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Strategic Information Transmission and Efficient Corporate Control

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Abstract

We present a model of corporate takeovers in which both, a potential acquirer and incumbent management have private information about the firm value under their respective leadership. Despite the two-sided asymmetric information and endogenously misaligned interests of shareholders and incumbent management, first-best control allocation is feasible if incumbent management can strategically communicate with shareholders. However, shareholders prefer access to more information than revealed in equilibrium. This demand for information leads to inefficiently few takeovers. The model provides implications for the regulation of disclosure requirements and fairness opinions, as well as empirical predictions that link executive compensation to takeover outcomes.

JEL Classification: D82, D83, G34, G38

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1 Introduction

Insider information held by a company's management is one of the fundamental frictions in corporate governance. Takeovers are no exception since incumbent's managerial skills and future strategies are private information. Shareholders' outside option of selling their shares to a potential acquirer is thus determined by management's insider information. This information asymmetry raises the question of how takeovers can guarantee the efficient allocation of control rights as suggested by Manne (1965).

One potential answer is the regulation of (mandatory) management disclosure and the provision of fairness opinions that gives shareholders the right to force management to provide (additional) information when a takeover is initiated.[1] The rationale underlying such regulation seems straightforward: better informed shareholders will make superior decisions, thus improving the allocation of control rights and firm value. We show, however, that this intuition is misleading because the tender offer by the potential acquirer depends on the shareholders' information and therefore on the management's communication strategy. In fact, we find that target shareholders' ignorance towards incumbent management's private information is *necessary* to obtain allocative efficiency.[2]

To study the informational frictions and their potential remedies in takeovers, we present a model where both, incumbent management and external bidder are privately informed about the firm value under their respective control.[3] We investigate whether takeovers allow for efficient trade in the market for corporate control under such two-sided asymmetric information. In particular, we analyze three salient channels of information transmission prevalent in practice that may facilitate the efficient control allocation. First, the external bidder can signal private information via his tender offer. Second, frequently observed management recommendations can provide some of the insider's private information. Third, shareholders can acquire additional information from other sources, be it through fairness opinions or forcing management to disclose additional information. In addition, we identify properties of executive compensation that foster efficient communication between incumbent management and shareholders. Our model predicts various stylized facts with respect to the relation of executive compensation and takeover outcomes. These are validated by empirical findings (see Section 8). We also identify empirical questions regarding managerial influence in takeovers that are not yet addressed by the existing literature.

The main contribution of this paper is to show that strategic management recommendations can implement the first-best control allocation. Crucially, first-best is attainable *only if* shareholders cannot acquire additional information regarding firm value. If shareholders

[1]For a detailed discussion, see Grossman and Hart (1980a), Bainbridge (1999) and Becht et al. (2003) who argue that both management and the potential acquirer need to disclose material information during a takeover. Kisgen et al. (2009) show that fairness opinions are prevalent and present legal cases that imply that shareholders can force management to conduct fairness opinions. At the end of the Introduction, we comment on why fairness opinions may optimally be uninformative.

[2]We are, of course, not the first to show that more information for some agents can be socially suboptimal, for instance, see Hirshleifer (1971).

[3]The fact that the potential acquirer also possesses private information regarding the target firm value under his control was first taken into account by (Shleifer and Vishny 1986).

have access to more – albeit costless – information than revealed by the incumbent's recommendation, too few takeovers occur in equilibrium. Similar to Grossman and Hart (1980b), who argue in favor of a (partial) exclusion of initial shareholders from post-takeover profits, we show that excluding shareholders from learning about the value of the firm can be welfare-improving. Strategic management communication is efficient in our setting because it serves a dual role: on the one hand, it provides information about management's inside information. On the other hand, it can be used to incentivize the bidder to fully reveal his private information.

In the basic model, an external bidder is privately informed about his ability to manage the company once he is in charge. To obtain control, he can submit a public tender offer to acquire a controlling stake in the company from the single initial shareholder. After the bidder's tender offer, the incumbent manager sends a cheap talk message to the shareholder which is based on his private information and the bidder's offer.[4] The manager, maximizing the value of his share endowment,[5] compares the firm value under his management with the firm value under the external bidder's management when he sends his message. In contrast, the shareholder wants to tender only if her expected payoff from selling shares (which contains the price offer) exceeds the expected firm value under incumbent management. The level of (dis)agreement in the cheap talk stage is thus given by the difference between (expected) bidder type (incumbent's view) and tender offer (shareholder's objective). As the tender offer is an equilibrium object, the level of conflict in the cheap talk stage arises endogenously.

As a benchmark, we let the shareholder freely choose the level of information she obtains. As she faces a pure decision problem at the tendering stage, she will always choose to become fully informed.[6] We show that this outcome is not efficient and leads to misallocations of control: too few takeovers occur in equilibrium. The reason is that the bidder has an incentive to post an inefficiently low tender offer when facing a fully informed shareholder.

Alternatively, in the absence of shareholder learning and without strategic management recommendations, there only exist equilibria where all bidder types above some cutoff take over the company with certainty (partial pooling). All types below the cutoff never gain control. Not surprisingly, such cutoff equilibria never attain the optimal control allocation.

Our main result focuses on cheap talk recommendations by the incumbent manager when shareholders cannot acquire additional information. We construct an equilibrium in which the manager sends a binary recommendation in favor of or against a takeover that is

[4]The takeover of BEA Systems, Inc. by Oracle in 2007/08 highlights that management may not be able to disclose verifiable information about all important matters but is able to give a cheap talk recommendation to shareholders:
'BEA has said it cannot fully disclose to the public why it rejected Oracle's offer because the information is confidential [...]. Some analysts have speculated that the company may have secret products in development that it believes will be blockbusters.' *https://www.reuters.com/article/us-bea-icahn/bea-giving-confidential-information-to-carl-icahn-idUSWNAS031920071105*, date 9/30/2019.

[5]We further extend our model and introduce private benefits the manager enjoys from being in charge and show how golden parachutes can be used to mitigate the problems associated with private benefits.

[6]To focus on allocative efficiency, we abstract from any costs associated with additional information acquisition.

followed by the shareholder. The anticipation of this message makes the bidder fully reveal his type via his tender offer. Thus, cheap talk enables both information provision regarding the incumbent's type and screening of the bidder's type. This is feasible because anticipating the informative management recommendation, the bidder trades off the probability of a takeover with profits earned from a takeover. Higher prices are costly to the bidder, but they will, in equilibrium, imply a higher takeover probability because they signal a higher type. We show that control allocation is first-best with such a strategic management recommendation. Strategic information transmission by the incumbent management thus improves the allocation of control rights compared to both, a fully informed and an uninformed shareholder.

The intuition is follows: with strategic communication, the shareholder only receives a binary message regarding the firm value under incumbent management. As interests of shareholder and manager are not perfectly aligned, more precise strategic information transmission is not feasible. In equilibrium, the manager sends a cheap talk message in favor of the takeover if and only if his type is below the expected bidder type, given the tender offer. Hence, the cheap talk message only informs the shareholder whether the tender offer is more profitable than retaining incumbent management. This allows the external bidder to extract all gains from the takeover, leaving the shareholder's payoff at her outside option of keeping the incumbent. Therefore, it is a best response for the shareholder to follow the message if she has no further information at her disposal.

On the other hand, if the shareholder can freely choose the level of information she receives, she will become fully informed.[7] In this case, a takeover occurs only if the incumbent's type is below the price offer (as opposed to the signaled bidder's type). It can be shown that first-best in this case requires all bidder types to earn zero profits on the takeover. This can, however, never be an equilibrium, as imitating lower bidder types, who also have the chance to realize a takeover, will yield strictly positive profits. Hence, fully informed shareholders make first-best infeasible, implying a tension between shareholders and society regarding the optimal provision of information.

We extend our model to a general ownership structure with finitely many shareholders. Further, we introduce private benefits from retaining control for incumbent management. Two differences arise: multiple shareholders give rise to equilibria suffering from coordination failures, and private benefits from remaining in charge hamper communication and introduce a wedge between the incumbent's incentives and first-best. We show, however, that with finitely many shareholders, the equilibrium with informative cheap talk also exists for sufficiently small private benefits. We further establish that if the private benefits are not too large, then the above equilibrium dominates the setting with fully informed shareholders in terms of welfare. In that sense, our equilibrium with informative cheap talk is robust in both dimensions.

Our paper has implications for optimal managerial salary schemes during takeovers,

[7] Any message she would receive from the incumbent is of course irrelevant in this case.

regulation of fairness opinions,[8] and disclosure requirements. First, we provide a novel rationale for equity compensation of managers that does not rely on the well-known moral hazard argument due to the separation of ownership and control (Jensen and Meckling 1976). In our model, it is the management's advisory role in takeovers that requires equity compensation to achieve efficiency. Second, it is crucial that the manager maintains his share position for a holding period after he steps down from office.[9] Indeed, many companies offer vested shares to their named executive officers as part of the compensation package. Holders of these contracts become owners of the shares only gradually over time to provide incentives to remain with the company. Often, compensation agreements specify that the shares – after termination of employment following the change in control – do not vest immediately, but within a specified time period of up to two years (Shearman & Sterling LLP 2016).

Third, our model relates severance payments to management's advisory role. Large severance payments in the event that top executives are let go – or *golden parachutes* – are often subject to public criticism and seen as a sign of management entrenchment. A recent example is the following excerpt from a *Financial Times* article regarding the takeover of Mead Johnson by Reckitt Banckiser (2017):

'*Mead introduced a "golden parachute" pay scheme if [executives] are let go within two years of a takeover... [T]he prospect of being paid because you decide to leave a job may seem decidedly odd. Not, sadly, in the wider context of executive pay agreements, where Mead's example is anything but unusual.*'[10]

However, through the lens of our model, golden parachutes can be efficient. They serve to improve the advisory role of management, which typically obtains some private benefits from remaining in charge. Rewarding incumbent management after a successful takeover may thus help to balance management's interests between remaining in charge and stepping down. Ultimately, this helps to maximize firm value. Of course, the golden parachute should be contingent on a takeover and not be triggered by a dismissal due to mismanagement or other reasons.[11]

Fourth, consulting an outside advisor (such as an investment bank) who provides information beyond the manager's recommendation is common within the realm of corporate takeovers (Kisgen et al. 2009). Furthermore, management may be subject to mandatory

[8] A fairness opinion comprises a brief letter stating the fairness of the offered price and additional material such as data, methods, and computations used for valuation (Bebchuk and Kahan 1989). In 1986, for example, Connecticut National Bank issued a fairness opinion for the takeover of Nutrisystem, Inc. stating that the "$7.16 a share price was fair to shareholders because the company was worth between $6.50 and $8.50 a share." See *https://casetext.com/case/herskowitz-v-nutrisystem-inc*, date 3/19/2019.

[9] An alternative would be to pay the manager a bonus for a high post-takeover shareholder value. In the present paper, this holding period need not necessarily be required by law since ex post, it is in the manager's best interest to tender none of his shares.

[10] See *https://www.ft.com/content/c63591b0-ea08-11e6-893c-082c54a7f539*, date 12/2/2019.

[11] This was true in the case of Mead Johnson.

disclosure rules (Bainbridge 1999).[12] Such fairness opinions and similar disclosure of information should not be required by law since they may destroy firm value.[13] Importantly, as the current shareholders in our model want more information at the time of their tendering decision, they may be prone to force management to procure an expert opinion or provide additional disclosure under threat of a lawsuit. Eliminating the possibility of successful lawsuits may increase allocative efficiency. Our model also provides a rationale for uninformative fairness opinions: fairness opinions that are just uninformative rubber-stamping of management's recommendation can actually be an optimal response to legally required fairness opinions, provided that management has discretion over how informative the report is.

The rest of this paper is organized as follows. In the remainder of this section, we highlight the relationship between our results and related work. Section 2 introduces our basic model. We present a benchmark in Section 3. In section 4, we solve our main model. In Section 5, we investigate several extensions to our basic model. In Section 6, we show how our results can be used to design optimal golden parachutes in takeovers. Section 7 highlights an interesting connection of our model with auction theory. Section 8 develops predictions and relates them to empirical findings from the literature. Finally, Section 9 concludes. All proofs are delegated to an appendix.

Literature on Corporate Takeovers

In the following, we highlight papers from the literature on corporate takeovers that are most related to ours. For a detailed review of the literature, see, for example, Burkart and Panunzi (2008). In their seminal paper, Grossman and Hart (1980b) argue that widely held companies are less prone to takeovers because shareholders can free-ride by not selling their shares and benefit from post-takeover profits. To make efficient takeovers possible, a corporate charter can incorporate exclusionary devices such as dilution of property rights to overcome the free-rider problem. Bagnoli and Lipman (1988) have shown that profitable takeovers of widely held firms are possible without exclusion.[14] The crucial feature is having *finitely* many shareholders, which enables the bidder to make some shareholders pivotal to impede free-riding. As our model contains a finite number of shareholders, we abstract from the free-rider problem and focus instead on informational frictions. Similar to the exclusion of shareholders to overcome the free-rider problem as in Grossman and Hart (1980b), we show that excluding shareholders from learning additional information can be welfare increasing.

Our paper is also related to Levit (2017), wherein one party (a board) has private in-

[12] In the US, if an attempt to purchase more than five percent of the shares of a target company is initiated, both the bidder and current management are legally compelled to disclose a statement (Bainbridge 1999).

[13] Although not explicitly required by law, there is evidence that managers acquire fairness opinions as protection against lawsuits initiated by unsatisfied shareholders (Kisgen et al. 2009).

