{2}ce_L^2 \geq \omega_H - \frac{1}{2}c\overline{e}^2, \tag{ICL$_{\text{DN}}$}$$

$$\omega_H - \frac{1}{2}ce_H^2 \geq \omega_L - \frac{1}{2}c\underline{e}^2, \tag{ICH$_{\text{DN}}$}$$

where $\overline{e} = \frac{\theta_H}{\theta_L}e_H$ and $\underline{e} = \frac{\theta_L}{\theta_H}e_L$. The constraints (ICL$_{\text{DN}}$) and (ICH$_{\text{DN}}$) ensure that truthfully reporting θ is incentive compatible to the manager. To facilitate the presentation, we denote the optimal effort choice and contract with a superscript DN.

As in the standard adverse selection framework, (ICH$_{\text{DN}}$) binds at the optimum:

$$\omega_H^{DN} = \omega_L^{DN} + \frac{1}{2}c\left[(e_H^{DN})^2 - (e_L^{DN})^2\right] + \underbrace{\frac{1}{2}c\left[(e_L^{DN})^2 - \underline{e}^2\right]}_{\text{information rent}}, \tag{4}$$

where the last term on the right-hand side corresponds to the information rent paid to the manager in state θ_H. That is, the firm must provide higher pay-performance sensitivity than the first-best wage scheme to induce the manager not to underreport θ_H. Furthermore, (PCL$_{\text{DN}}$) also binds since, otherwise, shareholders can increase their value by reducing ω_L:

$$\omega_L^{DN} = \frac{1}{2}c(e_L^{DN})^2, \tag{5}$$

By plugging (4) and (5) into (3), we can rewrite the shareholders' problem as:

$$\max_{\langle e_i \rangle} \mathbb{E}(V^{DN}) = \eta(\theta_H e_H R - \frac{1}{2}ce_H^2) + (1-\eta)(\theta_L e_L R - \frac{1}{2}ce_L^2) - \frac{1}{2}\eta c e_L^2 \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]. \tag{6}$$

Notice that, relative to the shareholders' objective function in the first-best case, (6) has the last additional term which corresponds to the expected value of information rent forgone to the manager in state θ_H. The first-order conditions are:

$$\frac{\partial \mathbb{E}(V)}{\partial e_H} = \eta(\theta_H R - ce_H^{DN}) = 0, \tag{7}$$

and

$$\frac{\partial \mathbb{E}(V)}{\partial e_L} = (1-\eta)(\theta_L R - ce_L^{DN}) - \eta c e_L \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0, \tag{8}$$

which imply that

$$e_H^{DN} = e_H^* \quad \text{and} \quad e_L^{DN} = \frac{(1-\eta)\theta_L R}{c\left[1 - \eta\left(\frac{\theta_L}{\theta_H}\right)^2\right]} < e_L^*. \tag{9}$$

Notably, the asymmetric information problem reduces the shareholders' value in two aspects: first, shareholders induce under-effort in unfavorable state θ_L (i.e., the effort distortion does not occur in θ_H); second, the optimal compensation ω_H^{DN} pays information rent to the manager in state θ_H (i.e., the optimal contract does not pay information rent in θ_L).

3.3 Case of interest: unobservable θ with takeover bids

Having defined the agency problem, we extend the analysis to the case in which shareholders have an opportunity to receive a takeover bid from potential acquirers. As shown below, the possibility of synergistic takeover provides managerial disciplinary effect to shareholders. We first consider the potential acquirer's optimal bidding strategy given $P(\hat{\theta})$, which is specified in the managerial compensation contract as the minimum price at or above which shareholders commit to selling the firm. Recall that, in our setting, $P(\hat{\theta})$ is publicly observable and the acquirer maximizes the firm value after takeover (i.e., the first-best effort will be chosen after takeover). When the realized state is θ_i ($i = L, H$) and the manager reports $\hat{\theta}_j$ ($j = L, H$), the takeover is profitable for the acquirer, provided that

$$P(\hat{\theta}_j) \equiv p_j \leq \theta_i e_i^* R - \frac{1}{2} c e_i^* + \pi \quad \Leftrightarrow \quad \pi \geq \pi_{ij} \equiv p_j - (\theta_i e_i^* R - \frac{1}{2} c e_i^*), \tag{10}$$

where e_i^* is the first-best effort level in θ_i-state. The condition (10) is intuitive: the takeover is more profitable for the acquirer as the synergy π is higher or as the required takeover premium p_j is lower relative to the target firm's maximum value net of the effort cost, $\theta_i e_i^* R - \frac{1}{2} c e_i^*$.

Now we find the optimal contract by solving the shareholders' optimization problem at $t = 0$. Notice that π_{ij} in (10) corresponds to the minimum synergy value that initiates takeover (i.e., the synergy value that makes the bidder break even). At $t = 0$, shareholders and the manager anticipate that takeover will occur with probability $1 - H(\pi_{ij})$. To facilitate the presentation, we abbreviate the probability of "no takeover" $H(\pi_{ij})$ as H_{ij}. Then, the optimal contract solves the following problem:

$$\max_{\langle e_i,\omega_i,p_i\rangle} \mathbb{E}(V^{DT}) = \eta[H_{HH}(\theta_H e_H R - \omega_H) + (1-H_{HH})p_H] + (1-\eta)[H_{LL}(\theta_L e_L R - \omega_L) + (1-H_{LL})p_L],$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL$_{\text{DT}}$}$$
$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH$_{\text{DT}}$}$$
$$H_{LL}(\omega_L - \frac{1}{2}ce_L^2) \geq H_{LH}(\omega_H - \frac{1}{2}c\overline{e}^2), \tag{ICL$_{\text{DT}}$}$$
$$H_{HH}(\omega_H - \frac{1}{2}ce_H^2) \geq H_{HL}(\omega_L - \frac{1}{2}c\underline{e}^2), \tag{ICH$_{\text{DT}}$}$$

where $\overline{e} = \frac{\theta_H}{\theta_L}e_H$ and $\underline{e} = \frac{\theta_L}{\theta_H}e_L$.[18] We denote the solution for this optimization problem with superscript DT.

As in the standard adverse selection models, (PCL$_{\text{DT}}$) and (ICH$_{\text{DT}}$) are binding constraints, implying the following first-order conditions:

$$\frac{\partial \mathbb{E}(V)}{\partial e_H} = \eta(\theta_H R - ce_H) = 0,$$
$$\frac{\partial \mathbb{E}(V)}{\partial e_L} = (1-\eta)H_{LL}(\theta_L R - ce_L) - \eta H_{HL} ce_L \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0,$$
$$\frac{\partial \mathbb{E}(V)}{\partial p_H} = \eta[h_{HH}(\theta_H e_H R - \frac{1}{2}ce_H^2) + (1-H_{HH}) - h_{HH}p_H] = 0,$$
$$\frac{\partial \mathbb{E}(V)}{\partial p_L} = (1-\eta)[h_{LL}(\theta_L e_L R - \frac{1}{2}ce_L^2) + (1-H_{LL}) - h_{LL}p_L] - \eta h_{HL}[\frac{1}{2}c(e_L^2 - \underline{e}^2)] = 0.$$

[18] Although not unique, it is optimal to set the managerial compensation to 0 in the event of a takeover. To see this, let ω_i^T represent the compensation in the event of a takeover. ICH becomes:

$$H_{HH}(\omega_H - \frac{1}{2}ce_H^2) + (1-H_{HH})\omega_H^T \geq H_{HL}(\omega_L - \frac{1}{2}c\underline{e}^2) + (1-H_{HL})\omega_L^T, \tag{ICH}$$

which implies that ω_L^T can be reduced without violating the participation constraint, while reducing the wage cost and relaxing the incentive compatibility. Likewise, ω_H^T can be reduced to improve profitability without violating the participation constraint.

