

# Advising Shareholders in Takeovers

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## **Abstract**

This paper studies the advisory role of the board of directors in takeovers. I develop a model in which the takeover premium and the ability of the target board to resist the takeover are endogenous. The analysis relates the influence of the board on target shareholders and the reaction of the market to its recommendations to various characteristics of the acquirer and the target. I also show that the expected target shareholder value can decrease with the expertise of the board and it is maximized when the board is biased against the takeover. Generally, uninformative and ignored recommendations are not necessarily evidence that the target board has no influence on the outcome of the takeover. Perhaps surprisingly, under the optimal board structure, target shareholders ignore the recommendations of the board, which are never informative in equilibrium.

**KEYWORDS:** Acquisition, Board of Directors, Cheap-Talk, Coordination, Corporate Governance, Free-riding, Merger, Takeover.

**JEL CLASSIFICATION:** D82, D83, G34

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# 1. Introduction

The decision of shareholders of public firms to accept a takeover offer is typically marred by two problems. First, shareholders generally do not have a precise estimate of the fair value of their shares, and without more information they cannot distinguish between inadequate and attractive offers. Second, the takeover succeeds only if the majority of target shareholders approve it. As noted by Grossman and Hart (1980), unless shareholders can coordinate their collective decision, there is a free rider problem when shareholders decide whether to accept a tender offer.<sup>1</sup> Overall, there is a risk that the outcome of the takeover is inefficient.

To assist target shareholders, the board of directors is expected to use its superior knowledge about the company and advise shareholders whether accepting the takeover offer is in their best interests. Indeed, most takeover attempts are accompanied by a public recommendation from the target board to its shareholders.<sup>2</sup> For example, in response to a multi-billion takeover offer from Kraft Foods, the board of Cadbury published a defence document in which it explains why shareholders should follow its recommendation to reject Kraft's offer.<sup>3</sup> Target shareholders, however, do not always follow these recommendations, perhaps because they do not trust their board. After being pressured by its shareholders, the board of Cadbury eventually accepted a sweetened bid from Kraft Foods, even though the bid was below what was suggested by Cadbury's CEO as a fair value for the company.<sup>4</sup> Baker and Savasoglu (2002) study 1901 US takeover offers between 1981 and 1996, and find that around 20% of the offers either succeeded despite the resistance of the target board, or failed in spite of the board's support.<sup>5</sup>

The evidence suggests that the ability of the target board to sway the collective decision of its shareholders varies across firms. What determines whether target shareholders listen and follow the recommendations of their board? Is it necessarily in their best interests to have an

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<sup>1</sup>Rossi and Volpin (2004) find evidence that is consistent with the free-rider hypothesis.

<sup>2</sup>SEC rule 14d-9 requires the target board to post a recommendation in response to a tender offer in the US.

<sup>3</sup>See <http://online.wsj.com/public/resources/documents/CadburyDefenceDocument2009-part1.pdf>

<sup>4</sup>See "How Cadbury's resolve melted when the price was right", The Guardian, 01/18/2010.

<sup>5</sup>See also Bange and Mazzeo (2004), Cotter and Zenner (1994), Cotter et al. (1997), Schwert (2000), Shivdasani (1993), Song and Walkling (1993).

influential board? How does the market react to these recommendations? Does a failure to influence shareholders' decision indicate that the board had no effect on the outcome of the takeover? How should corporate boards be structured given their advisory role in takeovers? The goal of this paper is to explore these important questions, which to best of my knowledge were overlooked by the existing literature.

For this purpose, I develop a model in which the takeover offer, the recommendation of the target board, and the collective decision of target shareholders are all determined in equilibrium. The bidder, who can increase the value of the target, makes a tender offer to acquire the firm. Once the offer is made, the target board posts a public recommendation to shareholders, advising them whether to accept or reject the offer. The board is not necessarily maximizing shareholder value; it may have self-serving motives. However, the board has private information about the value of the target. By its nature, this information is forward-looking and non-verifiable. Since the credibility of the board is the key in understanding its ability to influence the decision of shareholders, communication is modeled as cheap talk à la Crawford and Sobel (1982). Given the recommendation of the board, each shareholder decides whether to accept or reject the offer. The takeover is approved if and only if the majority of target shareholders tender their shares. As in Grossman and Hart (1980), target shareholders cannot coordinate their collective decision and they are subject to free-riding. If the initial offer is rejected by shareholders, the bidder can revise it and make a "best and final offer". Target shareholders then make their final decision about the takeover.

In equilibrium, there is an interplay between the takeover premium that is offered by the bidder and the ability of the target board to influence the decision of shareholders. If the premium is sufficiently high (too low), the recommendation from the board is uninformative and target shareholders accept (reject) the offer even if it is against their board's will. If the premium is "moderate", the success of the takeover is uncertain and depends on the board's recommendation, which is informative. Building on this characterization, the analysis provides novel predictions with respect to the likelihood that target shareholders ignore the

recommendations of their board and the reaction of the market to these recommendations. The analysis ties these variables to the type of the recommendation (accept or reject) and various characteristics of the bidding firm (e.g., empire building motives or the ability to make a “best and final offer”), the independence and industry related expertise of target board members, and the uncertainty about the value of target (e.g., target stock price informativeness or analysts coverage).

Seemingly, if in equilibrium the recommendation is uninformative and ignored by shareholders, the target board must have had no effect on the takeover. The analysis suggests otherwise. The threat that the target board would alert its shareholders that an offer is inadequate can in and of itself change the outcome of the takeover and deter the bidder from making a low offer. For example, if the bidder has significant private benefits of control, he would be willing to bid up the price to a point where in equilibrium target shareholders accept the offer even if the board recommends them otherwise. In this light, the decision of Cadbury shareholders to accept the offer from Kraft Foods in spite of their board’s objection does not mean that the Cadbury board was irrelevant – the Kraft Foods offer might have been lower had the Cadbury board not fulfilled its advisory role. On the other hand, by warning its shareholders that the offer is inadequate the board creates adverse selection that is intensified by their free-riding behavior: Target shareholders accept the offer only if it is higher than the expected post-takeover value of the target. Without significant private benefits of control, the bidder will try to avoid overpaying for the target by low-balling the offer, and as a consequence, increasing the risk of receiving a negative recommendation. At the extreme, the takeover premium in equilibrium is too low and target shareholders reject the offer irrespective of what the board recommends them to do. If the takeover is expected to increase value, following the advice of the board can result with a lower expected target shareholder value in equilibrium.

The influence of the target board in equilibrium depends on several factors. First, it increases with the quality of the board’s private information and the underlying uncertainty about the target. In both cases, the board has more information to share with its shareholders,

who are therefore willing to listen. Second, since a recommendation to reject the offer is a signal that the target is undervalued, in equilibrium, the revised offer is always higher than the initial offer. Therefore, the anticipation that the bidder will sweeten his initial offer gives the target board more reasons to recommend shareholders against it. If the board is biased against the takeover, the possibility of a bid revision exacerbates this bias and harms the credibility of the board. However, if the board is biased in favour of the takeover, the possibility of a bid revision counters this tendency and increases the influence of the board. Third, and perhaps surprisingly, the influence of the board can increase with its bias against the takeover. In particular, the model predicts a U-shape relationship between the independence of the board and the likelihood that target shareholders ignore its recommendation to reject a takeover offer. Intuitively, the objective of an unbiased board, which is to maximize the value of shareholders as a collective, is different from the objective of each individual shareholder. Indeed, due to free-riding, each shareholder has incentives to keep his share, hoping that other shareholders would tender their shares and approve the takeover. As a result, shareholders inevitably reject offers that benefit them collectively. A value-maximizing board distorts its recommendation in an attempt to resolve this coordination failure: It misrepresents the value of the target to convince shareholders that the offer is more attractive than it seems. Shareholders anticipate this paternalism and do not take the recommendations of the board on their face value. In equilibrium, these recommendations are contaminated with noise, and consequently, shareholders limit the extent to which they follow the advice of their unbiased board.<sup>6</sup> By contrast, if the board is biased against the takeover, for example, because directors can lose their job and the associated perks, it has weaker incentives to correct this coordination failure. In fact, the board would exploit the tendency of shareholders to free-ride and recommend them to reject some value-increasing offers. If the resulting distortion from the self-serving motives

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<sup>6</sup>Although the target board tries to overcome the free-riding problem, its impact is limited in equilibrium. Studies by Shleifer and Vishny (1986), Hirshleifer and Titman (1990), Cornelli and Li (2002), Kyle and Vila (1991), Mueller and Panunzi (2004), Amihud et al. (2004), Marquez and Yilmaz (2012), At et al. (2011) and Burkart et al. (1998), propose different ways to mitigate the free-riding problem.

of the board is not too large, it coincides with shareholders' free-riding behavior and reduces the tension between the board and each individual shareholder. As a result, a biased board has more credibility than a value-maximizing board in equilibrium.

The model provides a framework to study the reaction of the market to the recommendations of the target board. When the board resists the takeover, the reaction of the market in equilibrium can be either negative or positive. If the reaction is negative then target shareholders follow the recommendation of the board to reject the takeover even though the market penalizes them for doing so. Indeed, because of the free-riding problem, shareholders cannot avoid rejecting some offers that benefit them collectively. If the reaction of the market is positive then the recommendation of the board to reject the takeover reveals that the offer undervalues the target. The market therefore cheers the decision of target shareholders to reject the offer. I show that the resistance of the target board is more likely to generate a negative (rather than positive) market reaction in equilibrium when the target board is biased against the takeover, the takeover is likely to generate high synergy or private benefits for the bidder, the offer is likely to be the bidder's "best and final offer", or the target board is not well informed relative to its shareholders.

The bias of the board (i.e., directors' non-independence) and the quality of its private information (i.e., directors' expertise) play a key role in the analysis. The background, qualifications, and affiliation of directors, as well as the compensation they receive, affect these characteristics. What is the structure of the board that maximizes the expected target shareholder value in equilibrium? I show several results. First, fixing the independence of the board, the optimal level of expertise is not necessarily the highest level of expertise. Second, fixing the expertise of the board, it is always optimal to have a board with an intrinsic bias against selling the firm. Third, when both dimensions are endogenized, the optimal board is biased against the takeover but has the highest level of expertise possible. All together, the model suggests that in the context of takeovers, it is optimal to populate the board with directors who are either employed by the firm or have social and business ties with senior manage-

ment. These directors have access to management and are likely to be informed, but they also have incentives to protect the CEO, and hence, are biased against the takeover. Moreover, I show that in equilibrium under the optimal board structure (in all three configurations) target shareholders accept the takeover offer irrespective of the recommendation of the board, which is uninformative. In other words, the inability to influence the decision of target shareholders in equilibrium is a robust feature of an optimal board structure.<sup>7</sup>

Intuitively, the optimal board structure is designed to convince the bidder to make an offer so high that shareholders cannot refuse, no matter what the board recommends them to do. The subtlety is that the credibility of the optimal board has to be high enough to deter the bidder from low-balling the offer, but it cannot be too high so that the bidder can guarantee the success of the takeover by bidding-up the price. Since shareholders cannot commit not to follow a highly informative recommendation, too much expertise on the board can be counterproductive – it exposes the bidder to adverse selection and forces him to shade his offer. For a similar reason, the board has to be self-serving and sufficiently biased against selling the firm so that shareholders do not always follow its advice. Interestingly, the expertise and the bias of the board complement each other: Higher expertise increases the credibility of the board and therefore requires a larger bias to keep the credibility fixed. However, fixing the credibility of the board, a larger bias against the takeover forces the bidder to bid even higher to avoid a negative recommendation. Following this logic, when both the bias and the expertise of the board are designed, it is optimal to bias the board against the takeover and set its expertise at the highest level.

Overall, the analysis emphasizes that in the context of takeovers, a biased board has significant advantages that have been previously overlooked. This observation is consistent with Bange and Mazzeo (2004) who find that the takeover premium and the target shareholder value are higher for targets with non-independent boards. Furthermore, the model predicts

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<sup>7</sup>The result about the inability of the optimal board to influence the decision of its shareholders is derived in the context of takeovers. In practice, the optimal structure of the board and its behavior may also depend on factors that are not related to takeovers (e.g., the investment policy of the firm), and therefore, are not captured by the analysis in this paper.

that if corporate boards are structured optimally (with respect to takeovers), takeover offers would embed a relatively high premium, these offers are likely to be supported by the target board (since the premium is abnormally high), but when the board is recommending against the takeover, the target shareholders are likely to ignore these recommendations which are uninformative.

This paper contributes to the literature on managerial resistance in takeovers (Bagnoli et al. (1989), Baron (1983), Berkovitch and Khanna (1990), Hirshleifer and Titman (1990), Harris and Raviv (1988), and Ofer and Thakor (1987)). Different from this literature, here the target board cannot unilaterally block the takeover; it must convince target shareholders that it is in their best interest to reject the offer. Since the ability of the board to resist a takeover is endogenous, my framework can relate it to various characteristics of the acquirer and the target. Models of takeovers with asymmetric information have been studied by Baron (1983), Hirshleifer and Titman (1990), Marquez and Yilmaz (2008, 2012), Ofer and Thakor (1987), Ohta and Yee (2008), and Shleifer and Vishny (1986). Unlike these studies, here the board of directors of the target firm is privately informed about the value of the target, and it communicates this information strategically to influence the decision of target shareholders. To best of my knowledge, the role of corporate boards in advising their shareholders about takeovers has not been addressed by the existing literature. Finally, the paper is related to Adams and Ferreira (2007), Harris and Raviv (2008), Chakraborty and Yilmaz (2012), and Levit (2012), who study the trade-off between board independence and effective communication with the manager. Similar to these studies, I show that a biased advisory board can be better than an unbiased advisory board from the perspective of uninformed shareholders. However, instead of advising the manager, in this paper the board advises shareholders whether to accept a takeover offer, which is one of the key duties of corporate boards. Because the takeover offer is endogenous and affected by the ability of the target board to influence its shareholders, the optimal board structure has a unique and surprising feature – it cannot effectively use its private information to influence the decision of shareholders in equilibrium.



## 2. Setup

A public firm, the target, is owned by a continuum of homogeneous shareholders and run by its board of directors. Each shareholder holds one non-divisible share and each share carries one vote. The number of shares is normalized to one. According to the governance rules of the firm, a successful takeover requires at least half of its voting rights. A bidder is considering the acquisition of the firm. The value of the target firm under the control of the incumbent board is  $\tilde{q}$  which is uniformly distributed on  $[\underline{q}, \bar{q}]$ , where  $0 \leq \underline{q} < \bar{q}$ . The difference between  $\bar{q}$  and  $\underline{q}$  measures the level of uncertainty about the standalone value of the target, which is affected by the availability of external sources of public information (e.g., target stock price, debt ratings, or analyst coverage) or the volatility, intangibility, and complexity of the underlying assets of the target. The standalone value of the target also captures the possibility that the target remains independent for a while and then is acquired by a different bidder. The value of the target firm under the control of the bidder is  $\tilde{q} + \Delta$ , where  $\Delta$  is common knowledge. Consistent with the empirical evidence that takeovers on average create value (e.g., Andrade et al. (2001) and Bhagat et al. (2005)), I assume  $\Delta \geq 0$ . All players are risk neutral.

The game consists of five stages. At the outset, the bidder makes an (initial) offer to target shareholders. Following Grossman and Hart (1980), tender offers are the only admissible mode of takeovers. When making an offer, the bidder commits to buy all tendered shares conditional on gaining control of the target, that is, at least half of the shareholders tendered their shares. The focus is on conditional offers, which are common in practice. An offer consists of a cash payment that each shareholder receives in return for selling the bidder his share of the target firm. I denote the initial offer by  $p_1 \geq 0$ . If a shareholder decides to keep his share, he retains exactly one share of the target under either management. In particular, the value to non-controlling shareholders under the bidder's control is given by  $\tilde{q} + \Delta$ .<sup>8</sup>

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<sup>8</sup>The assumption that non-tendering shareholders can hold onto their shares is not necessary. Alternatively, the bidder can take the firm private and try to “freeze-out” non-tendering shareholders. As long as nontendering shareholders hold some bargaining power and expect to capture a fraction of the surplus, even if it is arbitrarily small, collective action problems are present and the results of the paper continue to hold (see also Mueller and Panunzi (2004) for a discussion on the fragility of freezeout mergers as a panacea to the free-riding problem).

In the second stage, the board advises its shareholders about the takeover. The target board is in a better position than its shareholders to estimate by how much the takeover offer increases (or decreases) the value of their shares. Indeed, directors have superior information as an integral part of their job, especially in the context of takeovers as the law requires directors to inform themselves of all relevant information when evaluating a takeover proposal.<sup>9</sup> To focus attention on the advisory role of the board, I assume that the board privately observes signal  $\tilde{s}$  on  $\tilde{q}$  while target shareholders are uninformed. Bidders also have limited information about the standalone value of the target and rely heavily upon its financial statements. For those reasons and for simplicity, I also assume that the bidder is uninformed about  $\tilde{q}$ . The signal of the board has the following properties:

$$\tilde{s} = \begin{cases} \tilde{q} & \text{with probability } \lambda \in (0, 1] \\ \tilde{\varepsilon} & \text{with probability } 1 - \lambda, \end{cases} \quad (1)$$

where  $\tilde{\varepsilon}$  and  $\tilde{q}$  are identically and independently distributed. Parameter  $\lambda$  measures the precision of the target board’s private information. It can be interpreted as the level of expertise on the board, which is a mix of the industry knowledge, experience, formal education, and talent of its members.