[14] Also Shleifer and Vishny (1986) and Müller and Panunzi (2004) present ways to alleviate the free-rider problem. Shleifer and Vishny (1986) show that toehold acquisitions before the takeover attempt can make takeovers profitable, and Müller and Panunzi (2004) demonstrate how dilution of the target firm's share value can be attained via leveraged *bootstrap* acquisitions.

formation and advises shareholders about a potential takeover in the form of cheap talk communication. The bidder in Levit (2017) does not possess private information, which shuts down signaling. In contrast, the interaction of costly signaling by the bidder and cheap talk by the incumbent drives our main result.

Marquez and Yılmaz (2008) analyze a framework in which shareholders privately observe conditionally independent signals about the potential value improvement of a takeover with an uninformed bidder. Takeovers may not be feasible as the bidder faces a lemons problem. Ekmekci and Kos (2016) are able to resolve this issue by introducing a large minority shareholder. Ekmekci and Kos (2014) allow for information acquisition by the bidder and the shareholders. It is shown that unilateral access to information for the bidder is of no use to him because all his information will be encoded in the price offer. Shareholders in their model prefer imprecise information because very detailed information provision may lead to a complete market breakdown. Marquez and Yılmaz (2012) compare public signals with information dispersed across shareholders and study the effects on the tender offer. Interestingly, only the precision of the dispersed information matters for the expected tender offer. Ekmekci et al. (2016) derive the optimal mechanism for the sale of a company when the buyer privately knows both, the security benefits he will create and his private benefits of control. There is no private information on the incumbent's side. Bernhardt et al. (2018) introduce heterogeneous private valuations of investors in a takeover model and study the consequences for the tender offer characteristics.

In our model, the bidder signals his private information via his tender offer, and we construct a fully revealing equilibrium (on the bidder's side). In this way, our model is related to Hirshleifer and Titman (1990) and Burkart and Lee (2015) who focus on private information of the external bidder. In Hirshleifer and Titman (1990), there exist mixed equilibria in which the bidder completely reveals his type. In our setting, mixed tendering strategies are not sufficient to induce bidder separation. Further, Burkart and Lee (2015) show how an external bidder can reveal his type by committing to relinquish private benefits. We find an alternative way of to screen bidder types that works even in a setting with two-sided asymmetric information: strategic management recommendations.

In the context of mergers, Hansen (1987), Berkovitch and Narayanan (1990), and Eckbo et al. (1990) study a setting in which separation can be obtained by a mix of cash and equity offers. We are interested in the allocation of control rights, whereas they consider the case in which two companies want to exploit synergies of a merging assets. As a consequence, in their setting, a lemon's problem arises.

Literature on Communication and Corporate Governance

Up to now, a plethora of papers have analyzed strategic communication in manifold economic environments. The seminal paper on cheap talk by Crawford and Sobel (1982) analyzes a situation with one informed sender and one uninformed receiver with a continuous action space. We combine costly signaling and cheap talk in a sequential model: an informed sender (the bidder) sends a costly message (his price offer), to which an informed receiver (the incumbent manager) reacts by sending a cheap talk recommendation. Accordingly, the manager is sender and receiver of information in one.

Our paper features an endogenous conflict of interest of shareholder and management as in Antic and Persico (2018; 2019). They provide a model of information transmission in which an expert shareholder chooses how much information to communicate about the return of an investment to a controlling shareholder who then decides on the investment strategy. A main innovation is that the bias in the cheap talk stage is determined endogenously, through share acquisitions in a competitive market prior to the communication stage. As a result, perfect information transmission is obtained. In our model, the conflict of interest is not determined by the communicating parties (management and shareholders), but through the price offer of the external bidder. In contrast to Antic and Persico (2018; 2019), full information transmission is not feasible.

Malenko and Tsoy (2019) show that advisors in English auctions (such as managers in takeovers) who are biased towards overbidding can increase expected revenues and allocative efficiency via cheap talk messages. In their paper, cheap talk advice influences the bidders' optimal price offer, whereas in our model, the bidder's price offer affects the cheap talk message. Adams and Ferreira (2007) analyze the monitoring and advisory role of a board. It is shown that, to facilitate communication between the board and CEO, the optimal board is not completely independent. Almazan et al. (2008) consider a model where a manager communicates via cheap talk to (potential) investors and is thereby able to increase shareholder value if the company is severely undervalued. Harris and Raviv (2008) examine the optimal board size and composition in the light of communication within the board. Kakhbod et al. (2019) study the design of an advisory committee when heterogeneous shareholders can acquire information and communicate. Malenko (2013) considers communication of directors from a company board in the presence of conformity motives. Interestingly, Malenko (2013) shows that communication may be fostered if directors' preferences are more heterogeneous. Chakraborty and Yılmaz (2017) show that even a board solely advising management may optimally withhold information. Levit (2018) shows how the threat of voice, and in some cases also exit, can help activist shareholders to communicate more effectively. Finally, Levit (2020) shows that a principal's ability to communicate is strengthened if he cannot intervene after the receiver takes some action.

2 Basic Model

Environment

An external bidder E considers the acquisition of a company. The target company has a continuum of shares of measure one outstanding. The bidder makes a publicly observable tender offer by posting a price $p_E \in \mathbb{R}_+$. For a successful takeover, he must acquire at least a fraction $\lambda > 0$ of the outstanding shares. The offer is conditional: if a fraction less than λ of the shares is tendered, the offer becomes void.

The company is currently owned by a single (initial) shareholder (she) and the incumbent manager (I). We generalize the ownership structure to any finite number of shareholders in Section 5. Manager I owns a fraction $s \in (0, \lambda)$ of the shares, making the initial shareholder hold a controlling stake in the company of $1 - s$.[15] The incumbent cannot make a counteroffer and he is not allowed to tender his shares.[16] It will become clear that I has, endogenously, no incentive to trade his shares during the takeover.

The game has three periods indexed by $t \in \{1, 2, 3\}$. At $t = 1$, the external bidder posts his tender offer p_E. At $t = 2$ and after observing the price, I sends a cheap talk message m_I. Finally, at $t = 3$ and given p_E and m_I, the shareholder decides which fraction $\gamma \in [0, 1]$ of her share endowment $1 - s$ to tender. In particular, neither the incumbent manager can commit to tell the truth nor can the shareholder commit to a tender rule ex ante. The timing of events is summarized in Figure 1.

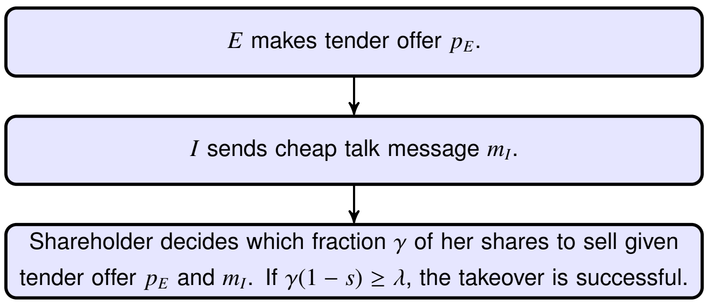

Figure 1: Timing

Information

As a novelty in the literature on corporate takeovers, whether a takeover is socially efficient depends on both the bidder's and the incumbent's private information. The bidder privately observes his type ω_E, which comprises information about his ability to run the company after a successful takeover. Furthermore, the manager has private *inside* information about the company's future profits under his management denoted by ω_I.[17] The shareholder does not know either of the two types. The bidder's and the incumbent's types are independently distributed on $[0, 1]$ according to continuous and commonly known cdfs F_E and F_I. The fact that the types are (potentially) distributed according to different cdfs allows us to

[15] As noted in the introduction, the shareholder may also own all shares if I is interested in the well-being of the company even after a successful takeover due to compensation schemes such as gradually vesting equity, stock options, or bonus payments.

[16] The reasons for this selling restriction are manifold and include, for instance, insider trading restrictions and incentive features in his employment contract such as stock options and vesting equity not immediately tradable. Further, employment contracts often specify retention periods even after the managers leave the company. Our results will imply that these features are highly desirable to increase efficiency in takeovers.

[17] Even though the manager runs the company at the time of the tender offer, he still typically will possess superior, inside information about the future profitability under his management. He may know, for example, about the state of an R&D project, or secret negotiations with a large potential customer. In general, the empirical literature suggests that the strongest form of the efficient market hypothesis does not hold true and not all insider information is incorporated in the market price.

capture the differences in expected firm values and uncertainty under the respective management. Generally, the firm value under different managements will be correlated. The correlated part, however, is non-specific to management and therefore not private information of either management. It is thus likely to be reflected in the current share price and our model specification is a mere normalization of this common part to zero. Both cdfs admit densities f_E and f_I with full support. Finally, we denote $\mu_E := \mathbb{E}[\omega_E]$ and $\mu_I := \mathbb{E}[\omega_I]$.

Payoffs

The firm's profits π are given by ω_E if the takeover attempt is successful and ω_I if the incumbent stays in charge. If no takeover occurs, the shareholder will earn ω_I per share irrespective of her tendering decision. Conditional on a successful takeover, tendering a fraction γ of her share endowment yields p_E per share and security benefits of ω_E on the residual $(1-\gamma)(1-s)$ shares. This results in the following shareholder utility:

$$v = \begin{cases} (1-s)\big(\gamma p_E + (1-\gamma)\omega_E\big), & \text{if takeover successful} \\ (1-s)\omega_I, & \text{otherwise.} \end{cases}$$

The incumbent's utility is given by his share endowment under either control allocation. In Section 5, we generalize his payoff structure and include private benefits from retaining control. In the current version of the model, the incumbent's utility is given by

$$u_I = \begin{cases} s\omega_E, & \text{if takeover successful} \\ s\omega_I, & \text{otherwise.} \end{cases}$$

Observe that even without private benefits of control, the interests of the incumbent and the shareholder are generally not perfectly aligned because the shareholder's payoff is a function of the tender offer p_E, which is an equilibrium outcome. Conversely, in case of a takeover, the incumbent is solely interested in the bidder's type. The bidder's utility is given by:

$$u_E = \begin{cases} \gamma(1-s)(\omega_E - p_E), & \text{if takeover successful} \\ 0, & \text{otherwise.} \end{cases}$$

E derives constant utility normalized to zero if no takeover occurs, and if the tender offer is successful, E buys a fraction of $\gamma(1-s) \geq \lambda$ shares from the shareholder at per-share costs of p_E and gains ω_E on the shares acquired.[18]

Strategies

Given the observed tender offer p_E and the incumbent's message m_I, a (pure) strategy for the shareholder specifies a fraction γ of tendered shares, i.e., $\gamma : \mathbb{R}_+ \times M_I \to [0,1]$ where

[18]As we abstract from the free-rider problem, there is no need to model private benefits for the external bidder to make takeovers feasible.

$M_I = [0, 1]$ denotes the message space. An incumbent's strategy is a mapping from the set of price offers and his type space into the message space, i.e., $m_I : \mathbb{R}_+ \times [0, 1] \to [0, 1]$. Finally, a (pure) strategy for the bidder $p_E : [0, 1] \to \mathbb{R}_+$ specifies a tender offer for any type ω_E. Throughout this paper, we assume that indifference on the shareholder side is broken in favor of a takeover.[19] Our solution concept is perfect Bayesian equilibrium in pure strategies, henceforth referred to as equilibrium. Whenever necessary, we restrict attention to off-path beliefs satisfying the intuitive criterion by Cho and Kreps (1987). An equilibrium requires that (equilibrium objects are denoted with a star):

1. given tender offer p_E^* and message m_I^*, the shareholder chooses optimally how many shares to tender, i.e., she chooses γ^* to maximize $\mathbb{E}[v|p_E^*, m_I^*]$.
2. Given p_E^* and γ^*, I chooses $m_I^* \in argmax\, \mathbb{E}[u_I|p_E^*, \omega_I, \gamma^*]$.
3. Given m_I^* and γ^*, E chooses p_E^* to maximize his expected profits $\mathbb{E}[u_E|\omega_E, m_I^*, \gamma^*]$.
4. Whenever possible, all players update their posterior belief according to Bayes' rule.

First-best Allocation

In our setting, ex post efficiency requires that the potential manager with the higher type leads the company. The following definition establishes the notion of first-best in our setting.

Definition 1. *We call any equilibrium (firm value-) optimal or first-best if it leads to a takeover if and only if $\omega_E \geq \omega_I$.*

3 Informed Shareholder

Before we analyze the implications of strategic information transmission by the incumbent, we turn to the case of an informed shareholder who privately[20] knows ω_I. In Section 4.3, we argue that, endogenously, the shareholder prefers to be well-informed.[21] For a given price offer p_E and induced posterior type $\mathbb{E}[\omega_E|p_E]$, a shareholder who knows ω_I will want to tender whenever there is some $\gamma \geq \frac{\lambda}{(1-s)}$ such that

$$\gamma p_E + (1 - \gamma)\mathbb{E}[\omega_E|p_E] \geq \omega_I. \tag{1}$$

A takeover is desired by the shareholder if there is a convex combination of the posted price and posterior expected bidder type (with $\gamma \geq \frac{\lambda}{(1-s)}$) that weakly exceeds the benefits from leaving the incumbent in charge. Given the equilibrium tendering decision of the shareholder and his private type ω_E, the external bidder chooses a price $p_E \in \mathbb{R}_+$ to maximize his expected utility. The following proposition establishes that, in any equilibrium, the bidder's tender offer and the shareholder's tendering decision are jointly inconsistent with the first-best allocation, i.e., ex post inefficient.

[19] This assumption is made to circumvent an openness problem and to ensure existence of equilibria.

[20] E remains uninformed about ω_I.

[21] We complement the analysis with a discussion of potential information channels.