From the first-order conditions, We find that the takeover prices are determined as follows:

Lemma 1 *When dispersed shareholders do not observe the realized state of industry θ_i ($i = L, H$), the takeover prices p_H^{DT} and p_L^{DT} are determined at*

$$p_H^{DT} = \frac{1}{2}\frac{(\theta_H R)^2}{c} + \frac{1 - H_{HH}}{h_{HH}},$$
$$p_L^{DT} = \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) + \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right],$$

where $a = 1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] > 1.$

Relative to the case in which shareholders observe θ, the takeover price in favorable state p_H^{DT} does not change, and the price for unfavorable state p_L^{DT} is lower.[19] The first terms in both p_H^{DT} and p_L^{DT} correspond to the net cash flow value, net of effort cost. The second term, $\hat{\pi} \equiv \frac{1-H_{ii}}{h_{ii}}$ is the critical value of operational synergy π at which the acquirer breaks even when θ is publicly observable. The third term in p_L^{DT}, which does not appear when θ is observable, represents the reduction in the takeover price proportionate to the information rent forgone to the manager.

Now consider how the possibility of synergistic takeover affects the managerial agency problem:

Proposition 1 *The probability of takeover incidence depends on the realized state as well as the managerial report. Specifically, $H_{HH} \geq H_{LL} \geq H_{HL}$.*

Proposition 1 states that the probability of takeover (i.e., $1 - H_{ij}$ for $i, j \in \{L, H\}$) is higher when the manager underreports the state than when the manager truthfully reports. Conditional on θ_L-state being declared, the takeover is more profitable for the acquirer if the manager misreported, because the acquirer knows it can generate the first best outcome of θ_H-state. To put it another way, incumbent shareholders undervalue the firm due to

[19] The takeover price when θ is publicly observable is derived in the Appendix.

managerial misreport and, thus, ask a low takeover price which, in turn, makes the deal more profitable for the acquirer. Scharfstein (1988) refers to this feature of a takeover as a managerial disciplining device. To utilize the disciplinary effect, shareholders must set the takeover price to be lower when the manager reports $\hat{\theta}_L$ than when she reports $\hat{\theta}_H$. This implies that the synergistic takeover is more likely to occur in the unfavorable state even when the manager reports truthfully. Proposition 1 also implies that the critical synergy values are characterized as $\pi_{HH} \geq \pi_{LL} \geq \pi_{HL}$, and, furthermore, π_{LL} can be negative, i.e., the takeover price for the unfavorable state is set low enough even for the acquirer with negative synergy who will find the deal profitable.

Finally, we characterize the optimal managerial wage scheme $(\omega_H^{DT}, \omega_L^{DT})$ and the corresponding effort choices (e_H^{DT}, e_L^{DT}):

$$
\begin{aligned}
\omega_H^{DT} &= \frac{(\theta_H R)^2}{2c} + \frac{H_{HL}}{H_{HH}} \frac{(\theta_L R)^2}{2ca^2} \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right], \\
\omega_L^{DT} &= \frac{(\theta_L R)^2}{2ca^2}, \\
e_H^{DT} &= \frac{\theta_H R}{c}, \\
e_L^{DT} &= \frac{\theta_L R}{c\left[1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left(1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right)\right]}.
\end{aligned}
$$

Relative to the case without takeover bids, the optimal effort in the unfavorable state is lower since $\frac{H_{HL}}{H_{LL}} < 1$. This result is due to the managerial disciplinary effect of takeover. Specifically, the managerial underreporting reduces the takeover price required by shareholders, and, thus, increases the probability of takeover incidence. Since the manager who truthfully reports the unfavorable state is more likely to remain after the takeover stage than the manager who underreports the favorable state, shareholders can induce higher managerial effort when the manager reports an unfavorable state. Furthermore, the market disciplinary mechanism also reduces the optimal managerial pay-performance sensitivity that provides the manager with truth-telling incentives. More specifically, the pay-performance sensitivity corresponds to the information rent that shareholders should forgo to the managers in the favorable state in order to induce higher managerial effort in the unfavorable state. Formally, we define the managerial pay-performance sensitivity as the expected value of information rent standardized by the expected compensation for unfavorable state:

$$\Delta_\omega \equiv \frac{H_{HH}(\omega_H - \omega_H^*)}{H_{LL}\omega_L}. \tag{11}$$

Then, the following proposition confirms the intuition discussed above:

Proposition 2 *The possibility of synergistic takeover bids allows shareholders to induce higher managerial effort in the unfavorable state while reducing the optimal managerial pay-performance sensitivity.*

Proposition 2 also shows that the managerial incentive pay and the market disciplinary mechanism are substitutable.

4 Concentrated ownership firms

In this section, we analyze the concentrated ownership firms that have controlling shareholders. First, we analyze the baseline model in which controlling shareholders face the same managerial agency problem with dispersed shareholders, and then we extend the model by consider the monitoring technology of the controlling shareholders.

4.1 Baseline case: without monitoring

In this setting, the controlling shareholders, e.g., family owners, receive non-transferable private benefits of control B that increases the takeover premium required by the controlling shareholder to sell out the firm. The higher takeover premium certainly lowers the probability of takeover, but as formally shown below, it does not necessarily reduce the managerial disciplinary effect of synergistic takeover.

Consider the controlling shareholders' optimization problem at $t = 0$. For the ease of exposition, we do not change the notations used in Section 3. Then, controlling shareholders' problem can be written as:

$$\max_{\langle e_i, \omega_i, p_i \rangle} \mathbb{E}(V^{CN}) = \eta[H_{HH}(\theta_H e_H R - \omega_H + B) + (1 - H_{HH})p_H] + (1-\eta)[H_{LL}(\theta_L e_L R - \omega_L + B) + (1 - H_{LL})p_L],$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL$_{\text{CN}}$}$$

$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH$_{\text{CN}}$}$$

$$H_{LL}(\omega_L - \frac{1}{2}ce_L^2) \geq H_{LH}(\omega_H - \frac{1}{2}c\bar{e}^2), \tag{ICL$_{\text{CN}}$}$$

$$H_{HH}(\omega_H - \frac{1}{2}ce_H^2) \geq H_{HL}(\omega_L - \frac{1}{2}c\underline{e}^2). \tag{ICH$_{\text{CN}}$}$$

Relative to the dispersed ownership case, there is an additional term of private benefits B in controlling shareholders' objective function. The first-order conditions can be easily derived from those in the dispersed ownership case and, thus, we place them in the Appendix. In what follows, we present the key results by comparing them with the dispersed ownership case. Proposition 3 formalizes how the presence of controlling shareholders affects the incidence of takeover:

Proposition 3 *Relative to dispersed ownership firms, concentrated ownership firms are less likely to be taken over, but are sold at strictly higher price.*

As noted previously, controlling shareholders require higher takeover premium as a reward for forgoing the private benefits of control B and, thus, make the takeover deal less profitable for acquirers than the deal with dispersed ownership firms.