To study the advisory role of the board, I assume that the only mean by which the board can affect the outcome of the takeover is by communicating private information to target shareholders. Intuitively, although in some jurisdictions corporate boards can use defensive measures such as “poison pills” to resist a takeover, withstanding a pressure from shareholders for a long period time is typically not feasible – the board must persuade shareholders that it acts in their best interests.<sup>10</sup> The board, whose members are assumed to speak in one

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Bates et al. (2006) provide empirical evidence that is consistent with minority shareholders holding some bargaining power in freezeout mergers.

<sup>9</sup>See the Delaware Supreme Court’s decision in *Smith vs. Van Gorkom*, 488 A.2d 858 (Del. 1985).

<sup>10</sup>In the UK, corporate boards cannot use poison pills unless shareholders explicitly approve them. In Canada, poison pills can “buy time” for the target board, but they cannot be used to block the takeover for an unlimited period of time. In the US, poison pills have no “expiration date”. Empirically, Heron and Lie (2006) and Bates

voice, recommends that shareholders either accept or reject the offer. The board can also be more specific, for example, by providing its own estimate of the “fair” value of the target. In the context of takeovers, the recommendations of the board are often based on the forecast of future performances. By nature, this information is subjective and non-verifiable. While the board can back its recommendations with the opinions of investments bankers, these “fair opinions” often rubber-stamp the view of directors and do not contain additional information (Kisgen et al. (2009)). Moreover, disclosure of proprietary information such as trade secrets or development of new technologies is often too costly and rare in practice. Consistent with this view, the private information of the board is assumed to be non-verifiable and the content of the board’s recommendation does not affect its payoff directly. I denote by  $\mu(s, p_1) \in [\underline{q}, \bar{q}]$  the message the board sends to target shareholders conditional on privately observing  $\tilde{s} = s$  and given the bidder’s initial offer  $p_1$ . I assume that the message is public.

In the third stage, shareholders simultaneously decide whether to tender their shares to the bidder in return for  $p_1$ . Each target shareholder is negligible in size and believes that his individual decision cannot change the outcome of the takeover. Moreover, shareholders do not rely on the recommendations of the board naively. They are aware of the possibility that the board can manipulate information to affect their decisions. Overall, the decision of each shareholder to tender his share given initial offer  $p_1$  and message  $m$  is denoted by  $\phi_1(m, p_1) \in \{0, 1\}$ , where  $\phi_1 = 1$  stands for tendering and  $\phi_1 = 0$  for not tendering.

In the fourth stage, the bidder can revise his initial offer if it failed. Specifically, if more than 50% of target shareholders tendered their shares then the takeover succeeds, payoffs are distributed, and the game ends. However, if more than 50% of target shareholders rejected the initial offer then with an exogenous probability  $\delta \in [0, 1)$  the bidder makes a new tender offer to target shareholders, which can be higher than, identical to, or lower than the initial offer. With probability  $1 - \delta$  the bidder has to walk away from the deal and the target remains independent.

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et al. (2008) find that anti-takeover measures do not significantly alter the likelihood that targets in contested bid are ultimately acquired. See the Online Appendix for a characterization of the conditions under which target shareholders benefit from granting their board with the power to unilaterally reject the takeover.

Parameter  $\delta$  captures in a reduced form the possibility that the bidder's initial offer is also his "best and final offer". Among other things,  $1 - \delta$  reflects the inability of the bidder to secure additional funds that might be needed to raise the initial offer, the benefit from establishing a reputation for being a tough negotiator in the market for corporate control (which is relevant for serial acquirers), the likelihood that an alternative and superior investment opportunity emerges, or the inability to generate synergy if the acquisition of the target is delayed. I denote the revised offer by  $p_2(m, p_1)$ .

Finally, if the initial tender offer is rejected by shareholders and then revised by the bidder, similar to the third stage, target shareholders make their final tendering decision and the game ends. I denote by  $\phi_2(m, p_1, p_2) \in \{0, 1\}$  the decision of each shareholder to tender his share in return for the revised offer  $p_2$ . Note that in the baseline model the board does not send shareholders an additional message if the initial offer is revised. In Section 3.5 I consider a variant of the model in which the board can also revise its initial recommendation.

## 2.1. Payoffs

If the takeover fails, the value of each share is the realized value of  $\tilde{q}$ . If an offer  $p$  is accepted, each tendering shareholder gets  $p$  for his share, and each non-tendering shareholder obtains a value of  $\tilde{q} + \Delta$ . I denote the aggregate target shareholder value by  $\tilde{v}$ . In equilibrium,  $\tilde{v}$  is a function of the realized standalone value of the target, the synergy, the tender offer, and the number of shareholders who tendered their shares.

The possibility of a takeover can introduce conflicts of interest between the target board and its shareholders. The utility of the target board is given by

$$\tilde{w} = \tilde{v} + \begin{cases} \beta & \text{if the takeover fails} \\ 0 & \text{if the takeover succeeds.} \end{cases} \quad (2)$$

If  $\beta = 0$  then the board is unbiased and its recommendations are given to maximize target shareholder value. However, if  $\beta > 0$  then the board is biased *against* selling the target and

it may advise shareholders to reject offers that increase value. A bias against the takeover can arise if the takeover threatens directors' compensation, power, prestige, or firm-specific human capital (Harford (2003)). Under this interpretation, higher  $\beta$  represents a board with more insiders, fewer independent directors, and a more powerful CEO. Alternatively,  $\beta > 0$  if directors represent other stakeholders whose wealth is negatively related to the success of a takeover, for example, the labor force. By contrast, if  $\beta < 0$  then the board is biased *in favor* of selling the target and it may advise shareholders to accept offers that undervalue the firm. For example, an assurance by the bidding firm of continuity in directors' positions, or a promised bonus upon successful transaction, can bias the board in favor of the takeover (Hartzell et al. (2004)).

Finally, the bidder has a benefit  $b \geq 0$  from the takeover that does not accrue to target shareholders. Managers benefit from acquisitions by gaining prestige from managing larger firms, reducing exposure of idiosyncratic risk, consuming perks, obtaining higher compensation, and reducing of the likelihood of a hostile takeover (Grinstein and Hribar (2004) and Harford and Li (2007)). Therefore, bidding firms with a weaker corporate governance (e.g., firms with dispersed shareholder base, low stock ownership by management, entrenched board, lack of institutional ownership, etc.) will have larger private benefits from acquiring the target. Alternatively, private benefits from control can stem from self-dealing with the target. Either way, if the takeover succeeds then the bidder consumes his private benefits  $b$  and earns  $\tilde{q} + \Delta - p$  on each of the tendered shares.<sup>11</sup>

## 2.2. Solution concept

A Perfect Bayesian Equilibrium of the game consists of five parts: the bidder's initial offer  $p_1^*$ , the communication strategy of the target board  $\mu^*$ , shareholders' initial tendering decision  $\phi_1^*$ , the bidder revised offer  $p_2^*$ , and shareholders' final tendering decision  $\phi_2^*$ . Specifically, the equilibrium is defined as follows: (i) For any message  $m$  and tendering stage  $i \in \{1, 2\}$ , the

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<sup>11</sup>The bidder's private benefits from control are exogenous and commonly known. See Burkart et al. (1998) for a model with endogenous private benefits.

strategy  $\phi_i^*$  maximizes the expected utility of each shareholder given that other shareholders are expected to follow  $\phi_i^*$ , taking as given  $\mu^*$  and  $p_i^*$ . As standard in the literature on takeovers,  $\phi_i^*$  is a symmetric pure-strategy and it cannot be weakly dominated.<sup>12</sup> Moreover, (ii) for any  $p_1^*$  and realization of  $\tilde{s}$ , if message  $m$  is in the support of  $\mu^*$ , then  $m$  maximizes the expected utility of the board given  $\phi_1^*$ ,  $p_2^*$ , and  $\phi_2^*$ ; (iii) the initial tender offer  $p_1^*$  maximizes the bidder's expected profit given  $\mu^*$ ,  $\phi_1^*$ ,  $p_2^*$ , and  $\phi_2^*$ ; (iv) for any message  $m$ , the revised offer  $p_2^*$  maximizes the bidder's expected profit given  $\mu^*$  and  $\phi_2^*$ . Finally, all agents have rational expectations in that each player's belief about the other players' strategies is correct in equilibrium. Moreover, all agents use Bayes' rules to update their beliefs from the board's message about  $\tilde{q}$ .

### 3. Analysis

Consider first the collective decision of target shareholders to tender their shares. Let  $p$  be tender offer made by the bidder and let  $\hat{q}(m)$  be the beliefs of target shareholders about the expected value of  $\tilde{q}$  conditional on message  $m$ . Since the tender offer is conditional and no shareholder is pivotal for the outcome, there always exists an equilibrium in which the tender offer fails. This observation is a standard result in the literature on takeovers. It holds both in the initial tendering stage as well as in the final tendering stage, and it is independent of the message of the board. However, if the tender offer is expected to succeed, each shareholder compares the tender offer  $p$  to the value of his share under the new management, which is given by  $\hat{q}(m) + \Delta$ . If  $p \geq \hat{q}(m) + \Delta$  then tendering is a best response for each shareholder, and if  $p < \hat{q}(m) + \Delta$  then each shareholder is better off holding onto his share. As noted by Grossman and Hart (1980), this free-riding behavior implies that value-increasing offers can be collectively rejected by shareholders. Hereafter, I focus on equilibria of the tendering stage in which shareholders never play weakly dominated strategies. The next result summarizes the conditions under which a given tender offer is accepted by shareholders.

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<sup>12</sup>There are few exceptions in the literature: Bagnoli and Lipman (1988) and Hirshleifer and Titman (1990).

**Lemma 1** *In any equilibrium of the tendering stage in which weakly dominated strategies are not played, target shareholders accept the tender offer  $p$  given message  $m$  if and only if*

$$p \geq \hat{q}(m) + \Delta. \quad (3)$$

According to Lemma 1, without more information, the lowest offer that shareholders accept is  $\hat{q}(m) + \Delta$ . Since the bidder shares the same beliefs with the shareholders about  $\tilde{q}$ , if the initial offer is rejected by shareholders and an opportunity to revise it has emerged (which happens with probability  $\delta$ ), the bidder revises his offer from  $p_1$  to  $\hat{q}(m) + \Delta$ .

**Lemma 2** *Suppose the board sends message  $m$  with respect to initial offer  $p_1$ . If the initial offer is rejected by shareholders, then the revised offer is given by*

$$p_2(m, p_1) = \hat{q}(m) + \Delta. \quad (4)$$

Notice that since the bidder is uninformed about  $\tilde{q}$ , the beliefs of target shareholders are not affected directly by his offer. However, the offer affects the message that is sent by the board, and through this channel, it *indirectly* affects the shareholders' beliefs and the revised offer in equilibrium.

### 3.1. Board's recommendations

For any initial offer  $p_1$  there exists a proper subgame which I refer to as the “communication subgame”. Consider the message of the board given  $p_1$ . The message affects the outcome of the takeover if it reveals information about  $\tilde{q}$  and either changes the tendering decision of target shareholders (at either stage) or encourages the bidder to revise the initial offer if it is rejected. Equilibria of the communication subgame with this property are called “influential”. Let  $M(p_1)$  be the set of messages on the equilibrium path of the communication subgame. The formal definition is given below.

**Definition 1** *An equilibrium of the communication subgame is influential if there exist  $m' \neq m'' \in M(p_1)$  such that  $\mathbb{E}[\tilde{q}|m'] \neq \mathbb{E}[\tilde{q}|m'']$  and one of the following conditions hold:*

- (i)  $\phi_1(m', p_1) \neq \phi_1(m'', p_1)$ .
- (ii)  $\phi_1(m', p_1) = \phi_1(m'', p_1) = 0$ , and  $p_2(m', p_1) \neq p_2(m'', p_1)$  or  $\phi_2(m', p_1, p_2(m', p_1)) \neq \phi_2(m'', p_1, p_2(m'', p_1))$ .

The next result shows that an influential equilibrium exists as long as the board can influence the collective decision of target shareholders with respect to the initial offer.<sup>13</sup>

**Lemma 3** *An equilibrium of the communication subgame is influential if and only if there are  $m' \neq m'' \in M(p_1)$  such that*

$$\hat{q}(m') + \Delta \leq p_1 < \hat{q}(m'') + \Delta. \quad (5)$$

Moreover, if  $\delta > 0$  and the equilibrium is not influential, then  $\hat{q}(m') = \hat{q}(m'')$  for all  $m' \neq m'' \in M(p_1)$ .

According to Lemma 3, if the equilibrium is influential then the message from the board must be sufficiently informative to change the beliefs of target shareholders about the value of the firm and the resulting decision. However, the message cannot be informative if it does not affect the collective decision of target shareholders, as prescribed by Lemma 1. Intuitively, one might think that even if the message has no influence on the decision of target shareholders, it may still change the incentives of the bidder to revise the initial bid if it is rejected by shareholders. In this case, however, the board would send the message that maximizes the revised offer irrespective of its private information about the fundamental value of the target. Understanding the incentives of the board to inflate the revised offer, the bidder will ignore this message, leaving the board with no influence on the outcome of the takeover.

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<sup>13</sup>All omitted proofs are given in the Appendix.



Lemma 3 also implies that if the equilibrium is influential then there are exactly two disjoint sets of messages on the equilibrium path,  $M_R(p_1)$  and  $M_A(p_1)$ , with distinctive properties. If  $m \in M_A(p_1)$  then  $\hat{q}(m) + \Delta \leq p_1$  and  $\phi_1(m, p_1) = 1$ . That is, shareholders tender their shares and the takeover succeeds. Messages in  $M_A(p_1)$  can be interpreted as *recommendations to accept* the initial offer  $p_1$ . If  $m \in M_R(p_1)$  then  $p_1 < \hat{q}(m) + \Delta$ , shareholders reject the initial offer, the bidder revises the offer to  $\hat{q}(m) + \Delta$  if an opportunity to do so emerges, and when it does, shareholders accept the revised offer. Messages in  $M_R(p_1)$  can be interpreted as *recommendations to reject* the initial offer  $p_1$ . The unique property of influential equilibria is that the board can influence the decision of target shareholders. Note that both  $M_R(p_1)$  and  $M_A(p_1)$  can have more than one message in equilibrium. Hereafter, I use the terminology “making a recommendation” to describe the board’s communication strategy and the term “the board is influential” when the equilibrium of the communication subgame is influential.

If the equilibrium is influential then the expected payoff of the board conditional on  $\tilde{s}$  is

$$W(m, p_1, \tilde{s}) = \begin{cases} p_1 & \text{if } m \in M_A(p_1) \\ \delta(\hat{q}(m) + \Delta) + (1 - \delta)(\mathbb{E}[\tilde{q}|\tilde{s}] + \beta) & \text{if } m \in M_R(p_1). \end{cases} \quad (6)$$

If  $\delta > 0$  ( $\delta = 0$ ) then conditional on recommending shareholders to reject the offer, the board has strict (weak) incentives to send a message in  $\arg \max_{m \in M_R(p_1)} \hat{q}(m)$ . Therefore, the board recommends that shareholders accept the initial tender offer if and only if

$$p_1 \geq \max_{m \in M_R(p_1)} \delta(\hat{q}(m) + \Delta) + (1 - \delta)(\mathbb{E}[\tilde{q}|\tilde{s}] + \beta), \quad (7)$$

which means that in any influential equilibrium there is a cutoff  $s^*$  such that  $m \in M_R(p_1) \Leftrightarrow \tilde{s} > s^*$ . If  $\tilde{s} = s^*$  then the board is indifferent between recommending shareholders to reject or accept the takeover. Therefore,  $m \in M_R(p_1)$  implies  $\hat{q}(m) = \mathbb{E}[\tilde{q}|\tilde{s} > s^*]$ , and  $s^*$  must solve

$$p_1 = \tau(s^*) \quad (8)$$

where

$$\tau(x) \equiv \delta (\mathbb{E} [\tilde{q}|\tilde{s} > x] + \Delta) + (1 - \delta) (\mathbb{E} [\tilde{q}|\tilde{s} = x] + \beta). \quad (9)$$

Overall, the board recommends shareholders to accept offer  $p_1$  if and only if

$$\tau(\tilde{s}) \leq p_1. \quad (10)$$

Consistent with Bates and Becher (2016), the target board is more likely to oppose the deal when the takeover premium is smaller.