Proposition 1. *Suppose the shareholder is perfectly informed about ω_I. Then, there is no equilibrium in which the first-best allocation is implemented.*

The intuition behind Proposition 1 is as follows. In order to obtain first-best, the shareholder's tendering inequality (1) must be equivalent to $\omega_E \geq \omega_I$. The proof shows that this is only the case if $p_E = \omega_E$, so first-best is only attainable if E makes zero profits and fully reveals his type. We show, however, that zero profits cannot be part of an equilibrium with full separation that is ex post efficient because higher types would imitate price offers of lower types: in a fully separating equilibrium that implements the first-best allocation, every bidder type has a strictly positive takeover probability. Consequently, for all $\omega_E > 0$ there is a deviation to a lower price that secures strictly positive profits. First-best is therefore not attainable with full information about ω_I.

Remark 1. Our setting is restricted to price offers, and there is no commitment regarding the allocation rule: the shareholder will tender only if she finds it optimal given p_E and ω_I. For the case where all shares must be traded for a change in control, i.e., $\lambda = 1 - s$, Proposition 1 follows from the classical impossibility result in bilateral trade by Myerson and Satterthwaite (1983), and (ex post) efficient trade is also not feasible in the more general mechanism design problem. For $\lambda < 1 - s$, the impossibility of first-best does not follow from Myerson and Satterthwaite (1983) because we consider interdependent values. If the shareholder does not tender her entire share endowment, i.e., $\gamma < 1$, the shareholder participates in the expected value improvement by the bidder. Hence, there is some degree of alignment of interests among shareholder and external bidder that may give rise to efficient trade. Proposition 1 shows, however, that ex post efficiency is still not attainable with take-it-or-leave-it price offers.

4 Strategic Management Recommendation

We now analyze the case in which the shareholder's only source of information regarding ω_I is the incumbent's cheap talk message. We show that there exists an equilibrium in which the bidder perfectly reveals his type *because of* the incumbent's cheap talk recommendation. Beyond this, we establish that informative cheap talk can implement the first-best control allocation and thus dominates a setting where the shareholder is fully informed in terms of welfare. Then, we derive the set of equilibria when cheap talk is uninformative and show that separation of the bidder's type cannot be attained in this case.

4.1 Informative Cheap Talk

Cheap talk not only (partially) informs the shareholder about ω_I, but also induces the bidder to fully reveal his type. As a shortcut, we will refer to an equilibrium with full information about the bidder's type as *fully revealing* or *fully separating*. In contrast to the previous benchmark, as shareholder's and incumbent's interests are not completely aligned, cheap talk prevents the shareholder from becoming fully informed. This, however, will turn out to be beneficial for the control allocation.

Tendering Decision and Cheap Talk Message

As the shareholder plays a pure strategy in $t = 3$, there are only two outcomes with respect to the final control allocation given p_E and m_I and the associated posteriors: a takeover occurs either with certainty or never. At the cheap talk stage, the manager knows p_E, and therefore, he knows (on the equilibrium path) whether a takeover will occur if he sends some message m_I. He is indifferent between both outcomes whenever $s\mathbb{E}[\omega_E|p_E] = s\omega_I$, which in turn implies that a takeover is endorsed by I whenever

$$\omega_I \leq \omega_I^*(p_E) := \mathbb{E}[\omega_E|p_E]. \tag{2}$$

The indifference type ω_I^* equals the posterior expected type of E and is thus a function of p_E. When it is clear from the context, we drop the price. Note that, by the common support assumption, for any p_E and induced posterior belief about ω_E there is a unique cutoff type $\omega_I^* \in [0, 1]$ at which the incumbent is indifferent.

The implication of informative cheap talk is illustrated in Figure 2. If the incumbent manager is not well-equipped to steer the company (low ω_I) and if he has a sufficiently high posterior expectation about the bidder's type, he prefers the shareholder to tender her shares. Conversely, if the manager knows that he is very skilled, he recommends not to tender. Hence, he sends at most two non-outcome equivalent messages.

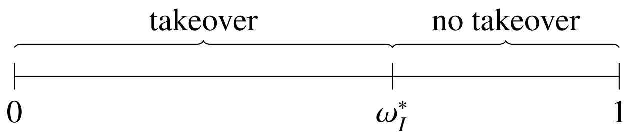

Figure 2: The ω_I-Type Space with Cutoff Type ω_I^*

Bidder's Payoff

If the shareholder follows I's recommendation, the bidder's expected utility is given by

$$F_I(\omega_I^*(p_E))\,\gamma(p_E)(1-s)\,[\omega_E - p_E]. \tag{3}$$

When the bidder chooses his tender offer at $t = 1$, the incumbent's message is not known since it will depend on I's private type ω_I. The bidder's expected utility thus equals the probability that the incumbent's type is below the cutoff type – $F_I(\omega_I^*(p_E))$ – and the amount of shares tendered $\gamma(p_E)(1-s)$ times the profit earned on each share acquired by the bidder $(\omega_E - p_E)$. Equation (3) illustrates that, if the shareholder follows I's message, the final allocation (probability) is fixed by the incumbent's indifference type $\omega_I^*(p_E)$ for any p_E and the corresponding expected posterior type $\mathbb{E}[\omega_E|p_E]$. The following main result characterizes a fully separating equilibrium with informative cheap talk.

Theorem 1
There is an equilibrium in which E fully reveals his type by posting

$$p_E^* = \mathbb{E}[\omega_I|\omega_I \le \omega_I^*(\omega_E)].$$

Furthermore,

1. *if* $\omega_I \le \omega_I^*(p_E)$*, then* $m_I^* \in [0, \omega_I^*(p_E)]$*, and a takeover occurs with probability one;*
2. *if* $\omega_I > \omega_I^*(p_E)$*, then* $m_I^* \in (\omega_I^*(p_E), 1]$*, and a takeover occurs with probability zero.*

Finally, it holds that $\gamma^*(m_I^*(\omega_I \le \omega_I^*(p_E)) = \frac{\lambda}{1-s}$.

Theorem 1 establishes that there exists an equilibrium in which the bidder fully reveals his type via his tender offer. Given p_E^*, the incumbent's posterior belief assigns probability one to the true bidder type on the equilibrium path, and I's indifferent type becomes $\omega_I^* = \omega_E$. The manager sends a binary cheap talk message in favor of or against the takeover. And finally, the shareholder finds it optimal to follow I's message given p_E^* and her posterior beliefs of ω_E and ω_I. If a takeover occurs, then she tenders as few shares as possible, i.e., $\gamma^*(m_I^*(\omega_I \le \omega_I^*)) = \frac{\lambda}{1-s}$. In the following, we convey the intuition underlying the equilibrium in two steps.

Tender Offer
After informative cheap talk, the fully revealing equilibrium exists because of the recommendation by the manager: it enables separation by introducing a way to compensate higher bidder types for posting higher prices. To see this, consider the bidder's per share profit $F_I(\omega_I^*(p_E))[\omega_E - p_E]$. If I's type is below ω_I^*, he recommends a takeover, and if the shareholder follows I's message, the takeover probability is given by $F(\omega_I^*)$. Since $\omega_I^* = \mathbb{E}[\omega_E|p_E]$, the takeover probability strictly increases in the posterior expected bidder type induced by the tender offer p_E. Separation is feasible because increasing p_E induces a higher posterior expectation and therefore a higher takeover probability, but also is costly to the bidder.

In particular, for a fully separating equilibrium to exist, there has to be a strictly increasing (and thus invertible) function $p_E : [0, 1] \to \mathbb{R}_+$ such that, given any ω_E, when E chooses his bid[22] $p \in \mathbb{R}_+$ optimally, we have

$$p = p_E(\omega_E) \in argmax \;\; F_I[\omega_I^*(p_E^{-1}(p))](\omega_E - p). \tag{4}$$

For any ω_E, this maximization yields the bidder-optimal price offer given that the shareholder and incumbent form posterior expectation according to p_E and the shareholder follows I's message. For any particular bid p, the takeover probability is thus determined by $F_I[\omega_I^*(p_E^{-1}(p))]$. The unique solution to (4) is $p_E^*(\omega_E) = \mathbb{E}[\omega_I|\omega_I \le \omega_I^*]$, where, in the fully separating equilibrium, $\omega_I^* = \omega_E$. It is then easy to verify that, given the incumbent man-

[22] We introduce the notation of p here to distinguish between the bid function p_E and a specific bid p (number).

ager and the shareholder form beliefs according to $p^*_E(\omega_E)$, it is indeed optimal for type ω_E to bid $p = p^*_E(\omega_E)$ relative to any other bid $p \in [p^*_E(0), p^*_E(1)]$.

Moreover, no bidder type wants to deviate to an (off-path) tender offer above $p^*_E(1)$ because $p^*_E(1)$ ensures a takeover with probability one. Hence, independent of off-path beliefs, deviating to a higher price only increases the costs but leaves the benefits unaffected. Further, as $p^*_E(0) = 0$ and $p \in \mathbb{R}_+$, off-path downward deviations are not feasible.

Observe that (4) only considers the per share profits. It is sufficient to solve for the bidder's per share profit because, in equilibrium given $m^*_I(\omega_I \leq \omega^*_I)$, the total amount of tendered shares equals $\frac{\lambda}{1-s}$ – independent of the posted price $p \in [0, p^*_E(1)]$. To see this, observe that $p^*_E(\omega_E) = \mathbb{E}[\omega_I|\omega_I \leq \omega_E] < \omega_E$, where the last inequality follows from the full support assumption. Hence, the post-takeover security benefits (ω_E) exceed the tender offer $p^*_E(\omega_E)$ for all bidder types such that the shareholder will tender as few shares as possible that still make the takeover succeed. This also implies that p^*_E guarantees at least the outside option of zero to all bidder types, i.e., $\omega_E \geq p^*_E(\omega_E)$ for any $\omega_E \in [0, 1]$.

Cheap Talk Constraints

In the equilibrium constructed in Theorem 1, the shareholder follows the incumbent's recommendation. To verify that this is indeed optimal for the shareholder, one has to show that, given the equilibrium price p^*_E and message $m^*_I(\omega_I \leq \omega^*_I)$, such that the incumbent endorses a takeover, the shareholder prefers tendering $\gamma \geq \frac{\lambda}{1-s}$ shares over leaving the incumbent in charge. That is, for some $\gamma \geq \frac{\lambda}{1-s}$, it has to hold that

$$\gamma p^*_E(\omega_E) + (1-\gamma)\mathbb{E}[\omega_E|p^*_E(\omega_E)] \geq \mathbb{E}[\omega_I|\omega_I \leq \omega^*_I(\omega_E)]. \tag{5}$$

Conversely, suppose that the manager does not recommend a takeover (i.e., $m^*_I(\omega_I > \omega^*_I)$) at $p^*_E(\omega_E)$. Then, the shareholder finds it optimal to follow the recommendation if

$$\gamma p^*_E(\omega_E) + (1-\gamma)\mathbb{E}[\omega_E|p^*_E(\omega_E)] < \mathbb{E}[\omega_I|\omega_I > \omega^*_I(\omega_E)]. \tag{6}$$

It is sufficient to check inequality (6) for $\gamma = \frac{\lambda}{(1-s)}$ because $\mathbb{E}[\omega_E|p^*_E] > p^*_E$ holds true in equilibrium as shown above.

Observe that the bidder's tender offer, $p^*_E = \mathbb{E}[\omega_I|\omega_I \leq \omega_E]$, is the shareholder's outside option of leaving the incumbent in charge given that the incumbent sends a message in favor of a takeover. As the shareholder receives exactly her outside option on the shares tendered, E obtains all expected gains he creates by taking control over the company. The shareholder participates in the bidder's value improvement via the shares that are not tendered $(1-s-\lambda)$.

Efficient Control Allocation

An important corollary of Theorem 1 is that this fully revealing equilibrium induces the first-best allocation of control rights and consequently, is more efficient than a situation with a fully informed shareholder (Section 3).

Corollary 1. *The equilibrium with informative cheap talk in Theorem 1 induces the first-best control allocation. In particular, it exhibits a strictly higher expected firm value than any equilibrium in which the shareholder is fully informed about ω_I.*

The intuition is straightforward: as $\omega_I^* = \omega_E$, the incumbent recommends a takeover if and only if it is efficient. As the shareholder finds it in her best interest to follow the recommendation, the first-best control allocation is obtained. Observe that there will never be perfect information transmission in the separating equilibrium: the cutoff type ω_I^* equals ω_E, and I merely sends a cutoff message revealing whether $\omega_I \leq \omega_E$ or not. Rather surprisingly, the equilibrium with informative cheap talk welfare-dominates our benchmark setup in which the shareholder is fully informed about ω_I. The intuition is as follows: The external bidder will post prices below his true type to make a profit on the takeover. If information is controlled by the incumbent manager via his message, he recommends a takeover whenever $\mathbb{E}[\omega_E|p_E^*] \geq \omega_I$. In equilibrium, the shareholder cannot do better than following I's recommendation. Conversely, if the shareholder is fully informed about ω_I and the bidder's price offer is fully separating,[23] she tenders if and only if $\frac{\lambda}{1-s}p_E^*(\omega_E) + (1 - \frac{\lambda}{1-s})\omega_E \geq \omega_I$. Denote by $\tilde{\omega}_I := \frac{\lambda}{(1-s)}p_E^*(\omega_E) + (1 - \frac{\lambda}{(1-s)})\omega_E$ the incumbent type at which a fully informed shareholder is exactly indifferent between a takeover and leaving the incumbent in charge. Then, $\tilde{\omega}_I < \omega_E$ holds since $p_E(\omega_E) = \omega_E$ can never be part of an equilibrium because this would imply zero profits (see Section 3). Therefore, there are types $\omega_I \in (\tilde{\omega}_I, \omega_E)$ for which a takeover does not occur with a fully informed shareholder, but the first-best allocation would require it.