Now we turn to the managerial disciplinary effect of synergistic takeover for concentrated ownership firms. While the controlling shareholders reduce the likelihood of takeover, they do not necessarily diminish the managerial disciplinary effect of the synergistic takeover. More specifically, the effect of ownership structure on the market disciplinary mechanism relies on the firm's operational synergies with potential acquirers, modelled as $H(\pi)$, the distribution function of synergy value. Proposition 4 characterizes how the firm's synergy potential affects the relationship between ownership concentration and the market disciplinary mechanism:

Proposition 4 *For $\theta = \theta_i$ and $\hat{\theta} = \hat{\theta}_j$ $(i, j \in \{L, H\})$, let H_{ij}^{CT} and H_{ij}^{DT} denote the probabilities of "no takeover" under concentrated and dispersed ownership, respectively.*

1. *If $H(\cdot)$ is log-convex, the disciplinary effect of takeovers is stronger in firms with concentrated shareholders, i.e., $\frac{H_{HL}^{CT}}{H_{LL}^{CT}} \leq \frac{H_{HL}^{DT}}{H_{LL}^{DT}}$,*

2. *If $H(\cdot)$ is log-concave, the disciplinary effect of takeovers is weaker in firms with concentrated shareholders, $\frac{H_{HL}^{CT}}{H_{LL}^{CT}} > \frac{H_{HL}^{DT}}{H_{LL}^{DT}}$.*

Before discussing the results, it is noteworthy that Proposition 4 considers the "local" log-convexity or log-concavity of $H(\cdot)$ in the subinterval of synergy value π that includes the critical synergy values π_{ij}^{CT} and π_{ij}^{DT} $(i, j \in \{L, H\})$ which make the acquirers break even given the state $\theta = \theta_i$ and the managerial report $\hat{\theta} = \hat{\theta}_j$ in concentrated and dispersed ownership structure, respectively.[20] The log-convex case in Proposition 4 may seem counter-intuitive at first glance since it implies that, all else being equal, the control premium reinforces the effectiveness of the market disciplinary mechanism while reducing the likelihood of takeover incidence.

To better understand the intuition, suppose that the control shareholders increase the takeover premium by B, relative to the takeover price of dispersed ownership firms, as a reward for forgoing their control benefit. The log-convexity of $H(\cdot)$ implies that the increase in takeover price reduces the probability of takeover incidence exponentially. Recall that the critical synergy value that makes the acquirer break even is higher when the manager truthfully reports the states than when she underreports it, i.e., $\pi_{HH}, \pi_{LL} > \pi_{HL}$. Given

[20]As implied by Proposition 3, the critical synergy values for which takeovers occur are shifted upward under concentrated ownership structure relative to dispersed ownership.

that $H(\cdot)$ is log-convex, the increase in takeover price associated with the control benefit reduces the probability of takeover more when the manager reports truthfully rather than reporting than when she misreports.

Intuitively, the firms with log-convex distribution function of synergy values can be interpreted as high synergy potential firms. That is, the target firm represents a high growth opportunity for the acquirer. For example, targets could be firms with relatively high proportion of intangible assets or firms that rely more heavily on their intellectual property to generate cash flows. Given the high potential synergy value, a truthful managerial report and the subsequent increase in takeover premium themselves do not significantly deter the takeover initiated by those who seek operational synergies from acquiring the firm. The takeover deterrence by truthful report, however, can be complemented by the control premium required by controlling shareholders. That is, when the controlling shareholders require an additional premium, the profitability of takeover becomes more sensitive to the current value of the target firm, determined by the managerial report.

So far, to illustrate the effect of control premium on market disciplinary mechanisms in growth firms, we assume that the control benefit affects the takeover price equally across the favorable and unfavorable states. In the choice of optimal takeover price, however, controlling shareholders consider not only the managerial disciplinary effect of takeover but the operational synergy value arising from takeover incidence, and therefore they do not necessarily increase the takeover price equally across the states. Proposition 4 shows that, if $H(\cdot)$ is log-convex, the likelihood ratio of "no-takeover" conditional on unfavorable managerial report, $\frac{H_{HL}}{H_{LL}}$, is higher in concentrated ownership for any parameter values than the likelihood ratio in dispersed ownership. Recall that the likelihood ratio decreases with the performance of the market disciplinary mechanism: lower $\frac{H_{HL}}{H_{LL}}$ implies that, after the takeover, the remaining managers who reported unfavorable state are more likely to be those who truthfully reported the state, i.e., the takeover market screens out the underreporting managers successfully. This intuition also explains why controlling shareholders negatively affect the market disciplinary mechanism if $H(\cdot)$ is log-concave. In what follows, we will focus on the log-convexity case for ease of exposition, but the results will be reversed in the log-concave case.

Proposition 5 shows how the ownership structure affects the optimal compensation contract and the managerial effort choice:

Proposition 5 *For $\theta = \theta_i$ ($i = L, H$), let $(\omega_i^{CT}, e_i^{CT})$ and $(\omega_i^{DT}, e_i^{DT})$ denote the optimal managerial compensation contracts and the corresponding effort choices in concentrated and dispersed ownership structure, respectively. If $H(\cdot)$ is log-convex, then:*

1. $e_L^{CT} > e_L^{DT}$ *and* $e_H^{CT} = e_H^{DT}$,

2. $\omega_L^{CT} > \omega_L^{DT}$ *and* $\Delta_\omega^{DT} > \Delta_\omega^{CT}$.

As shown in Proposition 2, the market disciplinary mechanisms and the managerial performance-based pay are substitutes. In growing firms that have the log-convex synergy distribution function, the controlling shareholders strengthen the market disciplinary mechanism, and therefore they reduce the optimal managerial pay-performance sensitivity. The efficiency gains from ownership concentration in these firms are also confirmed in the managerial effort choice for the unfavorable state.

Formally, the optimal pay-performance sensitivity $\Delta_\omega = \frac{H_{HL}}{H_{LL}}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]$ increases with the ratio $\frac{H_{HL}}{H_{LL}}$. In the case of log-convex $H(\cdot)$, as shown in Proposition 3, the control premium reduces this ratio, i.e., strengthens the market disciplinary mechanism. The reduced information rent in turn allows the controlling shareholders to offer larger pay to the manager who reports the unfavorable state and induce higher effort, as confirmed in the following optimal managerial effort choice:

$$e_L^{CT} = \frac{\theta_L R}{c\left[1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left(1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right)\right]},$$

which also decreases with the ratio $\frac{H_{HL}}{H_{LL}}$.

Since, in the log-convex case, controlling shareholders forgo less information rent in the favorable state per the expected managerial pay in the unfavorable state and therefore induce higher managerial effort, the presence of controlling shareholders can increase the operating efficiency of the incumbent managers. It is noteworthy that, notwithstanding the operating efficiency gains from ownership concentration, minor shareholders still prefer the dispersed ownership structure. Intuitively, controlling shareholders pass up profitable takeover bids for the sake of their control benefit, and this opportunity cost dominates the operating efficiency gains from concentrated ownership structure.[21] In sum:

Proposition 6 *If H is log-convex, the incumbent manager shows better operating performance in concentrated ownership firms than in dispersed ownership while the market value is higher under the dispersed ownership structure.*

4.2 Extension: monitoring by controlling shareholders

In this section, we extend the model by considering the managerial monitoring function of controlling shareholders.[22] We model the monitoring technology as follows: after the takeover stage (i.e., $t = 2$), controlling shareholders can observe the realized state of industry θ with probability λ by incurring a private cost $\frac{1}{2}\kappa\lambda^2$. If controlling shareholders observe θ from monitoring, they do not use the managerial report $\hat{\theta}$ and instead enforce the first-best effort choice without forgoing information rent (i.e., they compensate the manager for the effort cost only).[23]

Given that the managerial agency problem cannot be fully eliminated by the takeover threat and managerial compensation (i.e., $H_{HL} > 0$ when controlling shareholders do not

[21] However, since the takeovers with negative synergies are possible conditional on low state being declared, the presence of controlling shareholders may be socially beneficial, since their private benefits reduce the incidence of inefficient takeovers.