The board is influential only if both types of recommendations are on the equilibrium path, that is,  $s^* \in (\underline{q}, \bar{q})$  which is equivalent to  $\tau(\underline{q}) < p_1 < \tau(\bar{q})$ . In equilibrium, shareholders correctly anticipate the communication strategy of the board and use it to estimate the value of the target before they make a decision. Because of free-riding, shareholders follow the recommendation of the board to accept the initial offer if and only if

$$\mathbb{E} [\tilde{q}|\tau(\tilde{s}) \leq p_1] + \Delta \leq p_1. \quad (11)$$

Similarly, shareholders follow the recommendation of the board to reject the initial offer if and only if

$$p_1 < \mathbb{E} [\tilde{q}|\tau(\tilde{s}) > p_1] + \Delta. \quad (12)$$

According to Lemma 3, an influential equilibrium of the communication subgame exists only if both of these conditions are satisfied.

**Proposition 1** *Let  $p_1$  be the bidder's initial tender offer. An influential equilibrium of the communication subgame exists if and only if  $\tau(\underline{q}) < p_1$  and  $p_1 \in [\tau(q_L), \tau(q_H))$  where*

$$\begin{aligned} q_L &= \underline{q} + \frac{2}{\lambda} \max\{0, \Delta - \beta - \lambda \frac{\delta}{1-\delta} \frac{\bar{q}-\underline{q}}{2}\} \\ q_H &= \bar{q} + \frac{2}{\lambda} \min\{0, \Delta - \beta\}. \end{aligned} \quad (13)$$

(i) *If the equilibrium is influential, the board recommends shareholders to accept the initial*

tender offer if and only if  $\tau(\tilde{s}) \leq p_1$ . If the recommendation is to accept then shareholders tender their shares and the bidder acquires the target. If the recommendation is to reject then the initial offer fails. With probability  $\delta$  the bidder revises the initial offer to  $p_2 = \mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1] + \Delta$  and shareholders tender their shares. With probability  $1 - \delta$  the bidder withdraws his bid and the target remains independent.

- (ii) If the equilibrium is not influential, shareholders ignore the board's recommendation, which is uninformative, and accept the initial offer if and only if  $\mathbb{E}[\tilde{q}] + \Delta \leq p_1$ . If the initial offer is rejected, then with probability  $\delta$  the bidder revises it to  $p_2 = \mathbb{E}[\tilde{q}] + \Delta$  and shareholders tender their shares. With probability  $1 - \delta$  the bidder withdraws his bid and the target remains independent.

According to Proposition 1, if  $p_1 \in [\tau(q_L), \tau(q_H))$  (and  $\tau(\underline{q}) < p_1$ ) then there is an equilibrium of the communication subgame in which shareholders follow the recommendations of the board. In this equilibrium, the outcome of the takeover is uncertain and it depends on the type of the recommendation that the board issues. By contrast, if  $p_1 \notin [\tau(q_L), \tau(q_H))$  then no equilibrium of the communication subgame is influential, the outcome of the takeover does not depend on the recommendation of the board, and at least one type of recommendation (accept or reject) is ignored by shareholders. Specifically, suppose that  $q_L < q_H$ , where  $q_L$  and  $q_H$  are given by (13). It can be verified that  $q_L < q_H$  implies  $\tau(q_L) < \mathbb{E}[\tilde{q}] + \Delta < \tau(q_H)$ . Therefore, if  $p_1 < \tau(q_L)$  then shareholders ignore the board's recommendation to accept the offer, they reject it, and the takeover fails unless the bidder revises his initial offer. If  $p_1 \geq \tau(q_H)$  then shareholders ignore the board's recommendation to reject the offer, they accept it, and the takeover succeeds.

The interval  $[\tau(q_L), \tau(q_H))$  can measure the potential of the board to influence the decision of target shareholders. In particular, if  $q_L \geq q_H$  then this interval is empty and there is no offer with respect to which the board is influential.

**Corollary 1** *Let  $q_L$  and  $q_H$  be as defined in (13). Then,  $q_L < q_H$  if and only if*

$$\beta \in (\Delta - \lambda \frac{1}{1-\delta} \frac{\bar{q} - \underline{q}}{2}, \Delta + \lambda \frac{\bar{q} - \underline{q}}{2}). \quad (14)$$

*Moreover:*

- (i)  $\tau(q_H) - \tau(q_L)$  increases in  $\lambda$  and  $\bar{q} - \underline{q}$ .
- (ii)  $\tau(q_H) - \tau(q_L)$  increases in  $\delta$  if and only if  $\beta < \Delta - \lambda \frac{\delta}{1-\delta} \frac{\bar{q} - \underline{q}}{2}$ .
- (iii)  $\tau(q_H) - \tau(q_L)$  increases in  $\beta - \Delta$  if and only if  $\beta - \Delta < 0$ .

Part (i) of Corollary 1 shows that the influence of the board increases with the expertise of the board and the uncertainty about the value of the target. These two measure the information advantage the board has relative to its shareholders. The larger this information advantage is, the more influence the board can exert. Part (ii) shows that the influence of the board can increase with  $\delta$ . In equilibrium, a recommendation to reject the offer is a signal that the value of the target is higher than expected, and therefore, the bidder has a tendency to increase the bid if it is initially rejected. As a result, the anticipation that the bidder will sweeten the initial offer gives the target board more reasons to recommend shareholders to reject it. Therefore, higher  $\delta$  can harm the credibility of the board. However, this intuition is correct only when  $\beta$  is relatively large, that is, when the board has over-tendency to recommend shareholders to reject the offer. When  $\beta$  is relatively small, the opposite is true. In these cases, the board is inclined toward recommending the shareholders to accept the offer. Higher  $\delta$  counters this tendency and thereby increases the credibility of the board.

Part (iii) of Corollary 1 and condition (14) show that the board can influence its shareholders in equilibrium only if its bias is “moderate”. If  $\beta$  is too large or too small, shareholders ignore the board since they are concerned that its recommendations are primarily motivated by the desire to protect its private benefits/costs from obtaining control. Importantly, Corollary 1 demonstrates that a biased board can have *more influence* in equilibrium than an unbiased

board. Indeed, the size of the interval  $[\tau(q_L), \tau(q_H))$ , which measures the credibility of the board, is increasing with  $\beta$  when  $\beta < \Delta$ . Since  $\Delta > 0$ , a board with a bias  $\beta \in (0, \Delta)$  has more influence than an unbiased board ( $\beta = 0$ ). Moreover, if  $0 \leq \Delta - \lambda \frac{1}{1-\delta} \frac{\bar{q}-q}{2}$  then condition (14) requires  $\beta > 0$ . In this case, there is no offer with respect to which the unbiased board is influential. By contrast, if the board is biased against the takeover and its bias satisfies condition (14), then there is a nontrivial set of offers with respect to which the biased board is influential.

Why would shareholders ignore the unbiased board if its objective is to maximize their value? The intuition is the following. If  $\beta = 0$  then the objective of the board is to maximize the value of shareholders as a collective. However, due to free-riding, this objective is different from the objective of each individual shareholder. Because of these differences, the board has incentives to misstate its private information, and consequently, its private information is never fully revealed in equilibrium. To see why, let  $\delta = 0$  and suppose on the contrary that in equilibrium the unbiased board fully reveals its information. That is, for every  $\hat{q} \in [\underline{q}, \bar{q}]$  there is a unique message  $m^*(\hat{q})$  such that, in equilibrium, the board sends message  $m^*(\hat{q})$  when  $\tilde{q} = \hat{q}$ . Suppose  $\tilde{q} = \hat{q}$  where  $\hat{q} \in (p_1 - \Delta, p_1]$ . If the board sends message  $m^*(\hat{q})$  then shareholders believe that the standalone value of the target is  $\hat{q}$ . Since  $p_1 < \hat{q} + \Delta$ , according to (3), each shareholder has incentives to keep his share, hoping that other shareholders would tender their shares and approve the takeover. As a result, the takeover is rejected even though shareholders are offered a premium relative to standalone value of the target, i.e.,  $\hat{q} \leq p_1$ . This is the free-rider problem. To convince shareholders to accept the offer, which clearly benefits them as a collective, the unbiased board pretends that the offer is more attractive than it really is by falsely stating that  $\tilde{q} + \Delta \leq p_1$ . Specifically, instead of sending message  $m^*(\hat{q})$  as the equilibrium prescribes, the board has incentives to deviate and send the message  $m^*(q_0) \neq m^*(\hat{q})$  where  $q_0 < \hat{q}$  satisfies  $q_0 + \Delta \leq p_1$ . Therefore, the information of the unbiased board is never fully revealed in equilibrium.

In equilibrium, the manipulation of the unbiased board is anticipated by shareholders, who

do not take its recommendations on their face value. As a result, these recommendations are contaminated with noise and shareholders are less likely to follow them. A relatively small  $\tau(q_H) - \tau(q_L)$  reflects the low credibility of the unbiased board. Under certain conditions, the credibility of the unbiased board is too low (e.g., when  $0 \leq \Delta - \lambda \frac{1}{1-\delta} \frac{\bar{q}-q}{2}$ ) and shareholders refuse to follow these recommendations altogether, that is, the interval  $[\tau(q_L), \tau(q_H))$  is empty. This argument illustrates that shareholders' failure to coordinate their collective decision creates a tension with the unbiased board, which harms its ability to effectively advise them about the takeover.<sup>14</sup>

Interestingly, a biased board can have more influence than a value-maximizing (and unbiased) board. If  $\delta = 0$  then the biased board would like shareholders to accept the takeover offer if and only if  $\hat{q} + \beta \leq p_1$ . Therefore, similar to the arguments above, a biased board has incentives to misrepresent its private information when  $\hat{q} \in (p_1 - \Delta, p_1 - \beta]$ . If  $\beta \in (0, \Delta)$  then this interval is smaller than  $(p_1 - \Delta, p_1]$ , and in this respect, the incentives of the biased board to manipulate are weaker. If  $\beta = \Delta$  then the interval above is empty and the biased board can fully reveal its information in equilibrium. Intuitively, the bias of the board can relax the tension that is created by the collective action problem. When  $\beta > 0$  the board has self-serving reasons to keep the target independent, and in some cases, it recommends that shareholders reject the takeover offer even if it provides a premium relative to standalone value of the target. At the same time, shareholders free-ride each other, and thus, similar to the biased board but for a different reason, they collectively reject value-increasing offers. As long as the bias of the board against the takeover is not too large, the preferences of the board are effectively "closer" to the objective of each shareholder individually, and consequently, a biased board can exert more influence than a value-maximizing board. Overall, the credibility of the board, as measured by  $\tau(q_H) - \tau(q_L)$ , obtains its maximum when  $\beta = \Delta$ . In this case, the distortion from the free-riding behavior of target shareholders coincides with the self-serving

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<sup>14</sup>This argument also holds with a finite number of shareholders. More generally, it is related to the idea that externalities between group members can create incentives to manipulate information (e.g., Farrell and Gibbons (1989), Dessí (2008), Hanson (2003) and Teoh (1997)).

motives of their board.

**Remark** There always exists a non-influential equilibrium of the communication subgame in which the board randomizes between different messages, and the randomization is independent of  $\tilde{s}$ . The existence of a “babbling” equilibrium is standard in the cheap talk literature. If the conditions in Proposition 1 hold then the communication subgame has multiple equilibria: one equilibrium in which the board is influential and another equilibrium in which the board is not influential. Following the cheap talk literature, I assume that whenever an influential equilibrium of the communication subgame exists, this equilibrium is in play.<sup>15</sup>

### 3.2. Initial offer

The initial offer of the bidder depends on the type of recommendation that the board is expected to issue and the response of target shareholders. If condition (14) is violated then regardless of the offer, every equilibrium of the communication subgame is non-influential, and the game is played as if no communication between the board and the target shareholders is taking place. Since target shareholders believe that the expected value of the firm under the bidder’s control is  $\mathbb{E}[\tilde{q}] + \Delta$ , they accept the initial tender offer if and only if  $p_1 \geq \mathbb{E}[\tilde{q}] + \Delta$  (as suggested by Lemma 1). Moreover, since no information about  $\tilde{q}$  is revealed, the option to revise the initial offer has no effect and the outcome is similar to Grossman and Hart (1980): The bidder offers  $p_1^* = \mathbb{E}[\tilde{q}] + \Delta$ , target shareholders accept the initial offer irrespective of the recommendation of the board, and the takeover succeeds. However, if condition (14) holds then the ability of the board to influence the outcome of the takeover depends on the offer itself as described by Proposition 1. The next result characterizes the equilibrium in those cases.

**Proposition 2** *Suppose condition (14) holds. There exist cutoffs  $0 \leq \underline{b} \leq \bar{b} < \infty$  such that in equilibrium the following hold:*

- (i) *If  $b \in [0, \underline{b}]$  then the bidder offers  $p_1^* < \tau(q_L)$ , the board is not influential, and target*

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<sup>15</sup>A previous version of the paper showed that similar results hold under different selections of equilibria.

shareholders reject the initial offer irrespective of the board's recommendation.

(ii) If  $b \in (\underline{b}, \bar{b})$  then the bidder offers  $p_1^* = \tau(\max\{q_L, s^{**}\})$  where

$$s^{**} = \underline{q} + \frac{1}{\lambda}(\Delta + b - \beta) - \frac{\delta}{1 - \delta} \frac{\bar{q} - \underline{q}}{2}, \quad (15)$$

the board is influential and target shareholders follow its recommendations.<sup>16</sup>

(iii) If  $b \in [\bar{b}, \infty)$  then the bidder offers  $p_1^* = \tau(q_H)$ , the board is not influential, and target shareholders accept the initial offer irrespective of the board's recommendation.

In all cases, the equilibrium of the communication subgame unfolds as described by Proposition 1. In particular, if the initial offer is rejected and revised by the bidder on the equilibrium path, then  $p_1^* < p_2^*$ .

According to Proposition 2, there are three cases to consider. First, when  $b \in [0, \underline{b})$  shareholders reject the initial offer even if the board recommends them to accept it. When the board is influential, the bidder suffers from adverse selection: The board is recommending the shareholders to accept the offer if and only if it is high enough to compensate the board for the standalone value of the firm and the loss of its private benefits from control. Higher  $\beta$  makes this problem more severe since a positive recommendation becomes a stronger indication that  $\tilde{q}$  is lower than expected. The shareholders' free-riding behavior also magnifies this concern since the bidder can successfully acquire the target only if he pays shareholders at least the value of the firm under his control. When  $b$  is small, the bidder does not have enough private benefits from control to compensate for the expected over-payment, if his offer is accepted. The only way the bidder can avoid losing money is by low-balling the initial offer, such that it reflects the negative information about  $\tilde{q}$  that positive recommendations convey. In this equilibrium the bidder offers  $p_1^* < \tau(q_L) < \mathbb{E}[\tilde{q}] + \Delta$ ; however, a low-balled initial offer is always rejected by shareholders.

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<sup>16</sup>If  $b = \underline{b}$  then part (i) holds when  $\beta \geq \Delta - \lambda \frac{\delta}{1 - \delta} \frac{\bar{q} - \underline{q}}{2}$  and part (ii) holds otherwise.



Second, when  $b \in [\bar{b}, \infty)$  the bidder has high intrinsic motivation to acquire the target, and therefore, he tries to minimize the risk of a failure. Specifically, if  $b$  is large then the bidder makes the offer attractive to target shareholders such that they find it optimal to accept it even if the board recommends them otherwise. To the extent that public firms have a weaker corporate governance and higher private benefits (due to their dispersed ownership structure and separation between ownership and control), this result is consistent with Barger et al. (2008) and Betton et al. (2009) who find that relative to private firms, public firms offer higher premiums. The former also find that the difference is highest when acquisitions by private firms are compared to acquisitions by public firms with managerial ownership of less than 1%, and insignificant with managerial ownership in excess of 50%. Interestingly, while the board's recommendation to reject the takeover offer is ignored by shareholders on the equilibrium path, the bidder's initial offer is strictly higher than what he would have offered in the absence of communication, that is,  $p_1^* = \tau(q_H) > \mathbb{E}[\tilde{q}] + \Delta$ . Indeed, the possibility that the target board would alert its shareholders that the offer is inadequate is sufficient to deter the bidder from making a low offer. This result emphasizes that the board can have an influence on the outcome of the takeover even if in equilibrium its recommendations are not followed by shareholders. In other words, uninformative and ignored recommendations are not evidence against the ability of the board to affect the outcome of the takeover.

Third, when  $b \in (\underline{b}, \bar{b})$  the equilibrium is a combination of the two scenarios above. On the one hand, the bidder has enough incentives to acquire the target even though he might suffer from adverse selection. On the other hand, the bidder does not have enough incentives to increase the offer and avoid a negative recommendation for sure. As a result, the bidder's initial offer is "moderate" and shareholders follow the recommendations of the board, which are always informative. Since a recommendation to reject the offer increases the risk that the takeover fails ( $\delta < 1$ ), it is a credible signal that the initial offer undervalues the target. Consistent with empirical evidence (e.g., Bates and Becher (2016)), the revised offer is higher than the initial offer,  $p_1^* < p_2^*$ .