Put differently, in the cheap talk equilibrium of Theorem 1, the message of I pools cases where the shareholder prefers to tender with cases where the shareholder would be better off not tendering.[24] To see this, note that $\tilde{\omega}_I < \omega_E = \omega_I^*$. Consequently, given ω_E and $p_E^*(\omega_E)$, for all $\omega_I \leq \tilde{\omega}_I$, the shareholder would tender if she knew ω_I. Conversely, for all $\omega_I > \tilde{\omega}_I$, the shareholder would leave the incumbent in charge as she does not fully internalize all gains from trade. If the shareholder can base her decision solely on m_I, she can only tell whether ω_I is larger or smaller than ω_I^*, but – as $\tilde{\omega}_I < \omega_I^*$ – she never infers if $\omega_I \in (\tilde{\omega}_I, \omega_I^*]$, where she would keep her shares with full information but I recommends to tender. The fact that she is *not perfectly informed* about the firm value is what enables the first-best allocation of control rights.

Remark 2. In our setting, we focus on cheap talk to alleviate the informational frictions because this seems to be the prevalent channel in practice. Alternatively, a shareholder could delegate (without commitment) the control right to the incumbent manager, who then decides whether a takeover occurs or not at a given price offer. Due to the binary action, delegation and informative management recommendations are outcome-equivalent in our setting.[25] In this sense, delegation can be an alternative instrument to achieve the first-best control allocation.

[23] If it is not fully separating, the efficient control allocation cannot be implemented (see Section 3).

[24] This misalignment is the reason why the message by the incumbent can never be fully revealing.

[25] See Dessein (2002) for an analysis of communication versus delegation with commitment and continuous action space.

4.2 Uninformative Cheap Talk

Since the recommendation of the manager is cheap talk, there always exists an equilibrium in which his message is uninformative. A message $m_I(p_E, \omega_I)$ is uninformative (or *babbling*) if, for all $p_E \in \mathbb{R}_+$, $m_I(p_E, \omega_I)$ is independent of ω_I. Alternatively, one can interpret the results of this subsection as a benchmark in which the incumbent manager is not able to give a recommendation to the shareholder. Given an uninformative message of the manager, the next proposition characterizes the set of equilibria.

Proposition 2. *In any babbling equilibrium, there exists a cutoff price $\hat{p}_E < 1$ such that:*
if $\omega_E < \hat{p}_E$, a takeover never occurs;
if $\omega_E \geq \hat{p}_E$, E posts $\hat{p}_E$ and a takeover occurs with probability one.
Finally, it holds that $\gamma^*(\hat{p}_E) = \frac{\lambda}{1-s}$.

The result states that all equilibria with uninformative cheap talk are partially pooling, in that all bidder types larger than some cutoff post the same price resulting in a takeover. For simplicity, we simply call these *pooling equilibria*. Further, in every pooling equilibrium, the shareholder tenders as few shares as possible such that a takeover still occurs.

$\gamma^*(\hat{p}_E) = \frac{\lambda}{1-s}$ holds true in any pooling equilibrium because $\hat{p}_E < 1$ implies that $\mathbb{E}[\omega_E|\hat{p}_E] > \hat{p}_E$. Consequently, whenever $\gamma(\hat{p}_E) > \frac{\lambda}{1-s}$, then the shareholder could profitably deviate to tendering fewer shares, gaining $\mathbb{E}[\omega_E|\hat{p}_E] - \hat{p}_E$ and still making the takeover successful. Moreover, Proposition 2 shows that without informative cheap talk, no separation can be induced with respect to the bidder's type apart from a single cutoff. The intuition behind this observation is that for any finer separation, one has to incentivize higher bidder types to post larger prices with a higher probability of obtaining control. But such a screening device is missing here.

Hirshleifer and Titman (1990) show that in a model with a continuum of shareholders, separation of the bidder may be attainable if shareholders play mixed strategies.[26] Although we abstract from mixing, observe that even if we allowed the shareholder to play mixed strategies, full separation is not feasible in our model. To see this, note that the shareholder is indifferent between selling and keeping her shares if and only if

$$\gamma p_E + (1-\gamma)\mathbb{E}[\omega_E|p_E] = \mu_I, \tag{7}$$

for some $\gamma \geq \frac{\lambda}{1-s}$. The first observation is that if there is full separation, zero profits for bidder types $\omega_E > 0$ cannot be part of an equilibrium.[27] Hence, $\omega_E > p_E$ holds and therefore, the shareholder tenders as few shares as possible, i.e., $\gamma = \frac{\lambda}{(1-s)}$. Now denote the probability of a takeover, given that the shareholder is indifferent at p_E, by $\phi(p_E)$. By

[26] It is noteworthy, however, that mixing will always cause welfare losses, and first-best can never be implemented as the allocation of control is probabilistic.

[27] The precise argument requires a little work. If there is full separation, we know that there exists an $\tilde{\omega}_E < 1$ such that all $\omega_E \in [\tilde{\omega}_E, 1]$ have a strictly positive takeover probability. If that was not true, any type close enough to 1 could offer μ_I and take over the company with certainty, making strictly positive profits. Hence, for all $\omega_E > \tilde{\omega}_E$, zero profits cannot be an equilibrium outcome, as these types could deviate to the price offer $p_E(\tilde{\omega}_E)$ and realize a strictly positive profit.

monotonicity of the bidder's payoff, higher types have a higher willingness to pay for a given takeover probability. To induce full separation, the bidder's strategy must strictly increase in ω_E. For this to be optimal, higher types need to be compensated with a higher takeover probability. As the shareholder needs to mix at any price after which a takeover occurs with non-zero probability except for the price posted by $\omega_E = 1$, the indifference constraint (7) would need to hold for any type pair $0 < \omega_E < \omega'_E < 1$ posting prices $p_E < p'_E$ with $0 < \phi(p_E) < \phi(p'_E)$.[28] But since $\frac{\lambda}{(1-s)}p'_E + (1 - \frac{\lambda}{(1-s)})\omega'_E > \frac{\lambda}{(1-s)}p_E + (1 - \frac{\lambda}{(1-s)})\omega_E$, she cannot be indifferent at both prices, which yields a contradiction. Therefore, in contrast to Hirshleifer and Titman (1990), full separation is not feasible through mixing.

Figure 3 shows the control allocation in a pooling equilibrium as described in Proposition 2. Independent of ω_I, a takeover occurs whenever $\omega_E \geq \hat{p}_E$, so the blue area depicts those type pairs for which a takeover is realized. All optimal allocations, however, lie above the 45 degree line. Thus, there are pairs for which inefficient takeovers occur (blue triangle below the 45 degree line) and pairs for which I remains in charge although E would be optimal (white triangle above the 45 degree line). Not surprisingly, first-best cannot be attained in a pooling equilibrium, as no information is transmitted about ω_I and only very little about ω_E.

Remark 3. Without informative cheap talk, the first-best allocation of control rights is not attainable.[29]

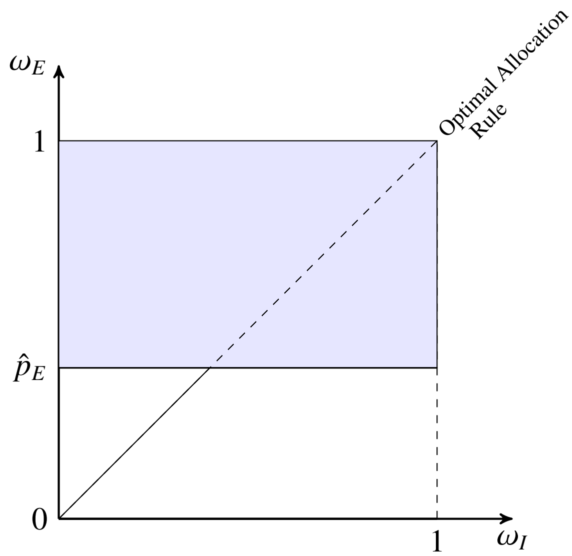

Figure 3: Optimal Allocation vs. Pooling Equilibria

4.3 Endogenous Shareholder Learning

As noted in Section 3, a shareholder who is fully informed about the current firm value prevents the first-best allocation of control rights whereas cheap talk is able to implement

[28] Such a type pair always exists because $\mu_I < 1$.

[29] We only illustrate the point graphically here because the formal proof is obvious.

first-best. A problem arises when shareholders themselves can choose the information they obtain. In practice, when a corporate bidder aims at taking over a target company, outside experts or advisors such as investment banks and consulting firms are frequently hired to conduct a fairness opinion. The aim of such assessments is to credibly inform the shareholders about the value of the company (Kisgen et al. 2009). Another interpretation of shareholders' additional learning is that regulation forces management to provide (credible) information to shareholders. Corporate law gives shareholders the opportunity to enforce a fairness opinion and/or management disclosure (Kisgen et al. 2009; Bainbridge 1999).

Irrespective of the source of information, consider now a situation where the shareholder has observed p_E and m_I. Then, if she can freely choose the level of information about ω_I, she will always choose the fully informative signal because she faces a pure decision-theoretic problem at this stage (a formal treatment can be found in Lemma B.1 in Appendix B).

Remark 4. If possible, the shareholder acquires the fully informative signal about ω_I.

When the shareholder perfectly learns ω_I, m_I is irrelevant, and E will anticipate that the shareholder will become fully informed. From Section 3, we know that first-best is not attainable in this situation. Through the lens of our model, a setting in which shareholders can force management to conduct a fairness opinion or disclose additional information is welfare-destroying. Our results therefore suggest that management recommendations may suffice to overcome the informational frictions in the market for corporate control and that additional sources of information may, in fact, harm efficiency.

5 Extensions

We now generalize the model in two important directions. First, most companies are not owned by a single shareholder but have multiple owners. We allow for this possibility by assuming that the target firm is owned by some finite number of shareholders. It will turn out that our results remain true with any finite number of shareholders. The only difference is that there exist equilibria that exhibit coordination failures.

Second, typically, the incumbent manager of a company will enjoy private benefits B_I from remaining in charge. For instance, B_I may stem from a fixed above market wage or general benefits from being in charge (such as status, amenities, etc.). Private benefits will make the manager more reluctant to recommend a takeover and drive a wedge between the optimal allocation rule and the preferences of the incumbent. We will prove, however, that an equilibrium similar to Theorem 1 still exists. This equilibrium again welfare-dominates a situation with informed shareholders, provided that B_I is sufficiently small relative to I's share endowment s. In Section 6, we discuss how the managerial salary scheme can be adjusted to implement first-best in the presence of private benefits.

5.1 A Model with Multiple Shareholders and Private Benefits

The company is now owned by $j \in \{1, \dots, J\}$ initial shareholders and I. A typical shareholder j owns a fraction of s_j shares, and all shareholders jointly own $\sum_{j=1}^{J} s_j = 1 - s > \lambda$. The incumbent still owns the remaining $s < \lambda$ shares. The game evolves as before: first, E posts a tender offer p_E to which I responds with a cheap talk message m_I. In the final stage of the game, the shareholders decide individually and simultaneously which fraction $\gamma_j \in [0, 1]$ of their share endowment s_j to tender given p_E and m_I. Let T denote the total amount of shares tendered, i.e., $T := \sum_{j=1}^{J} s_j \gamma_j$.

The payoff of shareholder j is composed as follows. If no takeover occurs, shareholder j will earn ω_I per share irrespective of her tendering decision. Conditional on a successful takeover, tendering γ_j of the s_j shares yields p_E per share and security benefits of ω_E on the residual fraction $1 - \gamma_j$ of her share endowment. This results in the following utility of shareholder j:

$$v_j = \begin{cases} s_j\big(\gamma_j p_E + (1 - \gamma_j)\omega_E\big), & \text{if takeover successful} \\ s_j \omega_I, & \text{otherwise.} \end{cases}$$

As noted above, besides being interested in the value of his shares, the incumbent also enjoys private benefits $B_I \geq 0$ from being in charge. B_I is common knowledge. Let $b_I := \frac{B_I}{s}$ denote I's private benefit per share. We will refer to b_I as I's *bias*. The incumbent's utility is given by:

$$u_I = \begin{cases} s\omega_E, & \text{if takeover successful} \\ s\omega_I + B_I, & \text{otherwise.} \end{cases}$$

The bidder's utility is as follows:

$$u_E = \begin{cases} T(\omega_E - p_E), & \text{if takeover successful} \\ 0, & \text{otherwise.} \end{cases}$$

Strategies

Given the observed tender offer p_E and the incumbent's message m_I, a (pure) strategy for shareholder j specifies a fraction γ_j of tendered shares, i.e., $\gamma_j : \mathbb{R}_+ \times M_I \to [0, 1]$ where $M_I = [0, 1]$ again denotes the message space. An incumbent's strategy is a mapping from the set of price offers and his type space into the message space, i.e., $m_I : \mathbb{R}_+ \times [0, 1] \to [0, 1]$. Finally, a (pure) strategy for the bidder $p_E : [0, 1] \to \mathbb{R}_+$ specifies a tender offer for any type ω_E. We still assume that indifference on the shareholder side is broken in favor of a takeover. The solution concept remains perfect Bayesian equilibrium in pure strategies, and if necessary, we keep restricting attention to off-path beliefs satisfying the intuitive criterion by Cho and Kreps (1987). An equilibrium requires that:

1. given tender offer p_E^*, message m_I^*, and given the tendering decision of the other shareholders, γ_{-j}^*, any shareholder j chooses optimally how many shares to tender,

i.e. she chooses γ_j^* that maximizes $\mathbb{E}[v_j|p_E^*, m_I^*, \gamma_{-j}^*]$.

2. Given p_E^* and γ_j^* ($j = 1, \ldots, J$), I chooses $m_I^* \in argmax\, \mathbb{E}[u_I|p_E^*, \omega_I, \gamma_j^*]$.
3. Given m_I^* and γ_j^* ($j = 1, \ldots, J$), E chooses p_E^* to maximize his expected profits $\mathbb{E}[u_E|\omega_E, m_I^*, \gamma_j^*]$.
4. Whenever possible, all players update their posterior belief according to Bayes' rule.