[22] Relative to dispersed shareholders, controlling shareholders can monitor the manager better due to, e.g., the absence of the free-riding problem, the required knowledge, and fixed monitoring costs.

[23] While this modelling choice simplifies our analysis, one may question the severity of punishment after monitoring the managerial misreport in practice. In our setting, more severe punishment relaxes the truthtelling incentive compatibility constraint, but it does not change our main results qualitatively.

monitor), the monitoring function of controlling shareholders can complement the other two governance mechanisms in our setting. Without loss of generality, we focus on the case in which controlling shareholders monitor only when the manager reports $\hat{\theta} = \hat{\theta}_L$, since the manager does not have an incentive to misreport in the unfavorable state (i.e., $\hat{\theta}_H$ is always truthful).

Now consider the optimization problem of controlling shareholders who can monitor θ:

$$\max_{\langle e_i,\omega_i,p_i,\lambda\rangle} \eta[H_{HH}(V_H^S - \omega_H + B) + (1-H_{HH})p_H] + (1-\eta)[H_{LL}(V_L^S - \omega_L + B - \frac{1}{2}\kappa\lambda^2) + (1-H_{LL})p_L],$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL$_{\text{CM}}$}$$

$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH$_{\text{CM}}$}$$

$$H_{LL}(\omega_L - \frac{1}{2}ce_L^2) \geq H_{LH}(\omega_H - \frac{1}{2}c\bar{e}^2), \tag{ICL$_{\text{CM}}$}$$

$$H_{HH}(\omega_H - \frac{1}{2}ce_H^2) \geq H_{HL}(1-\lambda)(\omega_L - \frac{1}{2}c\underline{e}^2), \tag{ICH$_{\text{CM}}$}$$

The first-order conditions are provided in Appendix, and in what follows, we focus on the effect of controlling shareholders' monitoring function on other governance mechanisms. For ease of exposition, we denote the optimal takeover prices, effort and monitoring intensities with a superscript CM.

The market disciplinary mechanism is imperfect due to the possibility that the acquirer finds negative synergy value. That is, even though the potential acquirer perfectly observes the realized state θ, it may not acquire the undervalued target firm if the manager underreports the state. Controlling shareholders' monitoring function, though it is costly and imperfect, can complement the market disciplinary mechanism, since the probability of monitoring success λ is independent of the distribution of synergy value $H(\cdot)$. Formally:

Proposition 7 *Concentrated shareholders monitor with a strictly positive intensity, i.e.,* $\lambda^{CM} > 0$.

Now we turn to the question of how the market disciplinary mechanism interacts with internal monitoring. To derive a policy implication regarding the regulation on ownership concentration, we consider a case in which the takeover price P_L is exogenously determined and analyze how the internal monitoring intensity changes with the takeover price. Proposition 8 below shows that the effect of the takeover price on monitoring activities depends on the firm's synergy characteristics:

Proposition 8 *Lower takeover price* P_L

1. *increases the internal monitoring intensity if* $H(\cdot)$ *is log-convex;*

2. *reduces the internal monitoring intensity if* $H(\cdot)$ *is log-concave.*

To discuss the intuition, recall that the takeover price P_L is negatively (resp. positively) associated with the likelihood ratio of "no takeover" $\frac{H_{HL}}{H_{LL}}$ if $H(\cdot)$ is log-convex (resp. concave), as shown in Proposition 4. Consider the log-convex case. Lower P_L increases the likelihood ratio, implying that shareholders should give out more information rent to the acquirer by accepting takeover bids with negative synergies more frequently. Controlling shareholders can improve the outcome by increasing the monitoring intensity, conditional on the managerial report of unfavorable state $\hat{\theta}_L$. The same logic explains why the two mechanisms are substitutes if $H(\cdot)$ is log-concave.[24] As discussed in Section 5 below, Proposition 8 suggests that the regulations that facilitate the market for corporate control affects the controlling shareholders' incentive to monitor managers and, more importantly, the regulatory effect is affected by the firm's synergy potential.

[24] Note that our model implies that while the controlling shareholders are kind to the incumbent manager if he reports truthfully, by providing relatively higher job security, they are also tougher on the incumbent in industry downturns in the sense of monitoring intensity.

5 Discussion: empirical and regulatory implications

The preceding analysis provides testable empirical predictions regarding the effect of ownership structure on other governance mechanisms and the firm's performance. First, as reported by previous studies, the model predicts that the presence of controlling shareholders in target firms reduces the incidence of takeover while increasing the takeover premium (Barclay and Holderness 1989, Nenova 2003, Dyck and Zingales 2004, Burkart and Panunzi 2006, and Albuquerque and Schroth 2010).

The model also provides a novel testable prediction about how the firm's synergy potential affects the relationship between the ownership structure and corporate governance mechanisms. Specifically, as shown in Propositions 5 and 6, we predict that, in high synergy potential firms, the presence of controlling shareholders (e.g., family firms managed by professional CEOs) strengthens the market disciplinary mechanism and therefore improves operational efficiency and reduces managerial pay-performance sensitivity while, in the firms which do not offer high growth opportunities to the acquirer, it reduces operational efficiency and increases managerial pay-performance sensitivity. To our best knowledge, this empirical prediction has not been explored in the previous literature. Notably, our analysis also shows that concentrated ownership structure does not necessarily increase the market value of growth firms since the controlling shareholders may forgo efficient synergistic takeover opportunities to maintain their control benefits. These results provide a novel testable prediction: as the firm offers more growth opportunities, the presence of controlling shareholders (e.g., family firms managed by professional CEOs) is more likely to improve operational efficiency and less likely to reward performance.

Finally, our analysis provide novel policy implications regarding the regulation of ownership concentration. In many countries, there are debates about the social cost of concentrated ownership structure, and some regulators (e.g., the European Commission) advocate breaking up concentrated ownership structures to facilitate the market for corporate control and its managerial disciplinary function. In contrast to this standard view, our analysis shows that the managerial disciplinary mechanism of synergistic takeover can be strengthened by the presence of controlling shareholders. Furthermore, while the control premium required by controlling shareholders reduces the incidence of synergistic takeover, the internal monitoring performed by these shareholders can complement the market disciplinary mechanism in high synergy potential firms. Overall, it is ambiguous whether dismantling concentrated ownership structure would increase firm value, in particular, in firms which provide high synergy potential to acquirers.

Proposition 8 suggests that more sophisticated policies for market for corporate control may improve social welfare more effectively. Our analysis shows that, in high synergy potential firms, controlling shareholders monitor the manager more intensively if they are sell out the firm at a lower price in unfavorable states, e.g., industry downturns. Thus, for high-tech industries in which firms tend to offer large growth opportunities and more concentrated ownership structure, policymakers may consider a policy that facilitates the market for corporate control in industry downturns to encourage internal monitoring of controlling shareholders.