The closed-form of  $\underline{b}$  and  $\bar{b}$  is given by expression (24) in the Appendix. Figure 1 depicts these cutoffs as a function of  $\beta - \Delta$ . The difference  $\bar{b} - \underline{b}$  measures the influence of the board in equilibrium, accounting for its effect on the bidder's initial offer. Note that  $\bar{b} - \underline{b}$  obtains its maximum when  $-\lambda \frac{\delta}{1-\delta} \frac{\bar{q}-q}{2} \leq \beta - \Delta \leq 0$ . In this range, the balance between the incentives of shareholders to free-ride and the incentives of the board to inflate the revised offer results with the highest alignment of interests between the biased board and target shareholders. Also note that  $\bar{b} - \underline{b}$  obtains its minimum when  $\lambda \frac{1-\delta}{2-\delta} \frac{\bar{q}-q}{2} \leq \beta - \Delta$ . In this range the board is not influential in equilibrium for all  $b \geq 0$ .

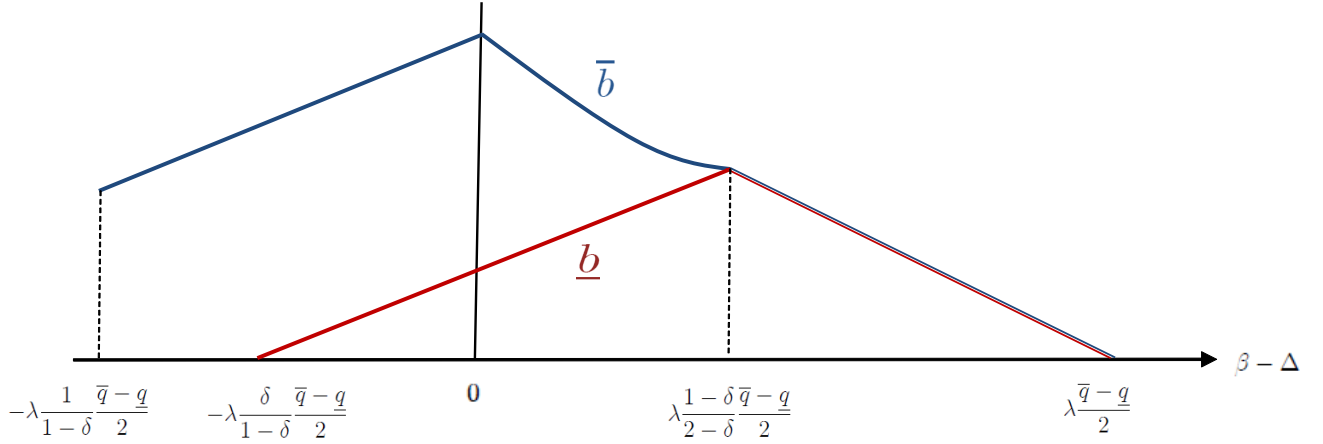


Figure 1

### 3.3. The determinants of the board's influence

This section describes the effect of various parameters of the model on the ability of the target board to influence the decision of its shareholders. For this purpose, I assume that there is an ex-ante distribution from which the parameters of the model are drawn at the outset of the game (the formal treatment is given in the Appendix). Under this formulation, the influence of the board in equilibrium is probabilistic as it depends on the realization of these parameters.

### Proposition 3

- (i) *The probability that target shareholders accept the initial tender offer in equilibrium irrespective of the recommendation of the board increases in  $b$ , decreases in  $\delta$ ,  $\lambda$  and  $\bar{q} - \underline{q}$ , and decreases in  $\beta$  if and only if  $\beta < \Delta$ .*
- (ii) *The probability that target shareholders reject the initial tender offer in equilibrium irrespective of the recommendation of the board decreases in  $b$ , increases in  $\delta$ ,  $\lambda$  and  $\bar{q} - \underline{q}$ , and increases in  $\beta$  if and only if  $\beta < \Delta + \lambda \frac{1-\delta}{2-\delta} \frac{\bar{q}-\underline{q}}{2}$ .*

According to the analysis in Section 3.2, target shareholders accept the initial tender offer irrespective of the recommendation of the board if condition (14) is violated or  $b \in [\bar{b}, \infty)$ . In those cases, the board is not influential on the equilibrium path and its recommendations are uninformative. These scenarios can be interpreted as instances in which shareholders ignore a recommendation from their board to reject the initial tender offer. According to part (i) of Proposition 3, the likelihood of these events is higher when the bidder has strong incentives to minimize the risk of a failure, which is the case when the bidder has significant private benefits (high  $b$ ) but he is unlikely to sweeten the initial bid (low  $\delta$ ). The likelihood that shareholders ignore a recommendation to reject the offer is also higher when the board has very little influence, which is the case when its informational advantage is small (low  $\lambda$  or  $\bar{q} - \underline{q}$ ) or when there is a significant conflict of interest between the board and each individual target shareholder (high  $|\beta - \Delta|$ ). The latter observation demonstrates that the likelihood that shareholders follow the recommendations of the board to reject the takeover is non-monotonic in the board's bias and follows an inverted U-shape.

Similarly, if condition (14) holds and  $b \in [0, \underline{b})$  then target shareholders reject the initial tender offer irrespective of the recommendation of the board, which is uninformative. These scenarios can be interpreted as instances in which shareholders ignore a recommendation from their board to accept the initial tender offer. Part (ii) of Proposition 3 suggests that the comparative statics is the opposite of part (i). Intuitively, shareholders ignore the board and

reject the tender offer only if the initial offer is low-balled. The bidder low-balls the initial offer when the target board can influence its shareholders but the bidder does not have enough incentives to overcome the associated adverse selection. Notice that when the initial offer is doomed to fail, the bidder may refrain from making the offer in the first place. Therefore, instances in which shareholders ignore accept recommendations and reject the takeover are less likely to be observed. This is consistent with the findings of Baker and Savasoglu (2002) that the proportion of offers that were supported by the target board but failed is less than a half of the proportion of offers that were resisted by the target board but the target was eventually taken over by the acquirer.

Proposition 3 generates novel empirical predictions. The interpretation of  $b$ ,  $\delta$ ,  $\lambda$ ,  $\bar{q} - \underline{q}$  and  $\beta$ , which are the independent variables of interest, is described in the setup of the model.<sup>17</sup> A natural proxy for the influence of the target board is the match between the outcome of the takeover (success or failure) and the actual recommendation of the board (accept or reject). Both variables can be directly observed by the econometrician.<sup>18</sup> Since the model predicts that the board influences the decision of target shareholders if and only if its recommendation is informative, the influence of the board can also be measured by the amount of private information that is revealed by the recommendation itself. The release of information can be measured by the magnitude (in absolute level) of the abnormal returns of the target's stock around the time the board publicly issues its recommendation (conditional on the announcement of the takeover bid), or by a text-based analysis of the details that the board uses to back its recommendation (as was the case in the takeover of Cadbury by Kraft).

### 3.4. *The market reaction to board's recommendations*

Let  $V^*$  be the expected shareholder value in equilibrium. With rational expectations, the

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<sup>17</sup>Since  $\beta$  and  $\lambda$  can be endogenous, new regulations and court rulings that force changes in board structure, or variations in laws across states and countries, can be used to identify the effect of  $\beta$  and  $\lambda$ .

<sup>18</sup>Schedule 14d-9 filings or press releases can be used to identify board's recommendations. Since a takeover can fail for reasons that are unrelated to the decision of the board or its shareholders (e.g., the bidder's failure to secure funds or clearance from regulators), one has to identify and exclude these cases (e.g., see Malmendier et al. (2016)).

market value of the target adjusts to  $V^*$  at the announcement of the takeover bid. According to the analysis in Section 3.2, if condition (14) is violated then  $V^* = \mathbb{E}[\tilde{q}] + \Delta$  and otherwise

$$V^* = \begin{cases} \mathbb{E}[\tilde{q}] + \delta\Delta & \text{if } b \in [0, \underline{b}) \\ \Pr[\tau(\tilde{s}) \leq p_1^{**}]p_1^{**} + \Pr[\tau(\tilde{s}) > p_1^{**}](\mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1^{**}] + \delta\Delta) & \text{if } b \in [\underline{b}, \bar{b}) \\ \tau(q_H) & \text{if } b \in [\bar{b}, \infty), \end{cases} \quad (16)$$

where  $p_1^{**} \equiv \tau(\max\{q_L, s^{**}\})$ .

The focus of this section is on the reaction of the market to the recommendations of the board *conditional* on the announcement of the takeover bid. Let the market reaction in equilibrium be  $r^*$ . If condition (14) is violated or  $b \notin [\underline{b}, \bar{b})$  then the board is not influential in equilibrium and its recommendations are uninformative. The market correctly anticipates that shareholders would ignore the board and accept the offer if and only if it is higher than  $\mathbb{E}[\tilde{q}] + \Delta$ . Since there is no news or surprise,  $r^* = 0$ . If condition (14) holds and  $b \in [\underline{b}, \bar{b})$  then  $p_1^* = p_1^{**}$  and the board is influential in equilibrium. Let  $r_{Accept}^*$  ( $r_{Reject}^*$ ) be the value of  $r^*$  following a recommendation of the board to accept (reject) the offer. Then

$$r_{Accept}^* = p_1^{**} - V^* = \Pr[\tau(\tilde{s}) > p_1^{**}] \times H^{**}. \quad (17)$$

$$r_{Reject}^* = \mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1^{**}] + \delta\Delta - V^* = -\Pr[\tau(\tilde{s}) \leq p_1^{**}] \times H^{**} \quad (18)$$

where

$$H^{**} \equiv p_1^{**} - \mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1^{**}] - \delta\Delta. \quad (19)$$

Since  $r_{Reject}^*$  and  $r_{Accept}^*$  have opposite signs, the discussion below only refers to  $r_{Reject}^*$ .

There are two scenarios. First, if  $r_{Reject}^* < 0$  then  $p_1^{**}$  is relatively high and the market penalizes the target when the board resists the takeover. Shareholders follow the recommendation of the board to reject the takeover in spite of the negative reaction of the market. Indeed, because of their free-riding behavior, shareholders cannot avoid rejecting some offers that ben-

efit them collectively. Second, if  $r_{Reject}^* > 0$  then  $p_1^{**}$  is relatively low and the market cheers when the board resists the takeover. Here, the resistance of the board is a credible signal that the offer undervalues the target ( $\tau(\tilde{s}) > p_1^{**}$ ) and that a sweeten bid is likely ( $\delta > 0$ ).

**Proposition 4** *Suppose condition (14) holds and  $b \in [\underline{b}, \bar{b})$ . In equilibrium,  $r_{Reject}^* < 0$  is more likely than  $r_{Reject}^* > 0$  when  $\beta$ ,  $\Delta$ , and  $b$  are large, or  $\delta$ ,  $\lambda$ , and  $\bar{q} - \underline{q}$  are small.<sup>19</sup>*

Intuitively, the resistance of the board to the takeover is bad news for the target when the offer is rejected to protect the board's private benefits from control rather than because the target is undervalued (large  $\beta$ ); when the takeover was likely to generate high synergy or high value for the bidder (large  $\Delta$  and  $b$ ); when the offer was likely to be the bidder's "best and final offer" (small  $\delta$ ); when the target board is not well informed relative to the market (small  $\lambda$  and  $\bar{q} - \underline{q}$ ).

Empirically, the market reacts negatively to announcements of a takeover termination (e.g., Malmendier et al. (2016) and the references therein). This evidence suggests that on average  $r_{Reject}^* < 0$ . Typically, however, the reaction of the market to the actual recommendation of the target board is not directly estimated. One exception is Safieddine and Titman (1999), who claim that target stock prices declined 3.42% on average as a reaction to an explicit announcement by the target management that it rejects the offer because "the price is too low or inadequate." Among other things, Proposition 4 suggests that these negative reactions are attributed to a bias of these boards against the takeover. Interestingly, Safieddine and Titman (1999) also identify a subset of targets which remained independent and outperformed their benchmarks. Under rational expectations, these targets should have experienced a positive market reaction to a termination announcement, that is,  $r_{Reject}^* > 0$ . Nevertheless, the authors do not find such evidence and conclude that the market must have underestimated the extent to which the values of these firms were improved. Proposition 4 generates novel empirical predictions about the expected reaction of the market to the recommendations of the board in

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<sup>19</sup>As in Section 3.3, the probabilistic nature of the result reflects an ex-ante distribution from which the parameters of the model are drawn at the outset of the game.

the cross section, and can be used to interpret existing findings. The market reaction can be measured by the sign of the abnormal returns of the target’s stock around the announcement of the board’s recommendation.

Finally, let  $V_{pre}$  be the “unaffected” market value of the target prior to the arrival of the bidder. If the market does not expect a takeover to take place, then  $V_{pre} = \mathbb{E}[\tilde{q}]$ . Notice that  $V^* \geq \mathbb{E}[\tilde{q}]$ , and in this respect, the unexpected announcement of a takeover is always good news, which is consistent with the empirical evidence. Also notice that  $\mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1^{**}] > \mathbb{E}[\tilde{q}]$ . Therefore, regardless of the sign of  $r_{Reject}^*$ , the market value of the target after the failure of the takeover remains higher than it was prior to the announcement of the takeover. This observation is also consistent with the empirical evidence (e.g., Malmendier et al. (2016)).

### 3.5. Revised recommendations

In the baseline model the board does not issue a new recommendation if the initial offer is revised. Generally, the target board is less likely to influence the decision of its shareholders with respect to the revised offer. There are two reasons behind this result. First, according to Proposition 2, if the initial offer is rejected by shareholders then the board must have revealed that  $\tilde{s} \geq s^*$  for some  $s^* \in [\underline{q}, \bar{q}]$ . Therefore, if a second round of negotiations takes place, target shareholders (and the bidder) face less uncertainty about  $\tilde{q}$ . According to part (i) of Corollary 1, lower uncertainty weakens the ability of the board to influence its shareholders. As a result, if shareholders follow the recommendation of board and reject the initial offer, they are less likely to follow its recommendations with respect the revised offer. Second, the revised offer is always the “best and final offer” (or generally, more likely to be the final offer). Therefore, unlike the initial offer, recommending shareholders to reject the revised offer does not have the benefit of convincing the bidder to increase it even further. This effect harms the credibility of the board since there is no force that mitigates the tendency of the board to undervalue the target in attempt to overcome the free-riding behavior of target shareholders. For both of these reasons, the board is less likely to be influential with respect to the revised offer.

Building on this reasoning, the next result shows that the main conclusions of the analysis are robust to the possibility that the board would issue a new recommendation with respect to the revised offer.

**Proposition 5** *Suppose the board can issue a second recommendation after the bidder revises the initial offer but before target shareholders make their final decision. If*

$$\beta \notin (\Delta - \lambda \frac{\bar{q} - q}{2}, \Delta + \lambda \frac{\bar{q} - q}{2}) \quad (20)$$

*then the board is not influential with respect to the revised offer on or off the equilibrium path, and the equilibrium unfolds as in Section 3.2.*

In particular, Proposition 5 implies that if  $\beta \in (\Delta - \lambda \frac{1}{1-\delta} \frac{\bar{q} - q}{2}, \Delta - \lambda \frac{\bar{q} - q}{2}]$ , which is exactly to the left of the interval described in (20), then the equilibrium unfolds exactly as described by Proposition 2: The board affects the initial offer or its success, but the board is never influential with respect to any revised offer.

In the Online Appendix I demonstrate that the analysis of the baseline model also extends to cases in which  $\beta \in (\Delta - \lambda \frac{\bar{q} - q}{2}, \Delta + \lambda \frac{\bar{q} - q}{2})$ . When  $\beta$  is relatively small, the rejection of the initial offer by the board is a credible signal that the target is undervalued. Therefore, the residual uncertainty about  $\tilde{q}$  conditional on the first (negative) recommendation is relatively small (i.e.,  $s^*$  is close to  $\bar{q}$ ), and the board cannot influence the decision of target shareholders with respect to the revised offer. In this case, the second round unfolds as in the baseline model. However, when  $\beta$  is relatively large, the rejection of the initial offer by the board is mostly attributed to the board's private benefits from control rather than the undervaluation of the target. Therefore, the residual uncertainty following the first recommendation is relatively large (i.e.,  $s^*$  is distant from  $\bar{q}$ ). Different from the baseline model, in this case the board is influential with respect to the revised offer, and on the equilibrium path it is possible that the board changes his recommendation from reject to accept, or keeps it unchanged.



## 4. Optimal board structure

In this section I study the optimal structure of the board from the perspective of target shareholders in the context of takeovers. For this purpose, let  $V^*(\beta, \lambda)$  be the expected shareholder value in equilibrium as a function of the bias of the board  $\beta$  and its expertise  $\lambda$ . The explicit form of  $V^*(\beta, \lambda)$  is given in Section 3.4. Similarly, let  $\underline{b}(\beta, \lambda)$  and  $\bar{b}(\beta, \lambda)$  be the cutoffs from Proposition 2.