5.2 Results

Fully Informed Shareholders

As before, if shareholders are perfectly informed about ω_I, the first-best allocation of control rights is not attainable. Observe that in this scenario, the incumbent and thus also his bias have no influence. The only difference is at the tendering stage. Since the company is owned by multiple shareholders, it may be the case that no single shareholder holds a majority stake individually ($s_j < \lambda$ for all j). Hence, now there also exist equilibria exhibiting a coordination failure as follows: if a shareholder expects all other shareholders not to tender, her decision does not have any influence on the outcome, and thus she may as well not tender. In equilibrium, no shareholder ever tenders.[30] It is intuitive that the potential coordination failure will not improve welfare in our setting. The following proposition extends the result from Section 4 to the general ownership structure.

Proposition 3. *Suppose shareholders are perfectly informed about ω_I. Then, there is no equilibrium in which the first-best allocation is implemented.*

The same logic as in the proof of Proposition 1 obtains here (and the proof is thus omitted): a necessary condition for first-best is full separation on the bidder's side, but in any ex post efficient fully separating equilibrium, the bidder must gain strictly positive expected profits. Thus, the equilibrium price must be lower than the bidder type. As shareholders compare a convex combination of price and expected security benefits with firm value under incumbent management, there will always be misallocations of control.

Uninformative Cheap Talk

As the manager still sends a cheap talk message, there always exist babbling equilibria. Since no information is transmitted in such equilibria, I's bias b_I again does not matter for the equilibrium outcome. b_I will, however, define a set in which babbling is the unique outcome of the cheap talk stage. Babbling equilibria will, similar to the basic model, either feature a cutoff structure or have no takeover as the certain outcome. The next proposition describes the set of these equilibria.

Proposition 4. *There always exists a babbling equilibrium. In any such equilibrium,*

1. *either a takeover never occurs;*

[30] This relies on the conditional form of the offer, which becomes void if a total fraction less than λ shares is tendered.

2. *or there exists a cutoff price $\hat{p}_E < 1$ such that:*
   if $\omega_E < \hat{p}_E$, a takeover occurs with probability zero,
   if $\omega_E \geq \hat{p}_E$, E posts $\hat{p}_E$ and a takeover occurs with probability one,
   further, it holds that $T^*(\hat{p}_E) = \lambda$;
3. *or $\hat{p}_E = 1$ and a takeover occurs if and only if $\omega_E = 1$. It holds that $T^*(\hat{p}_E) \geq \lambda$.*

Proposition 4 shows existence of three different kinds of equilibria: First, a takeover may never occur if no shareholder individually holds a majority stake. As no shareholder is pivotal on her own, never selling any shares constitutes an equilibrium, independent of price offers and beliefs about ω_E and ω_I.

Second, there are cutoff equilibria as in Proposition 2. In those, shareholders jointly tender $T^* = \lambda$ shares whenever a takeover occurs. The underlying argument goes back to Bagnoli and Lipman (1988), who analyze a complete information takeover game with finitely many shareholders. The idea is that in equilibrium, whenever the price p_E lies strictly below the security benefits after a successful takeover, the gain from keeping a share is larger than from tendering if this decision does not affect the overall success of the takeover. Hence, in any pure strategy equilibrium with a takeover, every shareholder is pivotal with all the shares she tenders. If any shareholder tendered more shares, she would have a profitable deviation to tender fewer shares while still making the takeover successful. As our setting entails asymmetric information, the true security benefits are generally not known to shareholders. One can, however, easily see that whenever $p_E < \mathbb{E}[\omega_E|p_E]$, the logic by Bagnoli and Lipman (1988) applies.

As the first equilibrium type, case three only exists if no shareholder individually holds a majority stake. Then, for all $p_E < 1$, no shareholder ever tenders sufficiently many shares to make another shareholder pivotal. Thus, at any $p_E < 1$, selling no shares is a best response for shareholders. $p_E = 1$ is only posted by $\omega_E = 1$ because all other types would make strictly negative profits. As post-takeover security benefits equal the price offer, i.e., $p_E = \mathbb{E}[\omega_E|p_E] = 1$, shareholders are indifferent between any γ_j that makes the takeover succeed and therefore, $T^*(1) \in [\lambda, 1-s]$.

Informative Cheap Talk

We now analyze equilibria with informative cheap talk. As the incumbent enjoys private benefits $B_I \geq 0$ from remaining in charge, I is now indifferent between a takeover and remaining in charge if $s\omega_I + B_I = s\mathbb{E}[\omega_E|p_E]$. Recalling that $b_I = \frac{B_I}{s}$, his indifferent type is then

$$\omega_I^* := \max\{\mathbb{E}[\omega_E|p_E] - b_I; 0\}.$$

The intuition is the same as before: whenever $\omega_I \leq \omega_I^*$, the incumbent favors a takeover. In contrast to the basic model without bias, informative cheap talk is harder to attain. Intuitively, if the incumbent only cares about remaining in charge, independent of ω_E and ω_I, there cannot be any meaningful communication.

The following result shows that with multiple shareholders and strictly positive bias, there also exists an equilibrium with informative cheap talk in which the bidder fully reveals his type via his tender offer.

Theorem 2
There exists a $\overline{b}_I > 0$ such that for all $b_I \leq \overline{b}_I$, there is an equilibrium in which E fully reveals his type by posting

$$p_E = \begin{cases} \mathbb{E}[\omega_I | \omega_I \leq \omega_I^*(\omega_E)] + b_I, & \text{if } \omega_E \geq b_I \\ \omega_E, & \text{otherwise.} \end{cases}$$

Furthermore,

1. *if $\omega_I \leq \omega_I^*(p_E)$, then $m_I^* \in [0, \omega_I^*(p_E)]$, and a takeover occurs with probability one;*
2. *if $\omega_I > \omega_I^*(p_E)$, then $m_I^* \in (\omega_I^*(p_E), 1]$, and a takeover occurs with probability zero;*

and $T^*(m_I^*(\omega_I \leq \omega_I^*(p_E)) = \lambda$.

The statement of Theorem 2 is similar to Theorem 1. E fully reveals his type via the price offer. The incumbent sends, conditional on p_E, a binary cheap talk message in favor or against the takeover, and shareholders follow I's message in equilibrium and tender jointly as few shares as possible such that the takeover is realized.

The equilibrium only exists for small enough biases. Intuitively, if b_I grows very large (the private benefit B_I is large relative to the share endowment s), the incumbent always prefers retaining control. Hence, his message is never informative, and there is no scope to screen the bidder's type.

If the equilibrium exists, i.e., b_I is smaller than $\overline{b}_I$, there are some noteworthy differences relative to the basic model. The allocation is still determined by an incumbent's indifference type. As the incumbent is now biased against a takeover, this type has shifted downwards to $\omega_I^* = max\{\omega_E - b_I; 0\}$. As a consequence, there is an interval of bidder types $\omega_E \in [0, b_I)$ for which the incumbent never recommends a takeover. As shareholders still follow the message in equilibrium, these bidder types will never obtain control over the target company. Therefore, in equilibrium, they are indifferent between posting any price $[0, b_I)$, as all imply zero profits, and it is a best response to post the true type as tender offer. The interesting case contains the bidder types strictly larger than b_I.[31] These have, on the equilibrium path, a strictly positive takeover probability. The equilibrium price changes in two aspects. First, note that $\mathbb{E}[\omega_I | \omega_I \leq \omega_I^*(\omega_E)] = \mathbb{E}[\omega_I | \omega_I \leq \omega_E - b_I]$. Conditional on a message in favor of the takeover by the incumbent, shareholders learn that $\omega_I \leq \omega_I^* = \omega_E - b_I$, i.e., shareholders are more pessimistic about their outside option of leaving the incumbent in charge for any $\omega_E \geq b_I$. This decreases the first component of the price relative to Theorem 1. On the other hand, the price now includes b_I itself with an additive component. The intuition is that a large bias will make the incumbent less likely to endorse the takeover. As shareholders follow I's message in equilibrium, this makes it more difficult for the bidder to realize the takeover. As a result, he is willing to ramp up his price offer relative to $\mathbb{E}[\omega_I | \omega_I \leq \omega_E - b_I]$.

[31] If $\omega_E = b_I$, the takeover probability is exactly zero. Further, the equilibrium price is continuous and $p_E(b_I) = b_I$.

Further, and similar to the basic model, $T^*(m_I^*(\omega_I \leq \omega_I^*(p_E)) = \lambda$ such that all shareholders are pivotal with all the shares they tender. Hence, given the other shareholders' strategy, no shareholder wants to tender fewer shares, as this would make the takeover fail.

Welfare Comparison

As the incumbent is biased against the takeover, first-best will generally not be implementable with informative cheap talk. We can, however, show that there is an interval of biases $[0, \overline{b}_I^{FV}]$ such that if $b_I \in [0, \overline{b}_I^{FV}]$, the equilibrium with informative cheap talk illustrated in Theorem 2 improves the allocation of control rights compared to a situation where 1) shareholders are not informed at all (babbling equilibrium), and 2) shareholders are fully informed (for example through endogenous learning).

Proposition 5. *There exists a $\overline{b}_I^{FV} > 0$ such that for all $b_I \leq \overline{b}_I^{FV}$, there is an equilibrium with informative cheap talk by the incumbent that improves expected firm value compared to*

1. *any equilibrium without (informative) communication;*
2. *any equilibrium where shareholders are fully informed about ω_I.*

Further, if b_I vanishes, expected firm value approaches first-best with informative cheap talk.

Proposition 5 establishes that even for a biased incumbent manager, cheap talk outperforms both equilibria with fully informed and completely uninformed shareholders. The intuition is again that in both cases, the optimal allocation is bounded away from first-best, whereas welfare in the informative cheap talk equilibrium approaches first-best as b_I converges to zero: according to Theorem 2, a takeover occurs if and only if $\omega_I \leq max\{\omega_E - b_I; 0\}$. As b_I converges to zero, this becomes the first-best allocation rule.

The following section gives precise solutions for the case of uniformly distributed types. It turns out that welfare with informative cheap talk dominates the other two informational regimes for a relatively large interval of biases.

5.3 The Uniform Case

We now provide a numerical example of our results for the uniform case. To be precise, in this subsection, we assume that ω_I and ω_E are i.i.d. random variables that are distributed according to the uniform distribution on $[0, 1]$. For simplicity, we further assume that $J = 1$ and $\lambda = 1 - s$. Here, we identify welfare with ex ante firm value and do not include B_I in this welfare measure. Note, however, that if one weighs the firm value with 1 instead of s in the incumbent's payoff, it equals the welfare including B_I. The equilibrium with informative cheap talk characterized in Theorem 2 exists for $b_I \leq \overline{b}_I = \frac{3}{2} - \sqrt{\frac{5}{4}} \approx 0.382$. On that account, a separating equilibrium can be supported for relatively large biases. The tender offer price is then given by $p_E = \frac{1}{2}\omega_E + \frac{1}{2}b_I$. Expected welfare is $\frac{2}{3} - b_I^2$, which converges to $\frac{2}{3}$ as b_I goes to zero – the first-best firm value.[32]

We now derive the maximal bias such that informative cheap talk increases firm value. To this end, we consider the (unique)[33] equilibrium without informative cheap talk: E offers $p_E = \frac{1}{2} = \mu_I$ if $\omega_E \geq \frac{1}{2}$ and a takeover occurs; otherwise, no takeover occurs. The (highest) ex ante firm value without communication equals $\mathbb{E}[\omega_I \mathbf{1}_{\{\omega_E < \mu_I\}}] + \mathbb{E}[\omega_E \mathbf{1}_{\{\omega_E \geq \mu_I\}}] = \frac{5}{8}$, which is smaller than $\frac{2}{3} - b_I^2$ for $b_I \leq \frac{1}{\sqrt{24}} \approx 0.204$.

If the shareholder knows the current firm value, she tenders if and only if the tender offer is larger than ω_I. The (unique) equilibrium price in this setting is $p_E^* = \frac{1}{2}\omega_E$. Thus, welfare equals $\mathbb{E}[\omega_I \mathbf{1}_{\{\omega_I > \frac{1}{2}\omega_E\}}] + \mathbb{E}[\omega_E \mathbf{1}_{\{\frac{1}{2}\omega_E \geq \omega_I\}}] = \frac{5}{8}$ which is – maybe surprisingly – the same as under uninformative cheap talk. It follows that for $b_I \leq \frac{1}{\sqrt{24}}$, informative cheap talk improves welfare compared with a situation where the shareholder becomes fully informed about ω_I.

Apart from aggregate welfare considerations, the numerical example allows us to shed light on the distribution of payoffs among I, E, and the initial shareholder: if both equilibria exist, i.e., $b_I \leq \overline{b}_I$, the manager always prefers informative cheap talk compared with the babbling equilibrium. His ex ante payoff in the fully revealing equilibrium with cheap talk is $s\mathbb{E}[\omega_I \mathbf{1}_{\{\omega_I > \omega_I^*\}}] + s\mathbb{E}[\omega_E \mathbf{1}_{\{\omega_I \leq \omega_I^*\}}] + \mathbb{P}(\omega_I > \omega_I^*)B_I = \frac{2}{3}s + \frac{1}{2}B_I$, which clearly exceeds his payoff for the case without cheap talk $s\mathbb{E}[\omega_I \mathbf{1}_{\{\omega_E < \mu_I\}}] + \mathbb{P}(\omega_E < \mu_I)B_I + s\mathbb{E}[\omega_E \mathbf{1}_{\{\omega_E \geq \mu_I\}}] = \frac{5}{8}s + \frac{1}{2}B_I$. Further, as the manager can only communicate if $b_I \leq \overline{b}_I$, increasing his private benefits B_I and thereby b_I slightly at $\overline{b}_I$ leads to a discontinuous drop in his payoff. Hence, the manager would like to limit his private benefits of control at $\overline{b}_I$.[34] The shareholder obtains an expected payoff of $(1-s)(\frac{1}{2} + \frac{b_I}{2} - \frac{5}{4}b_I^2)$ with informative cheap talk and $\frac{1}{2}(1-s)$ without cheap talk. As a consequence, whenever cheap talk is feasible, the shareholder prefers it. The intuition behind this is that she only follows the manager's recommendation if she benefits on average. Finally, the external bidder receives $\frac{1}{8}(1-s)$ without any information provision. When the shareholder follows management's recommendation, he obtains $(1-s)(\frac{1}{6} - \frac{1}{2}b_I + \frac{1}{4}b_I^2)$. He thus prefers no information whenever $b_I > 1 - \sqrt{\frac{5}{6}} \approx 0.087$. Cheap talk is costly to the bidder for high biases because takeovers become scarce and expensive.