6 Conclusion

In this paper we show the interaction between internal and external governance mechanisms in firms with controlling shareholders when agency problems arise due to information asymmetry. Contrary to the common prior, disciplinary effect of synergistic takeovers can be stronger in high synergy potential firms with controlling shareholders due to improvements in incentives for managerial self-selection. Specifically, the control premium encourages the manager to deter the takeover threat by increasing the current value of the firm. In this case, managerial entrenchment is consistent with improvements in shareholder value.

The disciplinary effect acts as a complement to the internal monitoring efforts of controlling shareholders in reducing the amount of incentive pay required to induce truthfulness.

In contrast, the control premium in firms with few synergies isolates the manager from the takeover threat, making incentive provision reliant on internal monitoring. In order to reduce the amount of "distortion at the bottom", controlling shareholders over-monitor the manager to ensure perpetuation of control.

The disciplining effect of synergistic takeovers is not without its costs. Incentive provision requires that shareholders accept relatively low bidding prices, even if it implies allowing takeovers with negative synergies. Furthermore, tailoring correct incentive pay requires a relatively high distortion to effort levels in the low states of the world. While controlling ownership is able to mitigate these concerns, the existence of a control premium reduces the incidence of socially desirable synergistic improvements in firm value.

Appendix

A.1 Shareholders' optimal choice of takeover price when θ is observable

The optimal contract under the first-best with takeovers, i.e., when the state is publicly observable/verifiable, solves the following program for the dispersed firm:

$$\max_{\langle e_i,\omega_i,p_i\rangle} \mathbb{E}(V) = \eta[H_{HH}(V_H^S - \omega_H) + (1 - H_{HH})p_H] + (1 - \eta)[H_{LL}(V_L^S - \omega_L) + (1 - H_{LL})p_L],$$

subject to

$$\omega_L - \frac{1}{2}ce_L^2 \geq 0, \tag{PCL}$$

$$\omega_H - \frac{1}{2}ce_H^2 \geq 0, \tag{PCH}$$

In equilibrium participation constraints bind, and the optimal solutions satisfy

$$e_i^* = \frac{\theta_i R}{c},$$

$$p_i^* = \frac{1}{2}\frac{(\theta_i R)^2}{c} + \frac{1 - H_{ii}}{h_{ii}},$$

$$\omega_i^* = \frac{(\theta_i R)^2}{2c},$$

for $\theta = \theta_i$ where $i \in (L, H)$. For the concentrated ownership, the only difference is that p_i^* will reflect an increase in B.

A.2 Proof of Lemmas and Propositions

Proof of Lemma 1 Omitted since it is straightforward from the first-order conditions.

Proof of Proposition 1

The first-order conditions for the program are

$$\frac{\partial \mathbb{E}(V)}{\partial e_H} = \eta(\theta_H R - ce_H) = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial e_L} = (1-\eta)H_{LL}(\theta_L R - ce_L) - \eta H_{HL} ce_L \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_H} = \eta[h_{HH}(\theta_H e_H R - \frac{1}{2}ce_H^2) + (1 - H_{HH}) - h_{HH}p_H] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_L} = (1-\eta)[h_{LL}(\theta_L e_L R - \frac{1}{2}ce_L^2) + (1 - H_{LL}) - h_{LL}p_L] - \eta h_{HL}[\frac{1}{2}c(e_L^2 - \underline{e}^2)] = 0.$$

Next, from the first order condition we derive the expressions for p_H^{DT} and p_L^{DT} are

$$p_H^{DT} = \frac{1}{2}\frac{(\theta_H R)^2}{c} + \frac{1 - H_{HH}}{h_{HH}} = p_H^*,$$

$$p_L^{DT} = \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) + \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] < p_L^*.$$

Next, we distinguish between three cases based on managerial report. To prove the proposition, we focus on critical values of $\pi_{ij} = p_j - Y_i^*$, where $Y_i^* \equiv \theta_i e_i^* R - \frac{1}{2}ce_i^{*^2}$ is the first-best value of net cash flow, net of the effort cost.

If the manager reports truthfully in the high state from the first-order condition for p_H,

$$\pi_{HH}^{DT} = p_H^{DT} - Y_H^* = \frac{1 - H_{HH}}{h_{HH}} = \pi_{HH}^*,$$

which only depends on the distribution of π and is the same as in the case of first-best.
If the manager reports truthfully in the low state we have

$$\pi_{LL}^{DT} = p_L^{DT} - Y_L^* = \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{\theta_L R}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right].$$

The second term in H_{LL} reduces the critical π at which takeovers occur compared to the first-best with takeovers. Note that, under the first-best the inverse of the hazard rate is the same if the manager reports truthfully irrespective of the state of the world. From the properties of Cumulative Distribution Functions, we know that H_{LL} must be non-decreasing in its arguments, and by continuity we have $H_{HH} > H_{LL}$.
If the manager misreports in the high state we have

$$\pi_{HL}^{DT} = p_L^{DT} - Y_H^* = \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] + \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) - \frac{1}{2}\frac{(\theta_H R)^2}{c},$$

The first two terms in the π_{HL} are the same as in π_{LL}, while the sum of the last two terms is negative because it represents the difference between values net of cost under the second-best and the first-best respectively. Since the shareholders do not know whether the true state is low, they distort the takeover price downward conditional on low managerial report. If the true state is indeed high, this makes it more profitable for the acquirer, which equates to higher probability of the takeover if the manager misreports. Comparing the quantities, $\pi_{HH} \geq \pi_{LL} \geq \pi_{HL}$. Since $H(\pi_{ij})$ is a monotonic non-decreasing function of π and is assumed to be continuous on the support $[\underline{\pi}, \overline{\pi}]$, it implies $H_{HH} \geq H_{LL} \geq H_{HL}$. Q.E.D.

Proof of Proposition 2

From the first-order condition we have

$$e_L = \frac{\theta_L R}{c\left[1+\frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left(1-\left(\frac{\theta_L}{\theta_H}\right)^2\right)\right]}.$$

If takeovers were not disciplinary, then $H_{HL} = H_{LL}$ or equivalently the ratio $\frac{H_{HL}}{H_{LL}} = 1$. If takeovers have disciplining effect, then by Proposition 1 $H_{HL} < H_{LL}$ or equivalently $\frac{H_{HL}}{H_{LL}} < 1$. Since, the optimal effort is decreasing in the ratio we must have $e_L^{DT} > e_L^{DN}$.

Pay-for-performance sensitivity implied by the optimal wage scheme $(\omega_H^{DT}, \omega_L^{DT})$ is given by

$$\Delta_\omega \equiv \frac{H_{HH}(\omega_H^{DT} - \omega_H^*)}{H_{LL}\omega_L^{DT}} = \frac{H_{HL}}{H_{LL}}\left[1-\left(\frac{\theta_L}{\theta_H}\right)^2\right],$$

which is smaller if the takeovers are disciplinary, $\frac{H_{HL}}{H_{LL}} < 1$. Q.E.D.