### 4.1. Optimal board expertise

Let  $\lambda^*$  be the optimal level of expertise for a given level of  $\beta$ . If  $\beta \notin (\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta + \frac{\bar{q}-q}{2})$  then condition (14) is violated for any  $\lambda \in [0, 1]$ , and according to Corollary 1, the expertise of the board has no effect on the takeover. Since the expertise of the board might still be desired by shareholders for reasons that are outside of the model, I assume that if  $\arg \max_{\lambda \in [0, 1]} V(\beta, \lambda)$  takes more than one value then  $\lambda^*$  is the maximum of this set. Under this assumption, if  $\beta \notin (\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta + \frac{\bar{q}-q}{2})$  then  $\lambda^* = 1$ . The next result analyzes the complement case.

**Proposition 6** *Suppose  $\beta \in (\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta + \frac{\bar{q}-q}{2})$ . In equilibrium under the optimal board expertise ( $\lambda = \lambda^*$ ) the board is not influential and target shareholders accept the initial offer irrespective of its recommendation. Moreover,*

- (i) *If  $\beta \in (\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta - \frac{b}{1-\delta})$  then  $\lambda^* \in (0, 1)$  and condition (14) is violated.*
- (ii) *If  $\beta \in (\Delta - \frac{1}{1-\delta} \max\{\frac{\bar{q}-q}{2}, b\}, \Delta + \frac{\bar{q}-q}{2})$  then condition (14) holds. Moreover:*
  - (a) *If  $b \geq \bar{b}(\beta, 1)$  then  $\lambda^* = 1$ , and if  $b < \bar{b}(\beta, 1)$  then  $\lambda^* \in (0, 1)$  such that  $\bar{b}(\beta, \lambda^*) = b$ .*
  - (b)  *$\lambda^*$  is increasing in  $\beta$  if and only if  $\beta \geq \Delta$ .*

The closed-form of  $\lambda^*$  is given by expression (58) in the Appendix. Proposition 6 demonstrates that more expertise on the board does not necessarily benefit target shareholders, that is,  $V(\beta, \lambda)$  can decrease in  $\lambda$ . This result holds even if the board's objective is to maximize

shareholder value ( $\beta = 0$ ). Moreover, under the optimal board structure, the recommendations of the board are uninformative and ignored by shareholders in equilibrium. This results holds even if  $\lambda^* = 1$ , i.e., when the optimal board is perfectly informed.

There are two reasons behind this result. First, as the discussion around part (i) of Proposition 2 suggests, target shareholders expose the bidder to adverse selection whenever they follow the informative recommendations of their board. If  $b$  is sufficiently small the adverse selection can result with a low-balled offer and a failure of the takeover. Since the takeover is expected to create value, shareholders end up being worse off. Limiting the expertise of the board is a mean by which shareholders commit to ignoring their board, which mitigates the adverse selection and encourages the bidder to increase the offer. Part (i) of Proposition 6 suggests that even though a fully informed board could affect the outcome of the takeover (condition (14) holds when  $\lambda = 1$ ), shareholders are better off with a board that has no effect whatsoever (setting  $\lambda^* < 1$  such that condition (14) is violated).

Second, if  $b$  is relatively large, the bidder is willing to pay a higher price to avoid a negative recommendation from the board and guarantee the success of the takeover. Since the takeover is value increasing, shareholders can extract more surplus if the takeover is likely to succeed. By limiting the expertise of the board, shareholders effectively commit to accepting offers that they would have otherwise rejected, thereby incentivizing the bidder to increase the takeover premium. At the same time, shareholders must ensure that the board has enough private information so it can credibly warn them when the bidder low-balls the premium. Part (ii.a) of Proposition 6 shows that the optimal level of expertise accounts for this trade-off by setting  $\lambda^*$  such that  $\bar{b}(\beta, \lambda^*) \leq b$ . In this case, the equilibrium unfolds as in part (iii) of Proposition 2.

Part (ii.b) of Proposition 6 shows that  $\lambda^*$  obtains its minimum as a function of  $\beta$  when  $\beta = \Delta$ . Intuitively, according to Corollary 1, if  $\beta < \Delta$  then the credibility of the board increases with  $\beta$ . In this region,  $\beta$  and  $\lambda$  substitutes each other. However, if  $\beta > \Delta$  then the credibility of the board decreases with  $\beta$ , and in this region,  $\beta$  and  $\lambda$  complements each other. In other words, the least amount of expertise is needed when the credibility of the board is the

highest, that is, when  $\beta = \Delta$ .

#### 4.2. Optimal board bias

The next result characterizes  $\beta^*$ , the optimal level of board bias (given  $\lambda$ ).

**Proposition 7** *Suppose  $\lambda \in (0, 1]$ . In equilibrium under the optimal bias ( $\beta = \beta^*$ ), the board is not influential and target shareholders accept the initial offer irrespective of its recommendation. Moreover,*

- (i) *If  $b \geq \bar{b}(\Delta, \lambda)$  then  $\beta^* = \Delta$ , and if  $b < \bar{b}(\Delta, \lambda)$  then  $\beta^* \in (\Delta, \Delta + \lambda \frac{\bar{q}-q}{2})$  such that  $\bar{b}(\beta^*, \lambda) = b$ .*
- (ii)  *$\beta^*$  is increasing in  $\lambda$ .*

The closed-form of  $\beta^*$  is given by expression (74) in the Appendix. According to Proposition 7, the highest shareholder value is obtained in equilibrium when the board is biased against selling the firm. Consistent with this prediction, Bange and Mazzeo (2004) find that the takeover premium is higher for targets with non-independent boards, and that if the CEO of the target is also a board member there is a higher likelihood that the takeover will succeed and shareholder value will be higher. In both cases, the CEO is likely to use her power over non-independent directors to resist the takeover and retain her job. Moreover, similar to Proposition 6, Proposition 7 shows that under the optimal bias, the recommendations of the board are uninformative and ignored by shareholders in equilibrium.

To understand this result, note that when the board is biased against the takeover, it is more likely to recommend shareholders to reject the offer. If the board is influential, the bidder is willing to pay a higher price to avoid a negative recommendation. Therefore, shareholders can extract more surplus from the bidder if their board is biased against the takeover. A key question is whether the credibility of the board is diminished by its bias. Without a credible threat to follow the recommendations of the board and reject lower offers, the bidder has no incentives to increase the offer above  $\tau(q_H)$ . As was shown in Corollary 1, the credibility of

this threat can increase with the bias of the board as long as  $\beta < \Delta$ . Therefore, it is always optimal to set the bias of the board at least as high as  $\Delta$ . In this range, a higher bias not only increases the resistance of the board, but it also increases its credibility. However, if  $\beta > \Delta$  then a trade-off emerges: Higher  $\beta$  implies higher resistance but also lower credibility. Part (i) of Proposition 7 shows that the optimal bias accounts for this trade-off by setting  $\beta^*$  to be the lowest value of  $\beta$  above  $\Delta$  that satisfies  $\bar{b}(\beta, \lambda) \leq b$ .

Part (ii) of Proposition 7 shows that  $\beta^*$  is increasing in  $\lambda$ . Intuitively, if  $\lambda$  is high then increasing the resistance of the board to the takeover is more important than maintaining its credibility, which is high in the first place. This observation implies that if the board structure is optimized along both dimensions,  $\beta$  and  $\lambda$ , it is always optimal to have a fully informed board! This result is in contrast to Proposition 6, which shows that for a fixed  $\beta$ ,  $\lambda^* < 1$  can be optimal. Indeed, as part (ii.b) of Proposition 6 suggests,  $\lambda^*$  increases in  $\beta$  if and only if  $\beta \geq \Delta$ . Since  $\beta^* \geq \Delta$  for a given  $\lambda$ , it is optimal to choose the highest level of expertise.

**Corollary 2** *The optimal board structure consists of  $\lambda^* = 1$  and  $\beta^* \in [\Delta, \Delta + \frac{\bar{q}-q}{2}]$ .*

### 4.3. Discussion

Propositions 6 and 7 optimize the board structure along one dimension, while keeping the other dimension fixed. In reality, the characteristics of board members are likely to be correlated. For example, boards which are populated with insiders who are either employed by the target firm or have social or business ties with senior management are likely to be both well informed (access to management) and biased against selling the firm (protecting the CEO). That is,  $\beta$  and  $\lambda$  are positively correlated (at least when  $\beta > 0$ ). In this respect, Corollary 2 is reassuring as it suggests that when both dimensions of the board are considered, it is optimal to have a well informed board that is biased against selling the firm.

Finally, outside the context of takeovers, the bias of the board and its expertise can have different effects on shareholder value. For example, biasing the board away from maximizing shareholder value can result with distortions in the investment policy of the firm, which could

affect its standalone value. In this respect, the analysis does not necessarily suggest that it is always desirable or feasible to design a board with “optimal bias” and “optimal expertise” as described by Propositions 6 and 7. Instead, the analysis emphasizes that in the context of takeovers, the bias and expertise of the target board have significant advantages and disadvantages that were previously overlooked.

## 5. Concluding remarks

Corporate boards can use their information advantage to alert shareholders when a takeover offer is inadequate. This paper studies the advisory role of the board of directors in takeovers. A unique feature of the model is that the ability of the target board to resist a takeover is endogenous - the board must convince target shareholders that it is in their best interests to reject the takeover offer. The analysis offers novel predictions about the relationship between the likelihood that shareholders follow the recommendations of the board and the reaction of the market to these recommendations, and various characteristics of the acquirer and the target firm.

In addition, the analysis characterizes the optimal board structure in the context of takeovers. Under the optimal board structure, directors of the target firm are biased against the takeover. Perhaps surprisingly, I show that uninformative and ignored recommendations are not necessarily evidence that the target board has no influence on the outcome of the takeover. In fact, under the optimal board structure, target shareholders accept the takeover offer in equilibrium irrespective of the recommendations of the board, which are never informative. In other words, the inability to influence the decision of target shareholders in equilibrium is a robust feature of an optimal board structure in takeovers.

## A. Appendix - Proofs of main results

**Proof of Lemma 3.** Suppose  $\hat{q}(m) + \Delta \leq p_1$  for all  $m \in M(p_1)$ . Based on Lemma 1,  $\phi_1(m, p_1) = 1$  for all  $m \in M(p_1)$ . Therefore, according to Definition 1, the equilibrium is not influential. Suppose  $p_1 < \hat{q}(m) + \Delta$  for all  $m \in M(p_1)$ . Based on Lemma 1,  $\phi_1(m, p_1) = 0$  for all  $m \in M(p_1)$ . Thus the equilibrium can be influential only if  $\delta > 0$ . Based on Lemma 2, the bidder always revises the initial offer to  $\hat{q}(m) + \Delta$ , if he has the opportunity to do so, and shareholders accept the revised offer. However, notice that if this is indeed an equilibrium, the expected payoff of the board is  $\delta(\hat{q}(m) + \Delta) + (1 - \delta)(\mathbb{E}[\tilde{q}|\tilde{s}] + \beta)$  for all  $m \in M(p_1)$ . Therefore, as long as  $\delta > 0$  the board has strict incentives to send  $m \in \arg \max_{m \in M(p_1)} \hat{q}(m)$  regardless of the realization of  $\tilde{s}$ . This condition implies  $\hat{q}(m') = \hat{q}(m'')$  for all  $m' \neq m'' \in M(p_1)$ , and hence, the equilibrium is not influential according to Definition 1. Finally, suppose there are  $m' \neq m'' \in M(p_1)$  such that

$$\hat{q}(m') + \Delta \leq p_1 < \hat{q}(m'') + \Delta. \quad (21)$$

If this condition holds, it requires  $\hat{q}(m') \neq \hat{q}(m'')$ . Therefore, according to Lemma 1,  $\phi(m', p_1) = 1$  and  $\phi(m'', p_1) = 0$ , and the equilibrium is influential. ■

**Proof of Proposition 1.** First note that parts (i) and (ii) follow from Lemma 1, Lemma 2, and the discussion in the main text that follows Lemma 3 up to Proposition 1. Suppose there exists an influential equilibrium of the communication subgame. According to Lemma 3 and the discussion that follows this lemma in the main text, the disjoint sets  $M_A(p)$  and  $M_R(p)$  are not empty, and if  $m \in M_A(p_1)$  then  $\hat{q}(m) + \Delta \leq p_1$  and if  $m \in M_R(p_1)$  then  $p_1 < \hat{q}(m) + \Delta$ . Moreover, based on (10) the board prefers sending  $m \in M_A(p)$  over  $m \in M_R(p)$  if and only if  $\tau(\tilde{s}) \leq p_1$ . Since these sets are disjoint, non-empty, and their union is  $M(p_1)$ , it is necessary that  $\tau(\underline{q}) < p_1 < \tau(\bar{q})$ . Moreover, the integration over all  $m \in M_A(p_1)$  yields  $\mathbb{E}[\tilde{q}|\tau(\tilde{s}) \leq p_1] + \Delta \leq p_1$ , and the integration over all  $m \in M_R(p)$  yields  $p_1 < \mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1] + \Delta$ .

The combination of these two conditions yields

$$\mathbb{E} [\tilde{q} | \tau(\tilde{s}) \leq p_1] + \Delta \leq p_1 < \mathbb{E} [\tilde{q} | \tau(\tilde{s}) > p_1] + \Delta. \quad (22)$$

Auxiliary Lemma 4 in Appendix B shows that the intersection of  $\tau(\underline{q}) < p_1 < \tau(\bar{q})$  and condition (22) is equivalent to the intersection of  $\tau(\underline{q}) < p_1$  and  $p_1 \in [\tau(q_L), \tau(q_H))$ , which proves the argument.

Next, suppose  $\tau(\underline{q}) < p_1 < \tau(\bar{q})$  and condition (22) hold. Consider an equilibrium of the communication subgame in which the board sends message  $m_A$  if  $\tau(\tilde{s}) \leq p_1$  and message  $m_R \neq m_A$  otherwise. Since  $\tau(\underline{q}) < p_1 < \tau(\bar{q})$ , both messages are on the equilibrium path. Note that  $\hat{q}(m_A) = \mathbb{E} [\tilde{q} | \tau(\tilde{s}) \leq p_1]$  and  $\hat{q}(m_R) = \mathbb{E} [\tilde{q} | \tau(\tilde{s}) > p_1]$ . Since (22) holds,  $\hat{q}(m_A) + \Delta \leq p_1 < \hat{q}(m_R) + \Delta$ , which according to Lemma 3 implies that the equilibrium is influential, as required. ■

**Proof of Corollary 1.** Let  $\kappa \equiv \lambda \frac{\bar{q}-q}{2}$ , I use this notation to ease the exposition throughout the Appendix. Based on (9) and (13),

$$\tau(q_H) - \tau(q_L) = (2 - \delta) \lambda \frac{q_H - q_L}{2} = (2 - \delta) \times \begin{cases} \kappa + \min\{\frac{\delta}{1-\delta}\kappa + \beta - \Delta, 0\} & \text{if } \beta \leq \Delta \\ \kappa + \Delta - \beta & \text{if } \Delta < \beta. \end{cases} \quad (23)$$

It can be verified that  $\tau(q_H) - \tau(q_L) > 0$  if and only if condition (14) holds. Moreover, it follows directly from the explicit expression of  $\tau(q_H) - \tau(q_L)$  that it increases in  $\kappa$ , and increases in  $\beta - \Delta$  if and only if  $\beta - \Delta < 0$ . Notice that if  $0 \leq \frac{\delta}{1-\delta}\kappa + \beta - \Delta$  then  $\tau(q_H) - \tau(q_L)$  decreases in  $\delta$ . If  $\frac{\delta}{1-\delta}\kappa + \beta - \Delta < 0$  then  $\frac{\partial}{\partial \delta} [\tau(q_H) - \tau(q_L)] = \frac{\kappa}{(1-\delta)^2} - (\beta - \Delta) > 0$  as required. ■

**Proof of Proposition 2.** Suppose condition (14) holds. I argue the cutoffs in the statement

are given by

$$(\underline{b}, \bar{b}) = \begin{cases} \left( \max\{0, \beta - \Delta + \frac{\delta}{1-\delta}\kappa\}, \beta - \Delta + \frac{2-\delta}{1-\delta}\kappa \right) & \text{if } \Delta - \frac{\kappa}{1-\delta} < \beta \leq \Delta \\ \left( \beta - \Delta + \frac{\delta}{1-\delta}\kappa, (\sqrt{\beta - \Delta} - \sqrt{\frac{2-\delta}{1-\delta}\kappa})^2 \right) & \text{if } \Delta < \beta < \Delta + \frac{1-\delta}{2-\delta}\kappa \\ \left( \frac{\Delta - \beta + \kappa}{1-\delta}, \frac{\Delta - \beta + \kappa}{1-\delta} \right) & \text{if } \Delta + \frac{1-\delta}{2-\delta}\kappa \leq \beta < \Delta + \kappa \end{cases} \quad (24)$$

and recall  $\kappa \equiv \lambda \frac{\bar{q} - \underline{q}}{2}$ . We start with several observations. First, suppose  $p_1 = \tau(x) \in [\tau(q_L), \tau(q_H)]$ . The board is influential with respect to this offer and the bidder's expected profit is

$$\begin{aligned} \pi(x) &\equiv \Pr[\tilde{s} \leq x] (\mathbb{E}[\tilde{q} | \tilde{s} \leq x] + \Delta + b - \tau(x)) + \delta \Pr[\tilde{s} > x] b \\ &= \frac{x - \underline{q}}{\bar{q} - \underline{q}} \left( \frac{\lambda x + (1 - \lambda) \bar{q} + \underline{q}}{2} + \Delta + b - \tau(x) \right) + \frac{\bar{q} - x}{\bar{q} - \underline{q}} \delta b. \end{aligned} \quad (25)$$

Second, note that  $s^{**} = \arg \max_x \pi(x)$ , where  $s^{**}$  is given by (15). Also note that

$$\pi(s^{**}) = \frac{1 - \delta}{4\kappa} \left( \Delta - \beta - \frac{\delta}{1 - \delta} \kappa + b \right)^2 + \delta b. \quad (26)$$

Third, notice that

$$s^{**} < q_L \Leftrightarrow b < \underline{y} \equiv \left| \Delta - \beta - \frac{\delta}{1 - \delta} \kappa \right| \quad (27)$$

$$s^{**} < q_H \Leftrightarrow b < \bar{y} \equiv -|\Delta - \beta| + \frac{2 - \delta}{1 - \delta} \kappa, \quad (28)$$

where condition (14) implies  $\underline{y} < \bar{y}$ .