Even though aggregate welfare is the same without cheap talk and with a fully informed shareholder, the distribution of payoffs differs substantially. When the shareholder is fully informed, her payoff amounts to $\mathbb{E}[v] = (1-s)(\mathbb{E}[\omega_I \mathbf{1}_{\{\omega_I > \frac{1}{2}\omega_E\}}] + \frac{1}{2}\mathbb{E}[\omega_E \mathbf{1}_{\{\frac{1}{2}\omega_E \geq \omega_I\}}]) = (1-s)(\frac{11}{24} + \frac{1}{2}\frac{4}{24}) = (1-s)\frac{13}{24}$. She prefers to be informed by the manager over being fully informed if $b_I \in [0.12, 0.28]$.[35] The intuition is as follows: For low values of b_I, the shareholder only receives a small part of the payoff increase created by the takeover. Increasing b_I induces the bidder to post higher prices, and the shareholder prefers cheap talk. However, if b_I becomes very large, takeovers become too scarce and full information

[32] $\frac{2}{3}$ equals the expected value of the first-order statistic of two random variables distributed uniformly on the unit interval.

[33] Uniqueness stems from the fact that $\lambda = 1 - s$ and $J = 1$.

[34] Of course, beyond $\overline{b}_I$, I's ex ante payoff is increasing in B_I again.

[35] These are rounded values.

is again preferred by the shareholder.

With a fully informed shareholder, E obtains $\mathbb{E}[u_E] = (1-s)\mathbb{E}[(\omega_E - p_E^*)\mathbf{1}_{\{\frac{1}{2}\omega_E \geq \omega_I\}}] = \frac{1}{2}(1-s)\mathbb{E}[\omega_E \mathbf{1}_{\{\frac{1}{2}\omega_E \geq \omega_I\}}] = (1-s)\frac{2}{24}$. Consequently, E prefers the manager's recommendation over the shareholder learning the current firm value if $b_I \leq 0.18$. Cheap talk helps E to extract full gains of trade if $b_I = 0$. As b_I increases, however, takeovers become too scarce and he prefers the shareholder being fully informed. Observe that E always prefers an uninformed over a fully informed shareholder. Finally, in the latter case, I receives $\mathbb{E}[u_I] = s\frac{5}{8} + \frac{1}{4}B_I$, which is worse than in the other two cases. Table 1 provides an overview for all these cases.

Information	E	I	S
Full Information	$\frac{2}{24}(1-s)$	$\frac{5}{8}s + \frac{1}{4}B_I$	$\frac{13}{24}(1-s)$
Cheap Talk	$(\frac{1}{6} - \frac{1}{2}b_I + \frac{1}{4}b_I^2)(1-s)$	$\frac{2}{3}s + \frac{1}{2}B_I$	$(\frac{1}{2} + \frac{1}{2}b_I - \frac{5}{4}b_I^2)(1-s)$
No Information	$\frac{1}{8}(1-s)$	$\frac{5}{8}s + \frac{1}{2}B_I$	$\frac{1}{2}(1-s)$

Table 1: Distribution of Expected Payoffs Across Players

6 Managerial Compensation and Golden Parachutes

In our model, efficient management advice can only be provided during a takeover if I possesses some share endowment. One can interpret this result as an additional argument for equity compensation beyond the classical moral hazard rationale (Jensen and Meckling 1976).

Furthermore, it is important that the manager obtains security benefits of the company after the bidder gains control over the target firm. Hence, frequently observed[36] vested share schemes can also be rationalized by our model.

Recall that $b_I = \frac{B_I}{s}$. From our results, we know that $b_I = 0$ implements the first-best control allocation and that small biases are welfare-superior to full information and no information on the shareholder side. To obtain a small b_I, one can either try to lower the private benefit from being in charge, B_I, or to increase the incumbent's share endowment s. B_I will typically not be easy to control (think of intangible benefits of control such as social status). The first-best allocation of control rights may, however, still be attainable because one can compensate the manager in case of a takeover for his loss of B_I. The practice of

[36]See Edmans et al. (2017) for a recent summary of data regarding executive compensation and vesting methods.

golden parachutes,[37] which are often subject to public criticism as they seemingly reward executives for failure, may be optimal in our model, as they enable the manager to increase welfare via his advisory role. To be precise, denote the amount the golden parachute pays in case of a takeover by $G \in \mathbb{R}_+$. Then, I is indifferent between a takeover and no takeover if and only if

$$s\mathbb{E}[\omega_E | p_E] + G = s\omega_I + B_I,$$

and it directly follows that $G = B_I$ implements the first-best outcome. Hence, in the likely scenario that private benefits B_I of control are non-negative, golden parachutes enable the manager to fulfill his advisory role during takeovers. In our model, golden parachutes have no downside as we abstract from any moral hazard problem of the manager. Inderst and Müller (2010) show how severance pay (e.g., golden parachutes) after terminating a bad CEO's contract rewards failure and thus makes incentivizing effort more difficult. In their model, steep incentives (high equity compensation) alleviate the problem by making continuation costly for bad CEOs. In our model, equity compensation and severance pay are substitutes regarding the manager's advisory role (both a large s and G make I more willing to endorse a takeover). Hence, Inderst and Müller (2010) suggests that G should be limited and incumbent management's advisory role should be strengthened through s.[38] Finally, it is important to stress that our model provides a rationale for golden parachutes that are triggered if management is let go within a takeover process. This squares with empirical findings that, as noted in the Introduction, companies frequently adopt golden parachutes *conditional* on takeovers.

7 An Equivalence of Cheap Talk and Auctions

An interesting connection between auctions and cheap talk arises in our model. To see this, suppose now that there are three potential managers: two external bidders E_1 and E_2 and one unbiased incumbent manager I, the firm value under each of which is i.i.d. distributed according to some cdf F on $[0, 1]$. For ease of exposition, further suppose that $\lambda = 1 - s$ and $J = 1$.

First, suppose the company was auctioned off among the two external bidders E_1 and

[37] We are by no means the first to consider the problem of golden parachutes or severance pay. None of the following papers considers, however, how golden parachutes influence management's advisory role in takeovers. Eisfeldt and Rampini (2008) show how bonuses (i.e., golden parachutes) can be used to induce managers to present unfavorable news to investors leading to a capital reallocation. Bebchuk and Fried (2004) argue that golden parachutes are a sign of managerial rent extraction. Lambert and Larcker (1985) develop a model where the probability that management gives up control increases if a golden parachute is adopted. Harris (1990) shows how anti-takeover measures can increase a CEO's bargaining position in a merger. To induce the manager to sometimes give up control, golden parachutes may be necessary. Both models build on the idea that management can directly block a takeover and therefore needs to be convinced to make a takeover successful. Knoeber (1986) argues that golden parachutes can be seen as a commitment device to pay managers after takeovers and not engage in "opportunism." Almazan and Suarez (2003) show how severance pay can commit a "strong" board not to fire a CEO to induce him to take desired actions.

[38] To analyze a "complete" model with takeovers and managerial private information and moral hazard seems an interesting avenue for future research and may provide clear answers.

E_2 in a sealed-bid first-price auction such that the bidder with the higher bid receives the fraction λ of shares and thus control over the target firm. E_i's private value is $\omega_{E_i},\ i = 1, 2$, and the manager remains silent. Then, we know from standard auction results (see e.g., Krishna (2009)) that each bidder will bid according to

$$p^*_{E_i}(\omega_{E_i}) = \mathbb{E}[\omega_{Ej}|\omega_{Ej} \leq \omega_{E_i}], \text{ for } i \neq j.$$

Now compare this setting with our model with one bidder E_1 and a cheap talk message by the incumbent. We know from Theorem 1 that there is an equilibrium where E_1 bids according to

$$p^*_{E_1}(\omega_{E_1}) = \mathbb{E}[\omega_I|\omega_I \leq \omega_{E_1}],$$

and one can immediately see that the bid is the same as if the external bidder faced a competitor from outside the target firm. In both cases, the good is allocated to the potential manager (E_1, E_2 or I) with the higher type. It follows that the expected firm value in our model with a single bidder facing an incumbent manager who sends a cheap talk message is the same as if the allocation mechanism was a first-price auction among two external bidders. Further, by revenue equivalence, the same holds true if we substitute the first-price auction with any other standard auction format that yields the same allocation rule and gives the lowest type the same expected utility as the first-price auction (see e.g., Krishna (2009)). Of course, this relies on all potential managers having i.i.d. types. Hence, our model shows that the competition induced by a simple cheap talk message by the incumbent is as powerful (with respect to allocative efficiency) as bidding competition.

Interestingly, as the incumbent has the toehold s in our model, Burkart (1995) shows that if he gave a bid, he might overbid. This is why a counterbid by the incumbent may differ from a cheap talk message by the incumbent in terms of allocative efficiency.

8 Empirical Predictions

In our model, the incumbent's bias against a takeover is given by the difference of private benefits of remaining in charge minus the golden parachute that is triggered upon CEO replacement during a takeover, divided by the incumbent's share endowment, formally

$$\frac{B - G}{s}. \tag{8}$$

According to (8) and provided that $G \leq B$, the takeover premium should decrease with the adoption of golden parachutes. Further, our model predicts that the success probability increases with a golden parachute. Both results are confirmed by the empirical literature (Hartzell et al. 2004; Fich et al. 2011; Qiu et al. 2014). Bebchuk et al. (2014) also find a positive correlation of takeover likelihood and the adoption of golden parachutes. In line with our model, they show that the increase in takeover probability is due to management's increased incentives for takeovers. In contrast to most of the literature, they find a positive effect of golden parachutes on acquisition premia. Particularly related to our results are Fich et al. (2013) who investigate effective golden parachutes, i.e., the size of the golden parachute net of future lost benefits of the CEO due to the takeover. This comes closest to our measure of alignment. They confirm our theoretical findings: the larger the golden parachute, the smaller is the taget shareholders' takeover premium and the larger is the takeover probability. Further, acquirers' expected profits are shown to be increasing in the relative size of the golden parachute, which is in line with our results. This stems from the fact that, in our model, a golden parachute outweighing the CEO's private benefits enables the bidder to extract all gains of the takeover on the shares tendered to him.

Since the CEO is retaining his shares in our model, the control rights of his shares do not matter. Thus, the dollar value of the inside stock ownership relative to the private benefits of remaining in charge are essential and we predict the takeover probability to be increasing and the takeover premium to be decreasing in the dollar amount of stock ownership. Up to now, the empirical literature has focused on relative ownership as a proxy for CEO control rights and produced mixed, often insignificant results (Fich et al. 2011; 2013; Qiu et al. 2014). An interesting avenue for future research may be investigating the effect of share and option value relative to the private benefits lost due to the takeover with particular focus on vesting equity compensation to exclude the possibility that shares are traded by the CEO during the takeover.

From the empirical literature, one can infer that CEO's incentives clearly matter for takeover outcomes. The CEO's net bias against a takeover increases takeover premium and decreases takeover likelihood, as our model predicts. The central question remains whether a CEO's net bias impacts takeover outcomes via our proposed communication channel, or rather due to the possibility that managers use takeover defense tactics, such as poison pills (Lambert and Larcker 1985), or a mix of the two. Since incumbent managers will find it difficult to remain in charge if shareholders have the opinion that management grossly acts against shareholder interest. If managers use takeover defense tactics against the will of shareholders or deny merger negotiations, they open themselves up for proxy battles. The takeover of BEA Systems, Inc. by Oracle in 2007/08 gives an example of such a scenario. Here, activist investor and large shareholder of BEA Systems, Carl Icahn, threatened a proxy fight to replace management if it did not accept the offer. In our model with private, insider information, shareholders agree with management given their information set, and it would be an interesting direction for future empirical research to investigate the precise channels by which management affects takeovers. One first step would be to study the effect of golden parachutes in a subsample of takeovers in which no takeover defense tactics were at management's disposal.

9 Concluding Remarks

We investigate the optimal control allocation in corporate takeovers. In our model, a bidder posts a tender offer and the incumbent manager reacts by sending a cheap talk recommendation to the shareholders. We show that with an informative message by the (potentially biased) manager, there exists an equilibrium in which the bidder fully reveals his type and that, for vanishing bias, the efficient control allocation is implemented. In practice, takeovers often involve costly provision of fairness opinions by outside parties such as investment banks. In our model, initial shareholders always prefer more information about the firm value than management is willing to provide. We show that the strategic and only partially informative recommendation by the manager is superior to a fully informative signal about the firm value under current management. This gives rise to two policy implications.

First, managerial salary is crucial to enable informative management recommendations. Our model rationalizes several features prevalent in reality: abstracting from moral hazard, steep incentives for the manager via equity compensation are useful, as they enable communication in our model. Further, retention periods for managers' equity position after a takeover benefit the incumbent's capability to credibly communicate with shareholders. In our model, it is crucial for effective strategic communication that the manager's bias (private benefit per share) of remaining in charge is sufficiently small. Golden parachutes, often criticized, may actually be beneficial for allocative efficiency because they reduce management's bias and can strengthen its advisory role. Of course, they should be contingent on a successful takeover and not be triggered when management is replaced due to poor performance.