Proof of Proposition 3

By the usual arguments, PCL and ICH are binding. The first-order conditions for the program are

$$\frac{\partial \mathbb{E}(V)}{\partial e_H} = \eta(\theta_H R - c e_H) = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial e_L} = (1-\eta)H_{LL}(\theta_L R - c e_L) - \eta H_{HL} c e_L\left[1-\left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_H} = \eta[h_{HH}(\theta_H e_H R - \frac{1}{2}c e_H^2 + B) + (1-H_{HH}) - h_{HH} p_H] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_L} = (1-\eta)[h_{LL}(\theta_L e_L R - \frac{1}{2}c e_L^2 + B) + (1-H_{LL}) - h_{LL} p_L] - \eta h_{HL}[\frac{1}{2}c(e_L^2 - \underline{e}^2)] = 0.$$

Further, the second-order conditions are:

$$\frac{\partial^2 \mathbb{E}(V)}{\partial e_H^2} = -\eta H_{HH} c,$$

$$\frac{\partial^2 \mathbb{E}(V)}{\partial e_L^2} = (1-\eta) H_{LL} c - \eta H_{HL} c \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right],$$

$$\frac{\partial^2 \mathbb{E}(V)}{\partial p_H^2} = -\eta H_{HH} \left(2h_{HH} + h'_{HH} \frac{1-H_{HH}}{h_{HH}}\right),$$

$$\frac{\partial^2 \mathbb{E}(V)}{\partial p_L^2} = -(1-\eta) \left\{2h_{LL} + h'_{LL} \frac{1-H_{LL}}{h_{LL}} - h'_{LL} \frac{\eta}{1-\eta} \frac{h_{HL}}{h_{LL}} \frac{(\theta_L R)^2}{2ca^2} \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]\right\},$$

$$\frac{\partial^2 \mathbb{E}(V)}{\partial e_H \partial p_H} = \eta h_{HH} \left(\theta_H R - \frac{\theta_H R}{c}\right),$$

$$\frac{\partial^2 \mathbb{E}(V)}{\partial e_L \partial p_L} = (1-\eta) h_{LL} (\theta_L R - \frac{\theta_L R}{a}) - \eta h_{HL} \frac{\theta_L R}{a} \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right],$$

where the rest of the unique cross-partials are zero. Hence, the determinant of the Hessian matrix, Δ, is given as

$$\Delta = \begin{vmatrix} \frac{\partial^2 \mathbb{E}(V)}{\partial e_H^2} & 0 & 0 & 0 \\ 0 & \frac{\partial^2 \mathbb{E}(V)}{\partial e_L^2} & 0 & \frac{\partial^2 \mathbb{E}(V)}{\partial e_L \partial p_L} \\ \frac{\partial^2 \mathbb{E}(V)}{\partial e_H \partial p_H} & 0 & \frac{\partial^2 \mathbb{E}(V)}{\partial p_H^2} & 0 \\ 0 & \frac{\partial^2 \mathbb{E}(V)}{\partial p_L \partial e_L} & 0 & \frac{\partial^2 \mathbb{E}(V)}{\partial p_L^2} \end{vmatrix} < 0$$

if $\frac{\partial^2 \mathbb{E}(V)}{\partial e_L^2} \frac{\partial^2 \mathbb{E}(V)}{\partial p_L^2} - \left\{\frac{\partial^2 \mathbb{E}(V)}{\partial p_L \partial e_L}\right\}^2 < 0$, which we assume to hold. Next, from the first-order condition we derive the expressions for p_H^{CT} and p_L^{CT}, which relative to the dispersed firm reflect the private benefits B

$$p_H^{CT} = \frac{1}{2}\frac{(\theta_H R)^2}{c} + \frac{1 - H_{HH}}{h_{HH}} + B > p_L^{DT},$$

$$p_L^{CT} = \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) + \frac{1 - H_{LL}}{h_{LL}} + B - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] > p_L^{DT}.$$

The first-order condition for p_i, for $i \in (L, H)$, is increasing in $B \in (0, \infty)$. Given the second-order condition for p_i implies $\frac{\partial^2 \mathbb{E}(V)}{\partial p_i^2} < 0$, by implicit function theorem it must be that $\frac{\partial p_i}{\partial B} > 0$. Under the concentrated ownership $B > 0$, while $B = 0$ for the dispersed ownership, we have $p_L^{CT} > p_L^{DT}$ and $p_H^{CT} > p_H^{DT}$. This proves the first part.

Next, the critical values of synergies conditional on report $\hat{\theta} = \theta_H$ are:

$$\pi_{HH}^{CT} = p_H^{CT} - Y_H^* = \frac{1 - H_{HH}}{h_{HH}} + B > \pi_{HH}^{DT},$$

since $p_H^{CT} > p_H^{DT}$ and because Y_H^* is determined by the acquirer and is the same under both ownership structures.

If the manager reports truthfully in the low state we have

$$\pi_{LL}^{CT} = p_L^{CT} - Y_L^* = \frac{1 - H_{LL}}{h_{LL}} + B - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{\theta_L R}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] > \pi_{LL}^{DT},$$

by analogy. From the properties of Cumulative Distribution Functions, H_{LL} is monotone non-decreasing in its argument, and by continuity we have $H_{HH} > H_{LL}$.

Next, if the manager misreports the favourable state, we have

$$\pi_{HL}^{CT} = \frac{1 - H_{LL}}{h_{LL}} + B - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] + \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) - \frac{1}{2}\frac{(\theta_H R)^2}{c} > \pi_{HL}^{DT},$$

Since $\frac{\partial H_{ij}}{\partial \pi_{ij}} > 0$ and $\frac{\partial \pi_{ij}}{\partial p_j} > 0$, $H_{ij}^{CT} > H_{ij}^{DT}$ and $H_{ii}^{CT} > H_{ii}^{DT}$ for $i, j \in (L, H)$ and $i \neq j$. Hence, a shifter B (being the only additional term) increases the takeover price that concentrated shareholders demand and the critical level of synergies for which the takeover occurs, π_{ij}, and in turn increases all the H_{ij} relative to the dispersed case. Q.E.D.

Proof of Proposition 4

Since $H(\cdot)$ is assumed to be continuous and twice differentiable, it is sufficient to show how the ratio $\frac{H_{HL}}{H_{LL}}$ changes with an increase in B. First, consider how $\frac{H_{HL}}{H_{LL}}$ changes with the increase in B if the distribution is log-convex in the relevant range. Since $H_{ij} \equiv H(p_j - (\theta_i e_i^* R - \frac{1}{2} c e_i^{*2}))$ $(i, j \in \{L, H\})$ and p_j increases in B, the ratio $\frac{H_{HL}}{H_{LL}}$ decreases in B if and only if

$$\frac{\partial \left(\frac{H_{HL}}{H_{LL}}\right)}{\partial p_L} = \frac{h_{HL} H_{LL} - h_{LL} H_{HL}}{H_{LL}^2} \leq 0.$$

Rearranging the inequality yields $h_{HL} H_{LL} \leq h_{LL} H_{HL}$ or equivalently

$$\frac{h_{HL}}{H_{HL}} \leq \frac{h_{LL}}{H_{LL}},$$

where $h_{HL} \equiv h(\pi_{HL})$, $h_{LL} \equiv h(\pi_{LL})$ and, thus, $\frac{h_{HL}}{H_{HL}}$ and $\frac{h_{LL}}{H_{LL}}$ are the reversed hazard ratio of $H(.)$ at π_{HL} and π_{LL}, respectively. By Proposition 1, $H_{HH} \geq H_{LL} \geq H_{HL}$, and by Proposition 3, $H_{HL}^{CT} > H_{HL}^{DT}$ and $H_{LL}^{CT} > H_{LL}^{DT}$. Since the distribution function $H(\pi)$ monotonically increases in π, the condition implies increasing reverse hazard rate (IRHR), i.e., $\frac{\partial \left(\frac{h}{H}\right)}{\partial p_L} > 0$, or equivalently, the log of distribution function $H(\hat{\pi})$ is convex. To show that the IRHR implies log-convexity, consider the following derivative:

$$\frac{\partial \left(\frac{h}{H}\right)}{\partial p_L} = \frac{h' H - h^2}{H^2} > 0,$$

implying $h' H > h^2$, which is the necessary and sufficient condition for log-convexity (see Lemma 3 in Bagnoli and Bergstrom (2005)). If the inequality is reversed, it implies a decreasing reversed hazard ratio (DRHR), or equivalently, that the log of distribution function $H(\hat{\pi})$ is concave.[A.1] Q.E.D.