There are two cases to consider. First, suppose  $\Delta - \frac{\kappa}{1-\delta} < \beta \leq \Delta$ . In this case,  $q_H = \bar{q}$  and  $q_L = \underline{q} + \frac{2}{\lambda} \max\{0, \Delta - \beta - \frac{\delta}{1-\delta}\kappa\}$ . Let  $\Pi(\tau(x))$  be the expected profit of the bidder as a



function of the initial offer  $p_1 = \tau(x)$ . In this case,

$$\Pi(\tau(x)) = \begin{cases} \pi(\underline{q}) = \delta b & \text{if } x < q_L \\ \pi(x) & \text{if } q_L \leq x \leq q_H \\ \pi(q_H) - (\tau(x) - \tau(q_H)) & \text{if } q_H < x \end{cases} \quad (29)$$

Indeed, if  $p_1 < \tau(q_L)$  then  $p_1 < \mathbb{E}[\tilde{q}] + \Delta$  and the board is not influential, so the initial offer is rejected for sure and the bidder's expected profit is  $\pi(\underline{q})$ . If  $\tau(q_L) \leq p_1 < \tau(q_H)$  then board is influential, and by construction, the expected profit of the bidder is  $\pi(x)$ . If  $\tau(q_H) \leq p_1$  then  $\mathbb{E}[\tilde{q}] + \Delta < p_1$  and the board is not influential, so the initial offer is accepted for sure by the shareholders and the bidder's profit is  $\mathbb{E}[\tilde{q}] + \Delta + b - p_1$ . Since  $q_H = \bar{q}$ , this can be written as  $\pi(q_H) - (\tau(x) - \tau(q_H))$ . Recall  $s^{**} < q_L \Leftrightarrow b < \underline{y}$  and  $s^{**} < q_H \Leftrightarrow b < \bar{y}$ . Since  $q_H = \bar{q}$  and  $\pi(x)$  is continuous and concave in  $x \in [q_L, \bar{q}]$ , we have

$$x^* \equiv \arg \max_{x \in [\underline{q}, \bar{q}]} \Pi(\tau(x)) = \begin{cases} q_L & \text{if } b \leq \underline{y} \\ s^{**} \in (q_L, q_H) & \text{if } \underline{y} < b < \bar{y} \\ q_H & \text{if } \bar{y} \leq b. \end{cases} \quad (30)$$

Therefore  $\bar{b} = \bar{y}$ . Note that in this region  $\underline{q} < q_L \Leftrightarrow \beta - \Delta + \frac{\delta}{1-\delta}\kappa < 0$ . I argue  $\bar{b} = \beta - \Delta + \frac{2-\delta}{1-\delta}\kappa$  and  $\underline{b} = \max\{0, \beta - \Delta + \frac{\delta}{1-\delta}\kappa\}$ . Indeed, if  $\beta - \Delta + \frac{\delta}{1-\delta}\kappa < 0$  then  $x^* \geq q_L > \underline{q}$  for all  $b$ . Therefore, the board is influential for all  $b \in [0, \bar{y})$ , in which case  $x^* = \max\{s^{**}, q_L\}$  and  $\underline{b} = 0$ . However, if  $\beta - \Delta + \frac{\delta}{1-\delta}\kappa \geq 0$  then  $q_L = \underline{q}$ . Therefore, if  $b \leq \underline{y} = \beta - \Delta + \frac{\delta}{1-\delta}\kappa \geq 0$  then the initial offer fails for sure, and the board is influential if and only if  $b \in (\underline{y}, \bar{y})$ , in which case  $x^* = s^{**} > q_L = \underline{q}$  and  $\underline{b} = \beta - \Delta + \frac{\delta}{1-\delta}\kappa$ .

Second, suppose  $\Delta < \beta < \Delta + \kappa$ . In this case,  $q_L = \underline{q}$ ,  $q_H = \bar{q} + \frac{2}{\lambda}(\Delta - \beta) < \bar{q}$ , and

$$\Pi(\tau(x)) = \begin{cases} \pi(x) & \text{if } \underline{q} \leq x < q_H \\ \mathbb{E}[\tilde{q}] + \Delta + b - \tau(x) & \text{if } q_H \leq x \end{cases} \quad (31)$$

We make several observations. First,

$$\pi(q_H) < \mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H) \Leftrightarrow 0 < b. \quad (32)$$

Second,

$$\pi(\underline{q}) < \mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H) \Leftrightarrow b > \hat{y} \equiv \frac{\Delta - \beta + \kappa}{1 - \delta} > 0. \quad (33)$$

Third,

$$\pi(s^{**}) < \mathbb{E}[q] + \Delta + b - \tau(q_H) \Leftrightarrow y_3 < b < y_4 \quad (34)$$

where

$$y_3 \equiv (\sqrt{\beta - \Delta} - \sqrt{\frac{2 - \delta}{1 - \delta}\kappa})^2 \text{ and } y_4 \equiv (\sqrt{\beta - \Delta} + \sqrt{\frac{2 - \delta}{1 - \delta}\kappa})^2. \quad (35)$$

Fourth,

$$\hat{y} \leq y_3 < \bar{y} < y_4 \quad (36)$$

and

$$\beta < \Delta + \frac{1 - \delta}{2 - \delta}\kappa \Rightarrow \underline{y} < \hat{y} < y_3 \quad (37)$$

$$\beta = \Delta + \frac{1 - \delta}{2 - \delta}\kappa \Rightarrow \hat{y} = \underline{y} = y_3 \quad (38)$$

$$\beta > \Delta + \frac{1 - \delta}{2 - \delta}\kappa \Rightarrow \hat{y} < y_3 < \underline{y}. \quad (39)$$

There are two cases:

1. First, if  $\Delta + \frac{1 - \delta}{2 - \delta}\kappa \leq \beta$  then  $\hat{y} \leq y_3 < \underline{y} < \bar{y} < y_4$ . Therefore, if  $b < \hat{y}$  then  $s^{**} < \underline{q}$  and  $\mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H) < \pi(\underline{q})$ , which implies that  $x = \underline{q}$  is the optimal decision of the

bidder. In this case the board is not influential and the initial offer fails for sure. If  $\hat{y} \leq b$  then  $\pi(\underline{q}) \leq \mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H)$ . Moreover, since  $b \in (\underline{y}, \bar{y}) \Rightarrow b \in (y_3, y_4)$  then  $s^{**} \in (\underline{q}, q_H) \Rightarrow \pi(s^{**}) < \mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H)$ . This argument implies that  $x = q_H$  is the optimal decision of the bidder. In this case, the board is not influential and the initial offer is accepted for sure. Overall,

$$x^* = \begin{cases} \underline{q} & \text{if } b < \hat{y} \\ q_H & \text{if } \hat{y} \leq b \end{cases} \quad (40)$$

and  $\underline{b} = \bar{b} = \frac{\Delta - \beta + \kappa}{1 - \delta}$ .

2. Second, if  $\Delta + \frac{1-\delta}{2}\kappa > \beta$  then  $\underline{y} < \hat{y} < y_3 < \bar{y} < y_4$ . Therefore, if  $b < \underline{y}$  then  $s^{**} < \underline{q}$  and  $\mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H) < \pi(\underline{q})$ . Therefore,  $x = \underline{q}$  is the optimal decision of the bidder. In this case the board is not influential and the initial offer fails for sure. If  $\underline{y} \leq b < y_3$  then  $s^{**} \in (\underline{q}, q_H)$  and  $\mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H) < \pi(s^{**})$ . Therefore,  $x = s^{**}$  is the optimal decision of the bidder. In this case the board is influential. If  $y_3 \leq b$  then either  $\pi(s^{**}) \leq \mathbb{E}[q] + \Delta + b - \tau(q_H)$ , or  $\mathbb{E}[q] + \Delta + b - \tau(q_H) < \pi(s^{**})$  and  $q_H < s^{**}$ . Since  $\pi(q_H) < \mathbb{E}[\tilde{q}] + \Delta + b - \tau(q_H)$  always holds,  $x = q_H$  is the optimal decision of the bidder. In this case, the board is not influential and the initial offer is accepted for sure. Overall,

$$x^*(b) = \begin{cases} \underline{q} & \text{if } b < \underline{y} \\ s^{**} & \text{if } \underline{y} \leq b < y_3 \\ q_H & \text{if } y_3 \leq b \end{cases} \quad (41)$$

where  $\underline{b} = \beta - \Delta + \frac{\delta}{1-\delta}\kappa$  and  $\bar{b} = (\sqrt{\beta - \Delta} - \sqrt{\frac{2-\delta}{1-\delta}\kappa})^2$ .

Finally, the proof that  $p_1^* < p_2^*$  if the initial offer is rejected and revised by the bidder on the equilibrium path, is given by the auxiliary Lemma 5 in Appendix B. ■

**Proof of Proposition 3.** Let  $\kappa \equiv \lambda \frac{\bar{q}-q}{2}$ . According to Proposition 2, the following hold:

1. The board is not influential and shareholders accept the initial tender offer if either

$\beta \leq \Delta - \frac{\kappa}{1-\delta}$ , or  $\Delta - \frac{\kappa}{1-\delta} < \beta < \Delta + \kappa$  and  $b \in [\bar{b}, \infty)$ , or  $\Delta + \kappa \leq \beta$ . In those cases, shareholders ignore a recommendation from the board to reject the offer. Denote these events by  $\epsilon = i$ .

2. The board is not influential and shareholders reject the initial tender offer if  $\Delta - \frac{\delta}{1-\delta}\kappa < \beta < \Delta + \kappa$  and  $b \in [0, \underline{b})$ . In those cases, shareholders ignore a recommendation from the board to accept the offer. Denote these events by  $\epsilon = ii$ .

Suppose that at the outset of the game, each parameter of the model, denoted by  $\theta \in \Theta \equiv \{b, \delta, \kappa, \beta, \Delta\}$ , is drawn by nature from a distribution  $F_\theta$  (where the parameters are subject to all the constraints I specify in the setup of the model, e.g.,  $\Delta > 0$ ). Suppose also the parameters of the model are independent of each other. The independence of parameters is essential for deriving of the comparative statics which by definition requires holding every else equal. Notice that condition (14) and cutoffs  $\underline{b}$  and  $\bar{b}$ , as given by expression (24) in the proof of Proposition 2, depend on the value of  $\Theta$ . Part (i) is a statement about how  $\Pr[\epsilon = i|\theta]$  changes with  $\theta$ , where the probability is taken with respect to the joint distribution of  $\Theta \setminus \{\theta\}$ . Similarly, part (ii) is a statement about how  $\Pr[\epsilon = ii|\theta]$  changes with  $\theta$ .

The comparative statics with respect to  $b$  follows directly from the two observations above. Consider the comparative statics with respect to  $\beta$ . Suppose condition (14) holds. According to expression (24),  $\bar{b}(\beta)$  increases with  $\beta$  if and only if  $\beta < \Delta$ , and  $\underline{b}(\beta)$  increases with  $\beta$  if and only if  $\beta < \Delta + \frac{1-\delta}{2-\delta}\kappa$ . This argument concludes the effect of  $\beta$ . The proof of the comparative statics with respect to  $\kappa$  and  $\delta$  is more involved and can be found in auxiliary Lemma 6 in Appendix B. ■

**Proof of Proposition 4.** Notice that  $H^{**} > 0$  if and only if

$$\begin{aligned}
p_1^{**} &> \mathbb{E}[\tilde{q}|\tau(\tilde{s}) > p_1^{**}] + \delta\Delta \Leftrightarrow \\
\tau(\max\{q_L, s^{**}\}) &> \mathbb{E}[\tilde{q}|\tilde{s} > \max\{q_L, s^{**}\}] + \delta\Delta \Leftrightarrow \\
\left( \begin{array}{l} \delta(\mathbb{E}[\tilde{q}|\tilde{s} > \max\{q_L, s^{**}\}] + \Delta) \\ + (1 - \delta)(\mathbb{E}[\tilde{q}|\tilde{s} = \max\{q_L, s^{**}\}] + \beta) \end{array} \right) &> \mathbb{E}[\tilde{q}|\tilde{s} > \max\{q_L, s^{**}\}] + \delta\Delta \Leftrightarrow \\
\mathbb{E}[\tilde{q}|\tilde{s} = \max\{q_L, s^{**}\}] + \beta &> \mathbb{E}[\tilde{q}|\tilde{s} > \max\{q_L, s^{**}\}] \Leftrightarrow \\
\lambda\mathbb{E}[\tilde{q}|\tilde{q} = \max\{q_L, s^{**}\}] + \beta &> \lambda\mathbb{E}[\tilde{q}|\tilde{q} > \max\{q_L, s^{**}\}] \Leftrightarrow \\
\max\{q_L, s^{**}\} &> \bar{q} - 2\beta/\lambda
\end{aligned} \tag{42}$$

Based on (15) and (13), this condition holds if and only if

$$\max\left\{\beta - \kappa, \Delta - \frac{\kappa}{1 - \delta}, \frac{\Delta + b + \beta}{2} - \frac{1}{2} \frac{2 - \delta}{1 - \delta} \kappa\right\} > 0, \tag{43}$$

and recall  $\kappa \equiv \lambda \frac{\bar{q} - q}{2}$ . The statement follows directly from this expression. In auxiliary Lemma 7 in Appendix B I show that the statement is not empty, that is, there is a configuration of parameters such that  $H^{**} > 0$  and a configuration such that  $H^{**} < 0$ . ■

**Proof of Proposition 5.** I prove that if  $\beta \notin (\Delta - \lambda \frac{\bar{q} - q}{2}, \Delta + \lambda \frac{\bar{q} - q}{2})$  then there is no revised offer with respect to which the target board is influential. If true, the analysis of Proposition 2 applies in this range. For this purpose, let  $m_1$  be the board's message with respect to initial offer  $p_1$ . Also let  $\phi_1(m_1, p_1)$  be the resulted decision of target shareholders and  $p_2(m_1)$  the revised offer that follows this message if the initial offer is rejected.

Suppose  $m_1$  is uninformative about  $\tilde{q}$ . If the initial offer is revised then the continuation of the game unfolds as in the baseline model with the exception that  $\delta = 0$ . Applying Proposition 1 and Corollary 1 for the special case  $\delta = 0$ , implies that if  $\beta \notin (\Delta - \lambda \frac{\bar{q} - q}{2}, \Delta + \lambda \frac{\bar{q} - q}{2})$  then the board can never influence the decision of target shareholders at the continuation of the game.