Second, legally prescribed fairness opinions and mandatory disclosure are generally not efficient, as they can prevent value-increasing takeovers. As shareholders always prefer more information, they are inclined to force management to disclose additional information to increase their rents from a successful takeover. Similar to Grossman and Hart (1980b), who advocate (partial) exclusion of shareholders from post-takeover security benefits, excluding shareholders from obtaining excessive information may thus increase allocative efficiency.

A Appendix: Omitted Proofs

Proof of Proposition 1. **Step 1:** If E does not fully separate in an equilibrium, then first-best is not achieved in this equilibrium.

Suppose, on the way to a contradiction that this was not true, i.e. there exist some bidder types ω_E, ω_E' with $\omega_E > \omega_E'$ but $p_E(\omega_E) = p_E(\omega_E')$. By the common support assumption, there exists an open interval of incumbent types $(\underline{\omega}_I, \overline{\omega}_I) \neq \emptyset$ such that $(\underline{\omega}_I, \overline{\omega}_I) \subset (\omega_E', \omega_E)$. For all $\omega_I \in (\underline{\omega}_I, \overline{\omega}_I)$, first-best requires that a takeover does not occur at ω_E', but at ω_E. But since $p_E(\omega_E) = p_E(\omega_E')$, either a takeover occurs at both types or at none. Hence, whenever the bidder does not fully separate, first-best cannot be achieved.

Step 2: If E fully separates, first-best requires zero profits for all bidder types.

Whenever E fully reveals his type, the shareholder prefers a takeover whenever there is some $\gamma \geq \frac{\lambda}{(1-s)} > 0$ such that $\gamma p_E + (1-\gamma)\omega_E \geq \omega_I$. This coincides with the optimal allocation rule (that a takeover occurs if and only if $\omega_E \geq \omega_I$) if and only if $p_E = \omega_E$. Of course, $p_E = \omega_E$ implies zero profits for E.

Step 3: Suppose an equilibrium was fully separating and implements first-best, then there is a non-degenerate interval of bidder types with a profitable deviation.

Suppose all bidder types make zero profits, so $\omega_E = p_E$ (strictly negative profits can of course never be part of an equilibrium). Then, any type $\omega_E > 0$ could deviate to some type $\omega_E'' \in (0, \omega_E)$ and the takeover probability at $p_E = \omega_E''$ is $F_I(\omega_E'') > 0$. $F_I(\omega_E'')$ is strictly positive because first-best requires that a takeover occurs for all $\omega_I \in [0, \omega_E'')$. Therefore, the proposed deviation yields strictly positive profits of $[\omega_E - \omega_E''] \, F_I(\omega_E'') > 0$. Hence, we obtain a contradiction and can conclude that first-best is not attainable with fully informed shareholders.

□

Proof of Theorem 1. We start by establishing that given the incumbent sends a cheap talk message according to

$$m_I \in \begin{cases} [0, \omega_I^*], & \text{if } \omega_I \leq \omega_I^* \\ (\omega_I^*, 1], & \text{otherwise} \end{cases}$$

and the shareholder follows this message, the bidder finds it indeed optimal to post $p_E^* = \mathbb{E}[\omega_I | \omega_I \leq \omega_I^*(\omega_E)]$. Afterwards, we verify that, given m_I^*, p_E^* and her posteriors, the shareholder optimally tenders $\gamma^* = \frac{\lambda}{(1-s)}$ shares if $m_I^* \in [0, \omega_I^*]$ and zero otherwise.

In $t = 3$, as she plays a pure strategy, given any p_E, m_I and the respective posteriors of ω_I, ω_E, a takeover occurs with probability one or zero: $\mathbb{P}(\text{takeover}|p_E, m_I) \in \{0, 1\}$. Hence, the incumbent can send at most two-non outcome equivalent messages.

Step 0: Single crossing and I's equilibrium message

In $t = 2$, for a fixed p_E and posterior of ω_E, I's utility from no takeover is $s\omega_I$ and thus strictly increasing in ω_I. His expected utility from a takeover is $s\mathbb{E}[\omega_E|p_E]$ and thus independent of ω_I. Therefore, the difference in his expected utility from sending a message m_I that induces a takeover and a message m_I' that does not is given by $\mathbb{E}[u_I|p_E, m_I, \omega_I] - \mathbb{E}[u_I|p_E, m_I', \omega_I] = s\mathbb{E}[\omega_E|p_E] - s\omega_I$ and thus strictly decreasing in ω_I. By this single crossing argument, all types below $\omega_I^* = \mathbb{E}[\omega_E|p_E]$ prefer a takeover. In the conjectured equilibrium, the shareholder always follows the incumbent's message. Hence, I has no incentive to deviate as he obtains his maximal payoff.

Step 1: Necessary condition for a fully separating bidder strategy

Suppose the bidder plays a fully separating strategy, i.e. p_E is strictly increasing in ω_E (and thus invertible). As noted in the proof of Proposition 1, in any fully separating equilibrium $p_E < \omega_E$ holds and thus $\gamma^* = \frac{\lambda}{1-s}$ independent of p_E (below, we show this more formally). Then, given his true type ω_E, the bidder's optimal bid p is given by

$$\underset{p \in \mathbb{R}_+}{argmax} \; F_I[\omega_I^*(p_E^{-1}(p)] \, \lambda \, [\omega_E - p].$$

The first-order condition (FOC) is

$$f_I[\omega_I^*(p_E^{-1}(p)] \, \omega_I^{*\prime}(p_E^{-1}(p)) \, p_E^{-1}(p)' \, [\omega_E - p] - F_I[\omega_I^*(p_E^{-1}(p))] = 0.$$

Observe that p_E is strictly increasing and it follows that $\omega_I^* = \mathbb{E}[\omega_E | p_E] = \omega_E$. Further, at the equilibrium bid $p = p_E(\omega_E)$, this can be rewritten as the following ODE:

$$p_E'(\omega_E) = \frac{f_I[\omega_I^*(\omega_E)]}{F_I[\omega_I^*(\omega_E)]}\Big(\omega_E - p_E(\omega_E)\Big) = \frac{f_I(\omega_E)}{F_I(\omega_E)}\Big(\omega_E - p_E(\omega_E)\Big). \tag{9}$$

Notice that equation (9) is reminiscent to the symmetric two player first-price auction where both players have i.i.d. private values distributed according to F_I (for comments on the relation of our results to auction theory, we refer to Section 7). It can be shown that the general solution to (9) is given by[39]

$$p_E(\omega_E) = \frac{\int_0^{\omega_E} f_I(z) z dz + C}{F_I(\omega_E)}, \tag{10}$$

where C is a constant that pins down the solution depending on the initial value. As the lowest bidder type $\omega_E = 0$ can only bid zero in equilibrium, we know that $C = 0$. Hence,

$$p_E^*(\omega_E) = \frac{\int_0^{\omega_E} f_I(z) z dz}{F_I(\omega_E)} = \mathbb{E}[\omega_I | \omega_I \leq \omega_E].$$

Step 2: Sufficiency

We now show that the bidder's objective function is concave evaluated at the price function derived above and that any bidder type ω_E optimally chooses $p = p_E^*(\omega_E)$, i.e. $p_E^*(\omega_E)$ indeed constitutes an equilibrium price function. The objective of the bidder (up to the amount of shares he acquires that is independent of p_E), evaluated at $p_E^*(\omega_E)$ becomes

$$F_I[p_E^{-1}(p)] \, [\omega_E - \frac{\int_0^{p_E^{-1}(p)} \omega_I f_I(\omega_I) d\omega_I}{F_I[p_E^{-1}(p)]}] = \omega_E \, F_I[p_E^{-1}(p)] - \int_0^{p_E^{-1}(p)} \omega_I f_I(\omega_I) d\omega_I. \tag{11}$$

[39]Applying Leibniz's integral rule and taking the derivative with respect to ω_E yields $p_E'(\omega_E) = \frac{f_I(\omega_E)\omega_E F_I(\omega_E) - \left(\int_0^{\omega_E} f_I(z) z dz + C\right) f_I(\omega_E)}{F^2(\omega_E)}$ which can be written as $\frac{f_I(\omega_E)\omega_E}{F_I(\omega_E)} - \frac{f_I(\omega_E)}{F^2(\omega_E)}\Big(\int_0^{\omega_E} f_I(z) z dz + C\Big)$. Comparing (9) with (10) shows the claim.

To see that it is indeed optimal to post $p = p_E^*(\omega_E)$, denote $\hat{\omega}_E := p_E^{*-1}(p)$ such that the objective function becomes

$$\omega_E\ F_I[\hat{\omega}_E] - \int_0^{\hat{\omega}_E} \omega_I f_I(\omega_I) d\omega_I.$$

Taking the derivative w.r.t. $\hat{\omega}_E$ yields

$$f_I(\hat{\omega}_E)\ [\omega_E - \hat{\omega}_E],$$

which is zero at $\hat{\omega}_E = \omega_E$, strictly positive whenever $\hat{\omega}_E < \omega_E$ and strictly negative for $\hat{\omega}_E > \omega_E$. Hence, the bidder indeed finds it optimal to post $p_E^*(\omega_E)$ given the other players expect him to play $p_E^*(\omega_E)$.

Step 3: Shareholder does sell after $(p_E^*, m_I^*(\omega_I \leq \omega_I^*))$

For p_E^* and $m_I^*(\omega_I \leq \omega_I^*)$, it has to hold that there is a $\gamma \geq \frac{\lambda}{1-s}$ such that

$$\gamma p_E^*(\omega_E) + (1-\gamma)\mathbb{E}[\omega_E | p_E^*(\omega_E)] \geq \mathbb{E}[\omega_I | \omega_I \leq \omega_I^*(\omega_E)].$$

Plugging in p_E^* and ω_I^*, this becomes

$$\gamma \mathbb{E}[\omega_I | \omega_I \leq \omega_E] + (1-\gamma)\omega_E \geq \mathbb{E}[\omega_I | \omega_I \leq \omega_E],$$

which holds true for any $\gamma \in [0, 1]$ since $\mathbb{E}[\omega_I | \omega_I \leq \omega_E] < \omega_E$ by full support.

Step 4: Shareholder does not sell after $(p_E^*, m_I^*(\omega_I > \omega_I^*))$

For p_E^* and $m_I^*(\omega_I > \omega_I^*)$, there is no $\gamma \geq \frac{\lambda}{1-s}$ such that

$$\gamma p_E^*(\omega_E) + (1-\gamma)\mathbb{E}[\omega_E | p_E^*(\omega_E)] \geq \mathbb{E}[\omega_I | \omega_I > \omega_I^*(\omega_E)].$$

To see this, plug in p_E^* and the latter inequality becomes

$$\gamma \mathbb{E}[\omega_I | \omega_I \leq \omega_E] + (1-\gamma)\omega_E \geq \mathbb{E}[\omega_I | \omega_I > \omega_E].$$

The right-hand side is strictly larger than the left-hand side by the full support assumption. Hence, the shareholder does not want to sell *any amount of shares* if current management does not recommend to do so.

Step 5: Shareholder does not sell more than $\gamma^* = \frac{\lambda}{1-s}$ shares

Suppose this was not true, and she sells, after observing p_E^* and $m_I^*(\omega_I \leq \omega_I^*)$, a fraction of $\hat{\gamma} > \gamma^* = \frac{\lambda}{1-s}$. It must then hold that

$$\hat{\gamma} p_E^*(\omega_E) + (1 - \hat{\gamma})\omega_E \geq \frac{\lambda}{1-s} p_E^*(\omega_E) + (1 - \frac{\lambda}{1-s})\omega_E.$$

As $p_E^* < \omega_E$, the left-hand side is strictly smaller than the right hand-side. Thus, the inequality is violated and we can conclude that $\gamma^* = \frac{\lambda}{1-s}$ whenever a takeover occurs.

Step 6: Individual rationality

Since $p_E^*(\omega_E) = \mathbb{E}[\omega_I | \omega_I \leq \omega_E] < \omega_E$ implies strictly positive expected profits for $\omega_E > 0$ and zero for $\omega_E = 0$, $p_E^*(\omega_E)$ is individually rational.

Step 7: There are no profitable deviations to prices not played on the equilibrium path.

As $F_I(p_E^*(1)) = 1$, a takeover occurs with certainty when the bidder posts the highest equilibrium price. Posting any price above $p_E^*(1)$ can thus never be profitable as it only increases the costs of a takeover. Further, as $p_E^*(0) = 0$ and $p_E \in \mathbb{R}_+$, there are no downward deviations to off-path prices.

□

Proof of Proposition 2. We want to establish that, in any babbling equilibrium, there exists a single price such that a takeover occurs with certainty at this price and that all types above this price post it. We perform the proof in four steps.

Step 1: If there is a $p_E < 1$ such that all $\omega_E \geq p_E$ post p_E and $\gamma^*(p_E) \geq \frac{\lambda}{(1-s)}$, then $\gamma^*(p_E) = \frac{\lambda}{(1-s)}$.

Suppose, on the way to a contradiction, this was not true, i.e. $\exists p_E < 1$ such that $\gamma^*(p_E) > \frac{\lambda}{(1-s)}$ and all $\omega_E \geq p_E$ post p_E. Then, $\mathbb{E}[\omega_E | p_E] > p_E$ by full support. As a consequence, the shareholder could lower γ^* to $\gamma' := \gamma^* - \epsilon$ for an $\epsilon > 0$ such that $\gamma' \geq \frac{\lambda}{(1-s)}$ still holds. As $\mathbb{E}[\omega_E | p_E] > p_E$, this is a strictly profitable deviation.