[A.1]Notice that, for this result, it is sufficient that $H(.)$ is log-convex in the subinterval of π that includes

Proof of Proposition 5

From Proposition 3 we have $\frac{\partial p_L}{\partial B} > 0$ and by Proposition 4, $\frac{\partial\left(\frac{H_{HL}}{H_{LL}}\right)}{\partial p_L} < 0$ under log convexity, implying$\frac{\partial\left(\frac{H_{HL}}{H_{LL}}\right)}{\partial B} < 0$. It follows that

$$e_L^{CT} = \frac{\theta_L R}{c\left[1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left(1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right)\right]} < e_L^{DT},$$

since the denominator decreases in B. Next, from the first-order conditions for e_H^{CT}, it is clear that the effort level in state θ_H is the same as the first-best under both ownership structures, which implies $e_H^{CT} = e_H^{DT}$. This proves the first part. Since the wage in the low state is only a function of e_L, and convex in e_L, it directly follows from the previous part that if $e_L^{CT} > e_L^{DT}$, then it must be that $\omega_L^{DT} > \omega_L^{DT}$. This is easily confirmed by inspecting the optimal wage

$$\omega_L^{DT} = \frac{(\theta_L R)^2}{2ca^2},$$

where $a = 1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]$. Lastly, the pay-for-performance sensitivity is defined as

$$\Delta_\omega \equiv \frac{H_{HH}(\omega_H - \omega_H^*)}{H_{LL}\omega_L} = \frac{H_{HL}}{H_{LL}}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right],$$

which is smaller under the concentrated ownership as $\frac{H_{HL}^{CT}}{H_{HH}^{CT}} < \frac{H_{HL}^{DT}}{H_{HH}^{DT}}$. Log-concavity implies the opposite results. Q.E.D.

Proof of Proposition 6 From Proposition 5 we have $e_L^{CT} > e_L^{DT}$. Since $V_i = \theta_i e_i R$ for $i \in (L, H)$, and V_i is increasing in e_i we must have $V_L^{CT} > V_L^{DT}$. For the state θ_H, given that $e_H^{CT} = e_H^{DT}$ we have $V_H^{CT} = V_H^{DT}$. This proves the first part.

the critical synergy values π_{ij} $(i, j \in \{L, H\})$ of both ownership structures. For a list of distributions that satisfy the property of increasing reverse hazard rate over the entire interval, see Bagnoli and Bergstrom (2005).

To prove the second part it is sufficient to note that the set of constraints under both ownership structures is the same. However, concentrated shareholders maximize the expected value of both cash flow and control rights, $\mathbb{E}(V^{CT})+\mathbb{E}(B)$, while the dispersed shareholders only maximize the value of expected cash flow rights, $\mathbb{E}(V^{DT})$. Hence, $\mathbb{E}(V^{DT}) > \mathbb{E}(V^{CT})$. In the case of log-concavity, the opposite results hold. Q.E.D.

Proof of Proposition 7

With internal monitoring, the first-order conditions are:

$$\frac{\partial \mathbb{E}(V)}{\partial e_H} = \eta H_{HH}(\theta_H R - c e_H) = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial e_L} = (1-\eta)H_{LL}(\theta_L R - c e_L) - \eta H_{HL}(1-\lambda)c e_L \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial \lambda} = -(1-\eta)H_{LL}\kappa\lambda + \eta H_{HL}\frac{1}{2}c e_L^2 \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0.$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_H} = \eta[h_{HH}(\theta_H e_H R - \frac{1}{2}c e_H^2 + B) + (1 - H_{HH}) - h_{HH} p_H] = 0,$$

$$\frac{\partial \mathbb{E}(V)}{\partial p_L} = (1-\eta)[h_{LL}(\theta_L e_L R - \frac{1}{2}c e_L^2 + B - \frac{1}{2}\kappa\lambda^2) + (1-H_{LL}) - h_{LL} p_L] - \eta h_{HL}(1-\lambda)\frac{1}{2}c e_L^2 \left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] = 0.$$

Assuming that the second-order conditions hold, solving the first-order conditions yields the following system of equations:

$$e_H^{CM} = \frac{\theta_H R}{c},$$

which is the same as the first-best. Next,

$$e_L^{CM} = \frac{\theta_L R}{c\left[1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}(1-\lambda)\left(1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right)\right]}. \tag{A.1}$$

The following equations represent the optimal prices at which the incumbent shareholders are willing to sell out to the raider:

$$p_H^{CM} = \frac{1}{2}\frac{(\theta_H R)^2}{c} + B + \frac{1 - H_{HH}}{h_{HH}},$$

$$\begin{aligned} p_L^{CM} &= \theta_L e_L R - \frac{1}{2}ce_L^2 + B - \frac{1}{2}\kappa\lambda^2 + \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}(1-\lambda)\frac{1}{2}ce_L^2\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] \\ &= \frac{(\theta_L R)^2}{ca}\left(1 - \frac{1}{2a}\right) + B - \frac{1}{2}\kappa\lambda^2 + \frac{1 - H_{LL}}{h_{LL}} - \frac{\eta}{1-\eta}\frac{h_{HL}}{h_{LL}}(1-\lambda)\frac{(\theta_L R)^2}{2ca^2}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right], \end{aligned}$$

where $a = 1 + \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}(1-\lambda)\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right] > 1$. Analogue to the previous section, the first term in both equations is the firm value net of effort cost. The second term, $\frac{1-H_{ii}}{h_{ii}}$ is the critical value of π_{ij} at which the takeovers occur. The third term in p_L^{CM} represents the reduction in the takeover price which is proportional to the information rent.

The optimal monitoring intensity is given by

$$\lambda^{CM} = \frac{\eta}{1-\eta}\frac{H_{HL}}{H_{LL}}\frac{ce_L^2}{2\kappa}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]. \tag{A.2}$$

Hence, we end up with a system of equations where e_L^{CM}, p_L^{CM} and λ^{CM} are endogenous. However, to prove the proposition we only need to show that λ^{CM} is a positive quantity. Observing the equation A.2, we know that first two ratios are strictly positive and the last term in the parentheses is positive from the definition of θ, which implies that the monitoring precision is positive as long as the effort in the required effort level is positive, which is the case in equilibrium. Q.E.D.

Proof of Proposition 8

Substituting equation A.1 into equation A.2, yields the following implicit function

$$G(\lambda, \frac{H_{HL}}{H_{LL}}) = \lambda \left[1 + A(1-\lambda)\frac{H_{HL}}{H_{LL}}\right]^2 - A\frac{(\theta_L R)^2}{2\kappa c}\frac{H_{HL}}{H_{LL}}, \tag{A.3}$$

where $A = \frac{\eta}{1-\eta}\left[1 - \left(\frac{\theta_L}{\theta_H}\right)^2\right]$.