Suppose  $m_1$  is informative about  $\tilde{q}$ . We proceed in several steps. First, I argue that there

is  $s^* \in [\underline{q}, \bar{q}]$  such that if  $\tilde{s} \geq s^*$  then  $m_1$  satisfies  $\phi_1(m_1, p_1) = 0$  and if  $\tilde{s} < s^*$  then  $m_1$  satisfies  $\phi_1(m_1, p_1) = 1$ . To see why, suppose that the initial offer is rejected. If the bidder does not revise the initial offer then the board's payoff is  $\mathbb{E}[\tilde{q}|\tilde{s}] + \beta$ . If the bidder revises the initial offer and the board is not influential with respect to the revised offer then its payoff is either  $p_2(m_1)$  if the revised offer is accepted or  $\mathbb{E}[\tilde{q}|\tilde{s}] + \beta$  if it is rejected. If the bidder revises the initial offer and the board is influential with respect to the revised offer then the board's payoff is  $\max\{p_2(m_1), \mathbb{E}[\tilde{q}|\tilde{s}] + \beta\}$ . Either way, conditional on message  $m_1$  and the rejection of the initial offer, the board's payoff, denoted by  $R(m_1, \tilde{s})$ , is strictly increasing in  $\tilde{s}$ . If  $\phi_1(m'_1, p_1) = \phi_1(m''_1, p_1)$  for all  $m'_1 \neq m''_1$  then the board chooses  $m_1 \in \arg \max_m p_2(m)$ , and therefore, message  $m_1$  cannot be informative about  $\tilde{q}$ , a contradiction. Therefore, there exist  $m'_1 \neq m''_1$  such that  $\phi_1(m'_1, p_1) = 0$  and  $\phi_1(m''_1, p_1) = 1$ . The board prefers message  $m'_1$  over  $m''_1$  if and only if  $p_1 \leq R(m'_1, \tilde{s})$ . Moreover, since  $\delta > 0$ , if the board sends message  $m'_1$  such that  $\phi_1(m'_1, p_1) = 0$ , then it has to be that  $m'_1 \in \arg \max_{m_1 \in \{m: \phi_1(m, p_1)=0\}} R(m_1, \tilde{s})$ . Since  $R(m_1, \tilde{s})$  is increasing in  $\tilde{s}$ , so is  $\max_{m_1 \in \{m: \phi_1(m, p_1)=0\}} R(m_1, \tilde{s})$ . Therefore, there is  $s^* \in [\underline{q}, \bar{q}]$  as required.

Second, suppose on the contrary that the board is influential with respect to the revised offer  $p_2(m_1)$ . The board will send a message that results with an approval if and only if  $p_2(m_1) \geq \mathbb{E}[\tilde{q}|\tilde{s}] + \beta$ . If  $p_2(m_1) < \mathbb{E}[\tilde{q}|\tilde{s} = s^*] + \beta$  then the board always has incentives to send a message that leads to the rejection of the revised offer. If  $p_2(m_1) \geq \mathbb{E}[\tilde{q}|\tilde{s} = \bar{q}] + \beta$  then the board always has incentives to send a message that leads to the approval of the revised offer. In both cases, the board cannot be influential with respect to  $p_2(m_1)$ . Suppose  $\mathbb{E}[\tilde{q}|\tilde{s} = s^*] + \beta \leq p_2(m_1) < \mathbb{E}[\tilde{q}|\tilde{s} = \bar{q}] + \beta$ , which is equivalent to

$$\lambda s^* + (1 - \lambda) \mathbb{E}[\tilde{q}] + \beta \leq p_2(m_1) < \lambda \bar{q} + (1 - \lambda) \mathbb{E}[\tilde{q}] + \beta. \quad (44)$$

If the board is influential then, similar to the proof of Proposition 1, integration over all (second round) messages that result with a rejection of the revised offer and all messages that result

with an approval of the revised offer require

$$\mathbb{E} \left[ \tilde{q} | s^* \leq \tilde{s} < \frac{p_2(m_1) - (1 - \lambda) \mathbb{E}[\tilde{q}] - \beta}{\lambda} \right] \leq p_2(m_1) - \Delta < \mathbb{E} \left[ \tilde{q} | \frac{p_2(m_1) - (1 - \lambda) \mathbb{E}[\tilde{q}] - \beta}{\lambda} \leq \tilde{s} \right], \quad (45)$$

which is equivalent to

$$\lambda s^* + (1 - \lambda) \mathbb{E}[\tilde{q}] + 2\Delta - \beta \leq p_2(m_1) < \lambda \bar{q} + (1 - \lambda) [\tilde{q}] + 2\Delta - \beta. \quad (46)$$

The intersection of conditions (44) and (46) is non-empty if and only if  $\beta \in (\Delta - \lambda \frac{\bar{q} - s^*}{2}, \Delta + \lambda \frac{\bar{q} - s^*}{2})$ . However, the combination of  $s^* \in [\underline{q}, \bar{q}]$  and  $\beta \notin (\Delta - \lambda \frac{\bar{q} - \underline{q}}{2}, \Delta + \lambda \frac{\bar{q} - \underline{q}}{2})$  implies  $\beta \notin (\Delta - \lambda \frac{\bar{q} - s^*}{2}, \Delta + \lambda \frac{\bar{q} - s^*}{2})$ . Therefore, the board cannot be influential with respect to offer  $p_2$ , a contradiction. ■

**Proof of Proposition 6.** Let  $\kappa \equiv \lambda \frac{\bar{q} - \underline{q}}{2}$ , and note that according to (9) and (13)

$$\tau(q_H) = \mathbb{E}[\tilde{q}] + \delta\Delta + \kappa + (2 - \delta) \min\{0, \Delta - \beta\} + (1 - \delta) \beta. \quad (47)$$

**Case I:** Suppose  $\beta \leq \Delta$ . If  $\beta \leq \Delta - \frac{\kappa}{1 - \delta}$  then  $V(\kappa) = \mathbb{E}[\tilde{q}] + \Delta$ , and if  $\Delta - \frac{\kappa}{1 - \delta} < \beta \leq \Delta$  then  $V(\kappa)$  is given by (16). Based on (47) and Lemma 8 in Appendix B,

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1 - \delta) \Delta & \text{if } \frac{\kappa}{1 - \delta} \leq \Delta - \beta \\ \kappa + (1 - \delta) \beta & \text{if } \Delta - \beta < \frac{\kappa}{1 - \delta} \text{ and } b \geq \bar{b} \\ \psi_2 & \text{if } \Delta - \beta < \frac{\kappa}{1 - \delta} < \frac{\Delta - b - \beta}{\delta} \text{ and } b \in [\underline{b}, \bar{b}) \\ \psi_1 & \text{if } \max\{\Delta - \beta, \frac{\Delta - b - \beta}{\delta}\} < \frac{\kappa}{1 - \delta} \text{ and } b \in [\underline{b}, \bar{b}) \\ 0 & \text{if } \Delta - \beta < \frac{\kappa}{1 - \delta} \text{ and } b < \underline{b}, \end{cases} \quad (48)$$

where  $\psi_1$  and  $\psi_2$  are given by (103) and (104). Substituting  $\underline{b}$  and  $\bar{b}$  with their explicit form

as reflected by (24),  $V(\kappa)$  can be rewritten as

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \frac{\kappa}{1-\delta} \leq \Delta - \beta \\ \kappa + (1-\delta)\beta & \text{if } \Delta - \beta < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta + b}{2-\delta} \\ \psi_2 & \text{if } \max\{\Delta - \beta, \frac{\Delta - \beta + b}{2-\delta}\} < \frac{\kappa}{1-\delta} < \min\{\frac{\Delta - \beta + b}{\delta}, \frac{\Delta - \beta - b}{\delta}\} \\ \psi_1 & \text{if } \max\{\Delta - \beta, \frac{\Delta - \beta + b}{2-\delta}, \frac{\Delta - \beta - b}{\delta}\} < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta + b}{\delta} \\ 0 & \text{if } \max\{\Delta - \beta, \frac{\Delta - \beta + b}{\delta}\} < \frac{\kappa}{1-\delta} \end{cases} \quad (49)$$

Note that  $\max\{\Delta - \beta, \frac{\Delta - \beta - b}{\delta}\} < \frac{\Delta - \beta + b}{\delta}$  and

$$\Delta - \beta < (>) \frac{b}{1-\delta} \Rightarrow \frac{\Delta - \beta - b}{\delta} < (>) \Delta - \beta < (>) \frac{\Delta - \beta + b}{2-\delta} \quad (50)$$

There are two cases to consider. First, if  $\Delta - \beta < \frac{b}{1-\delta}$  then

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \frac{\kappa}{1-\delta} \leq \Delta - \beta \\ \kappa + (1-\delta)\beta & \text{if } \Delta - \beta < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta + b}{2-\delta} \\ \psi_1 & \text{if } \frac{\Delta - \beta + b}{2-\delta} < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta + b}{\delta} \\ 0 & \text{if } \frac{\Delta - \beta + b}{\delta} < \frac{\kappa}{1-\delta}. \end{cases} \quad (51)$$

Note that  $\frac{\kappa}{1-\delta} = \Delta - \beta \Rightarrow \kappa + (1-\delta)\beta = (1-\delta)\Delta$ . Also note that according to Lemma 8,  $\psi_1$  is decreasing in  $\lambda$  in the relevant range, and that if  $\frac{\kappa}{1-\delta} = \frac{\Delta - \beta + b}{2-\delta}$  then  $\mathbb{E}[\tilde{q}] + \delta\Delta + \kappa + (1-\delta)\beta = \psi_1$ . Therefore, the optimal  $\kappa^*$  requires  $\frac{\kappa^*}{1-\delta} = \min\{\frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \frac{\Delta - \beta + b}{2-\delta}\}$ , which implies



$\lambda^* = \min\{1, \frac{\Delta - \beta + b}{\frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}}\}$ . Second, if  $\Delta - \beta \geq \frac{b}{1-\delta}$  then

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \frac{\kappa}{1-\delta} \leq \Delta - \beta \\ \psi_2 & \text{if } \Delta - \beta < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta - b}{\delta} \\ \psi_1 & \text{if } \frac{\Delta - \beta - b}{\delta} < \frac{\kappa}{1-\delta} \leq \frac{\Delta - \beta + b}{\delta} \\ 0 & \text{if } \frac{\Delta - \beta + b}{\delta} < \frac{\kappa}{1-\delta}. \end{cases} \quad (52)$$

Note that according to Lemma 8, both  $\psi_1$  and  $\psi_2$  are decreasing in  $\lambda$  in the relevant range. Also note that  $\frac{\kappa}{1-\delta} = \Delta - \beta \Rightarrow \psi_2 = (1-\delta)\Delta$  and  $\frac{\kappa}{1-\delta} = \frac{\Delta - \beta - b}{\delta} \Rightarrow \psi_2 = \psi_1$ . Therefore, the optimal  $\kappa^*$  requires  $\frac{\kappa^*}{1-\delta} = \min\{\frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta - \beta\}$ , which implies  $\lambda^* = \min\{1, \frac{\Delta - \beta}{\frac{1}{1-\delta} \frac{\bar{q}-q}{2}}\}$ .

**Case II:** Suppose  $\beta > \Delta$ . If  $\Delta + \kappa \leq \beta$  then  $V(\kappa) = \mathbb{E}[\tilde{q}] + \Delta$ , and if  $\Delta < \beta < \Delta + \kappa$  then  $V$  is given by (16). Based on (47) and Lemma 8

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \kappa \leq \beta - \Delta \\ \kappa + (2-\delta)\Delta - \beta & \text{if } \beta - \Delta < \kappa \text{ and } b \geq \bar{b} \\ \psi_1 & \text{if } \beta - \Delta < \kappa \text{ and } b \in [\underline{b}, \bar{b}) \\ 0 & \text{if } \beta - \Delta < \kappa \text{ and } b < \underline{b}, \end{cases} \quad (53)$$

where  $\psi_1$  is given by (103). Substituting  $\underline{b}$  and  $\bar{b}$  with their explicit form, then

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \kappa \leq \beta - \Delta \\ \kappa + (2-\delta)\Delta - \beta & \text{if } \beta - \Delta < \kappa \leq \min\{b(1-\delta) + \beta - \Delta, \frac{2-\delta}{1-\delta}(\beta - \Delta)\} \\ & \text{or } \frac{2-\delta}{1-\delta}(\beta - \Delta) < \kappa < \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2 \\ \psi_1 & \text{if } \max\{\beta - \Delta, \frac{2-\delta}{1-\delta}(\beta - \Delta), \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2\} < \kappa \leq (1-\delta)\frac{\Delta - \beta + b}{\delta} \\ 0 & \text{if } \max\{\beta - \Delta, b(1-\delta) + \beta - \Delta\} < \kappa \leq \frac{2-\delta}{1-\delta}(\beta - \Delta) \\ & \text{or } \max\{\frac{2-\delta}{1-\delta}(\beta - \Delta), (1-\delta)\frac{\Delta - \beta + b}{\delta}\} < \kappa. \end{cases} \quad (54)$$

Note that  $\beta - \Delta < \min\{\frac{2-\delta}{1-\delta}(\beta - \Delta), b(1-\delta) + \beta - \Delta\}$  and

$$\frac{\beta - \Delta}{(1-\delta)^2} < b \Rightarrow \frac{2-\delta}{1-\delta}(\beta - \Delta) < \min\{(1-\delta)\frac{\Delta - \beta + b}{\delta}, \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2, b(1-\delta) + \beta - \Delta\}$$

$$\frac{\beta - \Delta}{(1-\delta)^2} > b \Rightarrow \frac{2-\delta}{1-\delta}(\beta - \Delta) > \max\{(1-\delta)\frac{\Delta - \beta + b}{\delta}, \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2, b(1-\delta) + \beta - \Delta\} \quad (55)$$

There are two cases to consider. First, if  $\frac{\beta - \Delta}{(1-\delta)^2} < b$  then

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \kappa \leq \beta - \Delta \\ \kappa + (2-\delta)\Delta - \beta & \text{if } \beta - \Delta < \kappa < \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2 \\ \psi_1 & \text{if } \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2 < \kappa \leq (1-\delta)\frac{\Delta - \beta + b}{\delta} \\ 0 & \text{if } (1-\delta)\frac{\Delta - \beta + b}{\delta} < \kappa, \end{cases} \quad (56)$$

Note that  $\kappa = \beta - \Delta \Rightarrow \kappa + (1-\delta)\beta > (1-\delta)\Delta$ . Also note that according to Lemma 8,  $\psi_1$  is decreasing in  $\lambda$  in the relevant range, and that if  $\kappa = \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2$  then  $\mathbb{E}[\tilde{q}] + \delta\Delta + \kappa + (1-\delta)\beta > \psi_1$ . Therefore, the optimal  $\kappa^*$  requires  $\kappa^* = \min\{\frac{\bar{q}-q}{2}, \frac{1-\delta}{2-\delta}(\sqrt{b} + \sqrt{\beta - \Delta})^2\}$ ,

which implies  $\lambda^* = \min\{1, \frac{(\sqrt{b} + \sqrt{\beta - \Delta})^2}{\frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}}\}$ . Second, if  $\frac{\beta - \Delta}{(1-\delta)^2} \geq b$  then

$$V(\kappa) = \mathbb{E}[\tilde{q}] + \delta\Delta + \begin{cases} (1-\delta)\Delta & \text{if } \kappa \leq \beta - \Delta \\ \kappa + (2-\delta)\Delta - \beta & \text{if } \beta - \Delta < \kappa \leq b(1-\delta) + \beta - \Delta \\ 0 & \text{if } b(1-\delta) + \beta - \Delta < \kappa, \end{cases} \quad (57)$$

Here it is straight forward to see that  $\lambda^* = \min\{1, \frac{b(1-\delta) + \beta - \Delta}{\frac{\bar{q}-q}{2}}\}$ .

**Summary:** Overall,  $\lambda^* = \min\{1, L^*\}$  where

$$L^* = \frac{2(1-\delta)}{\bar{q}-q} \times \begin{cases} \Delta - \beta & \text{if } \beta \leq \Delta - \frac{b}{1-\delta} \\ \frac{b + \Delta - \beta}{2-\delta} & \text{if } \Delta - \frac{b}{1-\delta} < \beta \leq \Delta \\ \frac{(\sqrt{b} + \sqrt{\beta - \Delta})^2}{2-\delta} & \text{if } \Delta < \beta \leq \Delta + b(1-\delta)^2 \\ b + \frac{\beta - \Delta}{1-\delta} & \text{if } \Delta + b(1-\delta)^2 < \beta. \end{cases} \quad (58)$$

The comparative statics that is described in the main text follow directly from the explicit expression of  $\lambda^*$ . To prove parts (i) and (ii) we consider four subcases.

1. If  $\beta \notin (\Delta - \frac{1}{1-\delta} \max\{\frac{\bar{q}-q}{2}, b\}, \Delta + \frac{\bar{q}-q}{2})$  then condition (14) is violated for all  $\lambda \in [0, 1]$ . If  $\beta \in (\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2}, \Delta - \frac{b}{1-\delta})$  then  $\lambda^* = \frac{\Delta - \beta}{\frac{1}{1-\delta} \frac{\bar{q}-q}{2}} < 1$ .
2. Suppose  $\beta \in (\Delta - \frac{1}{1-\delta} \max\{\frac{\bar{q}-q}{2}, b\}, \Delta]$ . In this range,  $\bar{b}(\lambda) = \beta - \Delta + \lambda \frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}$  and  $\lambda^* = \min\{1, \frac{b + \Delta - \beta}{\frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}}\}$ . Thus,  $\lambda^* < 1$  if and only if  $b < \bar{b}(\beta, 1)$ . If  $b < \bar{b}(\beta, 1)$  then by construction  $b = \bar{b}(\beta, \lambda^*)$  and  $\Delta - \lambda^* \frac{1}{1-\delta} \frac{\bar{q}-q}{2} < \beta \Leftrightarrow \Delta - \frac{b}{1-\delta} < \beta$ . If  $b \geq \bar{b}(\beta, 1)$  then  $\lambda^* = 1$  and clearly  $\Delta - \frac{1}{1-\delta} \frac{\bar{q}-q}{2} < \beta$ .
3. Suppose  $\beta \in (\Delta, \Delta + \min\{b(1-\delta)^2, \frac{\bar{q}-q}{2}\})$ . Since  $\beta < \Delta + b(1-\delta)^2$  implies  $\frac{\beta - \Delta}{\frac{1-\delta}{2-\delta} \frac{\bar{q}-q}{2}} <$

$\frac{(\sqrt{b} + \sqrt{\beta - \Delta})^2}{\frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}}$ ,  $\beta < \Delta + \lambda^* \frac{1-\delta}{2-\delta} \frac{\bar{q}-q}{2} < \Delta + \lambda^* \frac{\bar{q}-q}{2}$  and condition (14) holds. Moreover,

$$\lambda^* < 1 \Leftrightarrow b < \left( \sqrt{\frac{2-\delta}{1-\delta} \frac{\bar{q}-q}{2}} - \sqrt{\beta - \Delta} \right)^2 = \bar{b}(\beta, 1). \quad (59)$$

If  $\lambda^* = 1$  then  $b \geq \bar{b}(\beta, 1)$ , and if  $\lambda^* < 1$  then  $b = \bar{b}(\beta, \lambda^*)$ , as required.

4. Suppose  $\beta \in (\Delta + b(1-\delta)^2, \Delta + \frac{\bar{q}-q}{2})$ . Since  $\beta > \Delta + b(1-\delta)^2$  implies  $\frac{\beta - \Delta}{\frac{1-\delta}{2-\delta} \frac{\bar{q}-q}{2}} > \frac{b(1-\delta) + \beta - \Delta}{\frac{\bar{q}-q}{2}}$ ,  $\Delta + \lambda^* \frac{1-\delta}{2-\delta} \frac{\bar{q}-q}{2} < \beta < \Delta + \lambda^* \frac{\bar{q}-q}{2}$  and condition (14) holds. Moreover,

$$\lambda^* < 1 \Leftrightarrow b < \frac{\Delta - \beta + \frac{\bar{q}-q}{2}}{1-\delta} = \bar{b}(\beta, 1). \quad (60)$$

If  $\lambda^* = 1$  then  $b \geq \bar{b}(\beta, 1)$ , and if  $\lambda^* < 1$  then  $b = \bar{b}(\beta, \lambda^*)$ .

■

**Proof of Proposition 7.** Let  $\kappa \equiv \lambda \frac{\bar{q}-q}{2}$ . If  $\beta \notin (\Delta - \frac{\kappa}{1-\delta}, \Delta + \kappa)$  then the board is never influential and the target shareholder value is  $\mathbb{E}[\tilde{q}] + \Delta$ . We show that for any  $b$  there is  $\beta \in (\Delta - \frac{\kappa}{1-\delta}, \Delta + \kappa)$  that generates a strictly higher expected shareholder value.

Suppose  $b \geq \frac{2-\delta}{1-\delta} \kappa$ . Based on (24),  $b \geq \bar{b}$  for all  $\beta$ . Therefore, according to (16),

$$V(\beta) = \tau(q_H) = \lambda \bar{q} + (1-\lambda) \frac{\bar{q} + q}{2} + \begin{cases} 2\Delta - \beta & \text{if } \Delta < \beta < \Delta + \kappa \\ \delta\Delta + (1-\delta)\beta & \text{if } \Delta - \frac{\kappa}{1-\delta} < \beta \leq \Delta, \end{cases} \quad (61)$$

which obtains its maximum at  $\beta = \Delta$ . Since  $V(\Delta) > \mathbb{E}[\tilde{q}] + \Delta$ ,  $\beta^* = \Delta$  as required.

Next, suppose  $b < \frac{2-\delta}{1-\delta} \kappa$ . Based on (24),  $\bar{b}(\Delta) = \frac{2-\delta}{1-\delta} \kappa$ ,  $\bar{b}(\Delta + \kappa) = 0$  and  $\bar{b}(\beta)$  is a decreasing function of  $\beta$  when  $\beta \in [\Delta, \Delta + \kappa]$ . Therefore, there is  $\bar{\beta} \in (\Delta, \Delta + \kappa)$  such that

$\bar{b}(\bar{\beta}) = b$ . Based on (24),

$$\bar{\beta} = \Delta + \begin{cases} \kappa - (1 - \delta)b & \text{if } b < \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa \\ (\sqrt{\frac{2-\delta}{1-\delta} \kappa} - \sqrt{b})^2 & \text{if } \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa \leq b < \frac{2-\delta}{1-\delta} \kappa \end{cases} \quad (62)$$

I argue that if  $b < \frac{2-\delta}{1-\delta} \kappa$  then  $\beta^* = \bar{\beta}$ . There are several steps. First, since  $V(\bar{\beta}) = \tau(q_H)|_{\beta=\bar{\beta}} > \mathbb{E}[\tilde{q}] + \Delta$ , choosing  $\beta \notin (\Delta - \frac{\kappa}{1-\delta}, \Delta + \kappa)$  is suboptimal. Also, choosing  $\beta$  such that  $b < \bar{b}(\beta)$ , which yields  $V = \mathbb{E}[\tilde{q}] + \delta\Delta$ , cannot be optimal.

Second, define  $\hat{\beta} < \Delta$  such that  $\bar{b}(\hat{\beta}) = b$ . Based on (24),

$$\hat{\beta} = \Delta - \frac{2-\delta}{1-\delta} \kappa + b. \quad (63)$$

Note that  $\hat{\beta} > \Delta - \frac{\kappa}{1-\delta}$  if and only if  $b > \kappa$ . We argue that if  $\kappa < b < \frac{2-\delta}{1-\delta} \kappa$  then  $V(\bar{\beta}) > V(\hat{\beta})$ . If true, choosing  $\beta \leq \Delta$  such that  $b \geq \bar{b}(\beta)$  is never optimal. There are two sub-cases. First, if  $\max\{\kappa, \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa\} < b < \frac{2-\delta}{1-\delta} \kappa$  then  $V(\bar{\beta}) > V(\hat{\beta})$  if and only if  $\tau(q_H)|_{\beta=\bar{\beta}} > \tau(q_H)|_{\beta=\hat{\beta}}$ , which holds if and only if

$$\begin{aligned} 2\Delta - \bar{\beta} &> \delta\Delta + (1-\delta)\hat{\beta} \Leftrightarrow \\ \Delta - \left( \sqrt{\frac{2-\delta}{1-\delta} \kappa} - \sqrt{b} \right)^2 &> \delta\Delta + (1-\delta) \left( \Delta - \frac{2-\delta}{1-\delta} \kappa + b \right) \Leftrightarrow \\ \kappa - 2\sqrt{\kappa} \sqrt{(2-\delta)(1-\delta)b} + b(2-\delta)(1-\delta) &< (1-\delta)^2 \kappa \Leftrightarrow \\ \left( \sqrt{(2-\delta)(1-\delta)b} - \sqrt{\kappa} \right)^2 &< (1-\delta)^2 \kappa \Leftrightarrow \\ b &< \frac{2-\delta}{1-\delta} \kappa \end{aligned}$$

which always holds in this range. Second, if  $\kappa < b < \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa$  then  $V(\bar{\beta}) > V(\hat{\beta})$  if and only if

$$2\Delta - \bar{\beta} > \delta\Delta + (1-\delta)\hat{\beta} \Leftrightarrow \delta < 1, \quad (64)$$

which always holds, as required.

Third, I show that if  $b < \frac{2-\delta}{1-\delta}\kappa$  and  $\beta$  is such that  $\underline{b}(\beta) \leq b < \bar{b}(\beta)$  then  $V(\beta, b) < V(\bar{\beta}, b)$ . If true, this argument completes the proof that  $b < \frac{2-\delta}{1-\delta}\kappa \Rightarrow \beta^* = \bar{\beta}$ . Notice that based on (24),  $\underline{b}(\beta) \leq b < \bar{b}(\beta)$  implies  $\beta < \Delta + \frac{1-\delta}{2-\delta}\kappa$ . Consider two sub-cases:

**Case I:** Suppose  $\Delta - \frac{\delta}{1-\delta}\kappa < \beta < \Delta + \frac{1-\delta}{2-\delta}\kappa$ . In this case,  $q_L < s^{**}$  and  $V(\beta) = \psi_1(\beta)$  where  $\psi_1(\beta)$  is given by (103) in Lemma 8. Since  $\underline{b}(\cdot)$  is an increasing function of  $\beta$  in this range,  $\underline{b}(\beta) \leq b$  implies  $\underline{b}(\Delta - \frac{\delta}{1-\delta}\kappa) \leq b$ . Notice that  $\psi_1(\beta)$  is concave in  $\beta$  and  $\arg \max_{\beta} \psi_1(\beta) = -\frac{\delta}{1-\delta}\kappa$ . Therefore, if  $b < \bar{b}(\Delta - \frac{\delta}{1-\delta}\kappa)$  then

$$V(\Delta - \frac{\delta}{1-\delta}\kappa) = \psi_1(\Delta - \frac{\delta}{1-\delta}\kappa) > \psi_1(\beta) = V(\beta) \quad (65)$$

and  $\beta \in (\Delta - \frac{\delta}{1-\delta}\kappa, \Delta + \frac{1-\delta}{2-\delta}\kappa)$  is suboptimal. Suppose  $\bar{b}(\Delta - \frac{\delta}{1-\delta}\kappa) \leq b$ . Since  $b < \bar{b}(\beta)$ , then  $\hat{\beta}$  as defined by (63) satisfies  $\bar{b}(\hat{\beta}) = b$ ,  $\Delta - \frac{\delta}{1-\delta}\kappa \leq \hat{\beta} < \beta$ , and  $V(\hat{\beta}) = \lambda \bar{q} + (1-\lambda) \frac{\bar{q}+q}{2} + \delta \Delta + (1-\delta)\hat{\beta} = \psi(\hat{\beta})$ . But notice that  $\psi_1(\hat{\beta}) > \psi_1(\beta) = V(\beta)$ . We conclude that  $\Delta - \frac{\delta}{1-\delta}\kappa < \beta < \Delta + \frac{1-\delta}{2-\delta}\kappa$  cannot be optimal.

**Case II:** Suppose  $\Delta - \frac{\kappa}{1-\delta} < \beta \leq \Delta - \frac{\delta}{1-\delta}\kappa$ . Note that  $\beta$  in this range can be optimal only if the following two conditions hold:

1. First, we require

$$\hat{\beta} < -\frac{\delta}{1-\delta}\kappa \Leftrightarrow b < 2\kappa - \Delta. \quad (66)$$

Otherwise, since  $b < \bar{b}(\beta) \Leftrightarrow \hat{\beta} < \beta$ , any  $\hat{\beta} < \beta$  satisfies  $-\frac{\delta}{1-\delta}\kappa < \beta$ . Therefore,  $\psi_1(\beta) < \psi_1(\hat{\beta})$ , but since  $\psi_1(\hat{\beta}) < V(\bar{\beta})$ , choosing  $\beta \leq \Delta - \frac{\delta}{1-\delta}\kappa$  cannot be optimal.

2. Second, we require

$$\Delta - \frac{\delta}{1-\delta}\kappa - b < -\frac{\delta}{1-\delta}\kappa \Leftrightarrow \Delta < b. \quad (67)$$

Otherwise, since  $q_L < s^{**} \Leftrightarrow \Delta - \frac{\delta}{1-\delta}\kappa - b < \beta$ ,  $q_L < s^{**}$  implies  $-\frac{\delta}{1-\delta}\kappa < \beta$  and  $\psi_1(\beta) < \psi_1(\Delta - \frac{\delta}{1-\delta}\kappa - b)$ . However, if  $s^{**} \leq q_L$  then  $\psi_1(\beta) = \psi_2(\beta)$ , where  $\psi_2(\beta)$  is given by (104). It can be verified that  $\Delta - \frac{\kappa}{1-\delta} < \beta$  implies  $\psi_2(\beta) < \mathbb{E}[\tilde{q}] + \Delta$ . Since

$\beta = \Delta - \frac{\delta}{1-\delta}\kappa - b \Rightarrow s^{**} = q_L$ , we have  $V(\Delta - \frac{\delta}{1-\delta}\kappa - b) < \mathbb{E}[\tilde{q}] + \Delta$ . However, since  $\mathbb{E}[\tilde{q}] + \Delta < V(\bar{\beta})$ , choosing  $\beta \leq \Delta - \frac{\delta}{1-\delta}\kappa$  cannot be optimal.

The intersection of the two conditions above requires

$$\Delta < b < 2\kappa - \Delta, \quad (68)$$

and note that this condition implies  $\Delta - \frac{\kappa}{1-\delta} < -\frac{\delta}{1-\delta}\kappa$ . If condition (68) holds and  $b \leq \frac{1}{1-\delta}\frac{1}{2-\delta}\kappa$  then  $\psi_1(-\frac{\delta}{1-\delta}\kappa) < V(\bar{\beta})$  if and only if

$$\mathbb{E}[\tilde{q}] + \delta\Delta + \frac{1-\delta}{\kappa} \frac{(\Delta+b)^2}{4} < \lambda\bar{q} + (1-\lambda) \frac{\bar{q}+q}{2} + 2\Delta - \bar{\beta} \Leftrightarrow \quad (69)$$

$$b < 4\kappa - \Delta \quad (70)$$

which holds if condition (68) holds. Thus,  $\bar{\beta}$  is optimal. Suppose condition (68) holds and  $\frac{1}{1-\delta}\frac{1}{2-\delta}\kappa < b < \frac{2-\delta}{1-\delta}\kappa$ . Since  $2\kappa - \Delta < \frac{2-\delta}{1-\delta}\kappa$ , we require

$$\max\{\Delta, \frac{1}{1-\delta}\frac{1}{2-\delta}\kappa\} < b < 2\kappa - \Delta. \quad (71)$$

In this range,  $\psi_1(-\frac{\delta}{1-\delta}\kappa) < V(\bar{\beta})$  if and only if

$$\mathbb{E}[\tilde{q}] + \delta\Delta + \frac{1-\delta}{\kappa} \frac{(\Delta+b)^2}{4} < \lambda\bar{q} + (1-\lambda) \frac{\bar{q}+q}{2} + 2\Delta - \bar{\beta} \Leftrightarrow \quad (72)$$

$$\frac{1-\delta}{\kappa} \frac{(\Delta+b)^2}{4} + \left( \sqrt{\frac{2-\delta}{1-\delta}}\kappa - \sqrt{b} \right)^2 < \kappa + \Delta(1-\delta) \quad (73)$$

Note that the LHS is the convex in  $b$ . Therefore, it is sufficient to check that the inequality holds at the end-points, that is, when  $b = 2\kappa - \Delta$  and when  $b = \frac{1}{1-\delta}\frac{1}{2-\delta}\kappa$ . In the latter case,  $V(\bar{\beta}) = \lambda\bar{q} + (1-\lambda) \frac{\bar{q}+q}{2} - \Delta - (\kappa - b(1-\delta))$ , which we have shown above to be greater than  $\psi_1(-\frac{\delta}{1-\delta}\kappa)$ , therefore, the inequality holds. If  $b = 2\kappa - \Delta$  then  $\hat{\beta} = -\frac{\delta}{1-\delta}\kappa$ . Therefore,  $\psi(-\frac{\delta}{1-\delta}\kappa) = \psi_1(\hat{\beta}) = \lambda\bar{q} + (1-\lambda) \frac{\bar{q}+q}{2} + \delta\Delta + (1-\delta)\hat{\beta} < V(\bar{\beta})$ . In both cases,  $\bar{\beta}$  is optimal,

as required.

**Summary:** Overall

$$\beta^* = \Delta + \begin{cases} \kappa - (1 - \delta) b & \text{if } b < \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa \\ (\sqrt{\frac{2-\delta}{1-\delta} \kappa} - \sqrt{b})^2 & \text{if } \frac{1}{1-\delta} \frac{1}{2-\delta} \kappa \leq b < \frac{2-\delta}{1-\delta} \kappa \\ 0 & \text{if } \frac{2-\delta}{1-\delta} \kappa \leq b. \end{cases} \quad (74)$$

The comparative statics of  $\beta^*$  follows directly from (74). ■

**Proof of Corollary 2.** According to the proof of Proposition 6, if  $\beta = \beta^*$  then  $V = \tau(q_H) = \kappa + \mathbb{E}[\tilde{q}] + 2\Delta - \beta^*$ , where  $\kappa = \lambda \frac{\bar{q}-q}{2}$ . Since  $\beta^*$  increases in  $\kappa$ , shareholder value is maximized by  $\lambda = 1$ . ■



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