Assume that an interior solution exists in both arguments. Next, note that the function $G(\cdot)$ is cubic in λ. If the value of the function is negative at $\lambda = 0$, then the function must cross the λ-axis from below. Since this satisfies the optimality condition $G = 0$, it must be that $\frac{\partial G}{\partial \lambda}|_{\lambda^*} > 0$. To verify,

$$G(0, \frac{H_{HL}}{H_{LL}}) = -A\frac{(\theta_L R)^2}{2\kappa c}\frac{H_{HL}}{H_{LL}} < 0,$$

and

$$\left.\frac{\partial G}{\partial \lambda}\right|_{\lambda=0} = \left[1 + A\frac{H_{HL}}{H_{LL}}\right]^2 > 0.$$

Hence, the function is below the horizontal axis and it is increasing, which proves the first part.

Next, note that $G(\cdot)$ is quadratic in the ratio $\frac{H_{HL}}{H_{LL}}$ with a positive leading coefficient. Then, $G(\cdot)$ must be convex in the ratio, and if the function value is positive at $\frac{H_{HL}}{H_{LL}} = 0$, then the function must cross the horizontal axis from above. Evaluating

$$G(\lambda, 0) = \lambda > 0$$

by Proposition 7, and re-arranging the equation A.3 yields

$$G(\lambda, \frac{H_{HL}}{H_{LL}}) = A^2\lambda(1-\lambda)^2 \left[\frac{H_{LL}}{H_{HL}}\right]^2 + \left[2\lambda(1-\lambda) - \frac{(\theta_L R)^2}{2\kappa c}\right] A\frac{H_{HL}}{H_{LL}} + \lambda. \tag{A.4}$$

The coefficient of the linear term in the equation A.3 must be negative, otherwise G will not have any positive roots. Hence,

$$\left.\frac{\partial G}{\partial \frac{H_{LH}}{H_{LL}}}\right|_{\frac{H_{LH}}{H_{LL}}=0} = \left[2\lambda(1-\lambda) - \frac{(\theta_L R)^2}{2\kappa c}\right] A \frac{H_{HL}}{H_{LL}} < 0.$$

The sign of the quantity in the derivative is also implied by the optimality condition, which is obvious from inspecting the equation A.4, i.e., by setting $G = 0$ and rearranging the terms. To determine the sign, by the Implicit Function Theorem we have

$$\frac{d\lambda}{d\frac{H_{HL}}{H_{LL}}} = -\frac{\frac{\partial G}{\partial \frac{H_{HL}}{H_{LL}}}}{\frac{G}{\partial \lambda}} > 0.$$

When H is log-convex, by Proposition 4, $\frac{\partial \frac{H_{HL}}{H_{LL}}}{\partial p_L} < 0$, the ratio $\frac{H_{HL}}{H_{LL}}$ is increasing with a decrease in p_L, which implies an increase in λ^{CM} by the Implicit Function Theorem. The reverse is true when H is log-concave. Q.E.D.

References

Albuquerque, Rui, and Enrique Schroth, 2010, Quantifying private benefits of control from a structural model of block trades, *Journal of Financial Economics* 96, 33 – 55.

Almazan, Andres, and Javier Suarez, 2003, Entrenchment and severance pay in optimal governance structures, *Journal of Finance* 58, 519–548.

Almeida, Heitor V., and Daniel Wolfenzon, 2006, A theory of pyramidal ownership and family business groups, *Journal of Finance* 61, 2637–2680.

Anderson, Ronald C., and David M. Reeb, 2003a, Founding-family ownership and firm performance: Evidence from the S&P 500, *The Journal of Finance* 58, 1301–1327.

Anderson, Ronald C., and David M. Reeb, 2003b, Founding-family ownership, corporate diversification, and firm leverage, *Journal of Law and Economics* 46, pp. 653–684.

Bagnoli, Mark, and Ted Bergstrom, 2005, Log-concave probability and its applications, *Economic Theory* 26, 445–469.

Barclay, Michael J, and Clifford G Holderness, 1989, Private benefits from control of public corporations, *Journal of Financial Economics* 25, 371–395.

Bertrand, Marianne, and Antoinette Schoar, 2006, The role of family in family firms, *Journal of Economic Perspectives* 20, 73–96.

Burkart, Mike, Denis Gromb, and Fausto Panunzi, 1997, Large shareholders, monitoring, and the value of the firm*, *The Quarterly Journal of Economics* 112, 693.

Burkart, Mike, and Fausto Panunzi, 2006, Takeovers, *ECGI-Finance working paper* .

Burkart, Mike, Fausto Panunzi, and Andrei Shleifer, 2003, Family firms, *The Journal of Finance* 58, 2167–2202.

Demsetz, Harold, and Kenneth Lehn, 1985, The structure of corporate ownership: Causes and consequences, *Journal of Political Economy* 93, 1155–1177.

Dyck, Alexander, and Luigi Zingales, 2004, Private benefits of control: An international comparison, *The Journal of Finance* 59, 537–600.

Ellul, Andrew, Marco Pagano, and Fausto Panunzi, 2010, Inheritance law and investment in family firms, *The American Economic Review* 100, pp. 2414–2450.
URL: *http://www.jstor.org/stable/41038768*

Fahlenbrach, Rudiger, 2009, Founder-CEOs, investment decisions, and stock market performance, *Journal of Financial and Quantitative Analysis* 44, 439–446.

Grossman, Sanford J., and Oliver D. Hart, 1980, Takeover bids, the free-rider problem, and the theory of the corporation, *The Bell Journal of Economics* 11, 42–64.

Kini, Omesh, William Kracaw, and Shehzad Mian, 2004, The nature of discipline by corporate takeovers, *The Journal of Finance* 59, 1511–1552.

Li, Zhi, Harley E Ryan, and Lingling Wang, 2015, Compensation incentives for non-family executives in family firms, *Unpublished working paper* .

Maug, Ernst, 1998, Large shareholders as monitors: is there a trade-off between liquidity and control?, *The Journal of Finance* 53, 65–98.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, Management ownership and market valuation: An empirical analysis, *Journal of Financial Economics* 20, 293 – 315, the Distribution of Power Among Corporate Managers, Shareholders, and Directors.

Myerson, Roger B., 1982, Optimal coordination mechanisms in generalized principal-agent problems, *Journal of Mathematical Economics* 10, 67–81.

Nenova, Tatiana, 2003, The value of corporate voting rights and control: A cross-country analysis, *Journal of Financial Economics* 68, 325 – 351.

Scharfstein, David, 1988, The disciplinary role of takeovers, *The Review of Economic Studies* 55, 185–199.

Schwert, G. William, 2000, Hostility in takeovers: In the eyes of the beholder?, *The Journal of Finance* 55, 2599–2640.

Shleifer, Andrei, and Robert W. Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 461–488.

Shleifer, Andrei, and Robert W. Vishny, 1997, A survey of corporate governance, *The Journal of Finance* 52, 737–783.

Sraer, David, and David Thesmar, 2007, Performance and behavior of family firms: Evidence from the french stock market, *Journal of the European Economic Association* 5, 709–751.

Stulz, René, 1988, Managerial control of voting rights: Financing policies and the market for corporate control, *Journal of Financial Economics* 20, 25–54.

Villalonga, Belén, and Raphael Amit, 2006, How do family ownership, control and management affect firm value?, *Journal of Financial Economics* 80, 385 – 417.

Villalonga, Belén, and Raphael Amit, 2009, How are U.S. family firms controlled?, *Review of Financial Studies* 22, 3047–3091.