Step 2: $\exists p_E < 1$ such that $\gamma^*(p_E) \geq \frac{\lambda}{(1-s)}$.

As I does not provide any information, the shareholder's tendering decision is

$$\gamma p_E + (1 - \gamma)\mathbb{E}[\omega_E | p_E] \geq \mu_I, \tag{12}$$

for $\gamma \geq \frac{\lambda}{(1-s)}$ to make the takeover successful. From the full support assumption, we know that $\mu_I < 1$. Now suppose, on the way to a contradiction, there is an equilibrium where no takeover occurs for all bidder types. In this equilibrium, all bidder types post prices

$p_E < \mu_I$ as otherwise a takeover would occur. There are now two possibilities: after some deviation to $p'_E \in [\mu_I, 1)$, either off-path beliefs yield $\mathbb{E}[\omega_E|p'_E] \geq p'_E$ or $\mathbb{E}[\omega_E|p'_E] < p'_E$. In the former case, the shareholder would tender a fraction $\frac{\lambda}{1-s}$ (or any $\gamma \geq \frac{\lambda}{1-s}$ in case of strict inequality) of her shares. Any bidder type $\omega_E > p'_E$ makes strictly positive profits by deviating to p'_E as opposed to zero on the proposed equilibrium path.

If off-path beliefs are such that $\mathbb{E}[\omega_E|p'_E] < p'_E$, then the shareholder optimally tenders (as $p'_E \geq \mu_I$) all of her shares and the takeover succeeds. Again this is a profitable deviation for $\omega_E > p'_E$. This yields the contradiction. It is then clear that there exists at least one price $p_E < 1$ such that a takeover occurs with probability one, i.e. $\gamma^*(p_E) \geq \frac{\lambda}{(1-s)}$. Denote $\hat{p}_E$ as the minimal price such that the takeover succeeds. In any equilibrium, $\hat{p}_E$ exists as we have established that there is some price after which a takeover occurs. Since there is no openess problem, $\hat{p}_E$ has to exist.

Step 3: All types $\omega_E \geq \hat{p}_E$ post $\hat{p}_E$.

We show that there is no price $p'_E > \hat{p}_E$ such that some bidder type posts p'_E. If this was true, bidder types need to be compensated by receiving a larger fraction of shares, i.e. we need $\gamma^*(p'_E) > \gamma^*(\hat{p}_E) \geq \frac{\lambda}{(1-s)}$. Suppose this was the case. It follows that $p'_E = \mathbb{E}[\omega_E|p'_E]$ because if it were true that $p'_E < \mathbb{E}[\omega_E|p'_E]$ and $\gamma^*(p'_E) > \frac{\lambda}{(1-s)}$, the shareholder would have a profitable deviation to tendering fewer shares but still making the takeover successful. Since $p'_E = \mathbb{E}[\omega_E|p'_E]$ holds, one can infer that $p'_E = \omega_E$. The shareholder's decision becomes $p'_E > \mu_I$ and they may tender a fraction larger than $\frac{\lambda}{(1-s)}$. This, however, yields zero profits for E who has now an incentive to deviate and post the price $\hat{p}_E$. Hence, all types above $\hat{p}_E$ post $\hat{p}_E$.

Step 4: For all $p_E < \hat{p}_E$, no takeover occurs.

Suppose this was not true, i.e. $\exists p_E < \hat{p}_E$ and $\gamma^* \geq \frac{\lambda}{1-s}$ at p_E. Then, all types above $\hat{p}_E$ would deviate to p_E.

□

Proof of Proposition 4. As we consider babbling equilibria, suppose $m^*_I(p_E)$ is uninformative for all $p_E \in \mathbb{R}_+$.

Step 1: Suppose $s_j < \lambda, \forall j$. Then, there always exists an equilibrium in which no takeover ever occurs.

We show by construction that the following equilibrium always exists provided no shareholder is pivotal on her own.

1. $\gamma^*_j(p_E, m_I) = 0, \forall j, p_E, m_I$,
2. $p^*_E = 0, \forall \omega_E$,

3. $m_I^* = 1, \forall \omega_I, p_E$.

Given $\gamma_j^*(p_E, m_I) = 0 \; \forall j, p_E, m_I$, no shareholder j has an incentive to deviate as she cannot induce a takeover unilaterally. And as $\gamma_j^* = 0$ independent of m_I and p_E, the incumbent knows that shareholders will not react on his message and therefore it is optimal for him to send an uninformative message e.g. $m_I^* = 1$ for all ω_I.

As all prices lead to no takeover and thus zero profits, any bidder type finds it optimal to post, for example, $p_E^* = 0$. Off-path beliefs regarding ω_I and ω_E are irrelevant given the coordination failure.

Step 2: There exists an equilibrium with a cutoff price $\hat{p}_E < 1$ such that:
if $\omega_E < \hat{p}_E$, a takeover occurs with probability zero;
if $\omega_E \geq \hat{p}_E$, E posts $\hat{p}_E$ and a takeover occurs with probability one.
Finally, it holds that $T^*(\hat{p}_E) = \lambda$.

Let m_I^* be uninformative w.r.t. ω_I. Further, there is a price $\hat{p}_E \in (0,1)$ such that all shareholders tender $\gamma_j^* = \gamma^* = \frac{\lambda}{1-s}$ whenever $p_E \geq \hat{p}_E$. For $p_E < \hat{p}_E$, shareholders tender zero shares. Let $\hat{p}_E$ be the price that makes shareholders exactly indifferent between tendering and not tendering given the on-path expected posterior bidder type, i.e.

$$\frac{\lambda}{1-s}\hat{p}_E + (1 - \frac{\lambda}{1-s})\mathbb{E}[\omega_E | \omega_E \geq \hat{p}_E] = \mu_I.$$

This equilibrium is, for instance, supported by an off-path belief yielding posterior expected type bidder type of $\mathbb{E}[\omega_E|\omega_E \leq p_E]$ for $p_E < \hat{p}_E$ and of $\mathbb{E}[\omega_E|\omega_E \geq p_E]$ for $p_E > \hat{p}_E$.

By their symmetric tendering strategy $\gamma^* = \frac{\lambda}{1-s}$, each shareholder is pivotal at any $p_E \geq \hat{p}_E$. Further, at $\hat{p}_E$, each shareholder is indifferent between tendering γ^* shares and not tendering thereby letting the takeover fail. Hence, it is (weakly) optimal for shareholders to tender exactly a fraction of $\frac{\lambda}{1-s}$.

For any $p_E > \hat{p}_E$, any shareholder strictly prefers a takeover to occur and tendering at least γ^* shares. No shareholder has an incentive to tender more than γ^* shares because according to above off-path beliefs: $\mathbb{E}[\omega_E|\omega_E \geq p_E]$ for $p_E > \hat{p}_E$, and expected security benefits strictly exceed the price.[40] As $\sum_j^J s_j = 1 - s$, it follows that $T^* = \sum_j^J s_j \gamma_j^* = \lambda$.

For E, deviating to a price above $\hat{p}_E$ yields to a purchase of λ shares with certainty but at a higher cost. Deviating to a price smaller than $\hat{p}_E$ yields no takeover and zero profits. Hence, E does not want to deviate.

Step 3: Suppose $s_j < \lambda$ for all $j \in \{1, \ldots, J\}$. Then, there is an equilibrium where $p_E^*(\omega_E = 1) = 1$ and $\omega_E = 1$ is the only bidder type who secures a takeover. Further, $T^*(p_E^*(1)) \geq \lambda$.

Suppose $\gamma_j^*(p_E) = 0$ for all $p_E < 1$ and $\gamma_j^*(p_E = 1) = \frac{\lambda}{1-s}$ for all $j = 1, \ldots, J$.

[40] Except for $p_E = 1$ at which E makes at most zero profits. Hence, this can never be a profitable deviation.

Further suppose that $p_E^*(\omega_E) = 0$ for all $\omega_E < 1$ and $p_E^*(\omega_E = 1) = 1$. In the conjectured equilibrium, a takeover occurs only after $p_E^* = 1$. Any $T^*(p_E^* = 1) \geq \lambda$ can be supported in equilibrium because $p_E = \omega_E = 1$ and shareholders are thus indifferent between security benefits after a successful takeover and the tender price. If a shareholder was pivotal at $p_E^* = 1$, i.e. she could block the takeover by not tendering she would refrain from doing so as $\mu_I < 1 = p_E = \omega_E$ by the full support assumption. Therefore, $T^*(p_E^*(1)) \geq \lambda$.

No bidder type $\omega_E < 1$ has an incentive to deviate to $p_E = 1$ as this would imply strictly negative profits. Independent of off-path beliefs, it is optimal for any shareholder not to tender after any price $p_E < 1$ because she is not pivotal ($s_j < \lambda$ for all $j \in \{1, \ldots, J\}$). Bidder type $\omega_E = 1$ does not want to deviate downwards as this would also imply zero profits.

Step 4: In any equilibrium in which a takeover occurs with non-zero probability, there exists a unique price $\hat{p}_E \leq 1$ such that $\mathbb{P}[takeover|\hat{p}_E] = 1$.

Suppose, on the way to a contradiction, this was not the case, i.e., there are at least two prices $\hat{p}_E \neq p'_E$ s.t. $\mathbb{P}[takeover|\hat{p}_E] = \mathbb{P}[takeover|p'_E] = 1$. W.l.o.g. assume $\hat{p}_E < p'_E$. Then, for bidder types that post p'_E on the equilibrium path, it must hold that $T^*(p'_E) > T^*(\hat{p}_E) \geq \lambda$ as otherwise p'_E implies higher costs but leaves the takeover probability and the amount of shares acquired constant.

For $T^*(p'_E) > \lambda$ to be part of an equilibrium and conditional on making the takeover successful, shareholders must be indifferent between selling and keeping their shares at p'_E, i.e. $p'_E = \mathbb{E}[\omega_E|p'_E]$ must hold true. Otherwise, if $p'_E < \mathbb{E}[\omega_E|p'_E]$, $T^*(p'_E)$ cannot be an equilibrium object because any shareholder tendering a positive amount would sell less shares to enjoy the larger security benefits and still making the takeover succeed. By the full support assumption and incentive compatibility, $p'_E = \mathbb{E}[\omega_E|p'_E]$ is only possible if type $\omega_E = p'_E$ alone posts p'_E. But this implies zero profits, so this type has a profitable deviation to $\hat{p}_E$.

Step 5: All types $\omega_E \geq \hat{p}_E$ post $\hat{p}_E$.

Since there is a unique price on the equilibrium path that leads to a takeover, the only other possibility is that these types post a price that does not realize a takeover. This, however, would imply zero profits and is therefore no profitable deviation.

Step 6: All $\omega_E < \hat{p}_E$ post a price that does not realize a takeover.

Posting $p_E \geq \hat{p}_E$ implies strictly negative profits. Any $p_E < \hat{p}_E$ cannot yield $T^*(p_E) \geq \lambda$ as otherwise $\hat{p}_E$ would not be the unique price after which a takeover is implemented.

Step 7: $T^*(\hat{p}_E) = \lambda$ for $\hat{p}_E < 1$.

Suppose not. However, we know that $\hat{p}_E$ is unique and that all $\omega_E \geq \hat{p}_E$ post $\hat{p}_E$ on the equilibrium path. Hence, $\mathbb{E}[\omega_E|\hat{p}_E] > \hat{p}_E$ for all $\hat{p}_E < 1$. Thus, if $T^*(\hat{p}_E) > \lambda$, any shareholder could profitably deviate and tender strictly less shares but make the takeover still succeed.

□

Proof of Theorem 2. We want to establish that the following constitutes an equilibrium:

1. The bidder fully reveals ω_E via p_E^*, where

$$p_E^* = \begin{cases} \mathbb{E}[\omega_I|\omega_I \leq \omega_I^*(\omega_E)] + b_I, & \text{if } \omega_E \geq b_I \\ \omega_E, & \text{otherwise.} \end{cases}$$

2. Given p_E^*, the incumbent's belief assigns probability one to $\omega_E = p_E^{*-1}(p_E(\omega_E)))$. Hence, $\omega_I^* = max\{\omega_E - b_I; 0\}$ and I sends

$$m_I \in \begin{cases} [0, \omega_I^*], & \text{if } \omega_I \leq \omega_I^* \\ (\omega_I^*, 1], & \text{otherwise.} \end{cases}$$

3. Given p_E^* and m_I^*, shareholder j assigns probability one to $\omega_E = p_E^{*-1}(p_E(\omega_E)))$ and updates his belief about the incumbent's type conditional on m_I^* to $f_I(\omega_I|\omega_I \leq \omega_I^*)$ and $f_I(\omega_I|\omega_I > \omega_I^*)$, respectively. Whenever $m_I^* \in [0, \omega_I^*]$, then $\sum_j^J \gamma_j^* s_j = \lambda$. If $m_I^* \in (\omega_I^*, 1]$, then $\gamma_j^* = 0$ for all j.
4. Off-path beliefs by incumbent and shareholders after some price offer p_E that is not played on the equilibrium path are restricted to those surviving the intuitive criterion by Cho and Kreps (1987).

In $t = 3$, as shareholders play pure strategies, given any p_E, m_I and the respective posteriors of ω_I, ω_E, a takeover occurs with probability one or zero: $\mathbb{P}(\text{takeover}|p_E, m_I) \in \{0, 1\}$. Hence, the incumbent can send at most two-non outcome equivalent messages.

In $t = 2$, for a fixed p_E and posterior of ω_E, the incumbent's utility from no takeover is $s\omega_I + B_I$ and thus strictly increasing in ω_I. His expected utility from a takeover is $s\mathbb{E}[\omega_E|p_E]$ and thus independent of ω_I. Therefore, the difference in his expected utility from sending a message m_I inducing a takeover and a message m_I' not inducing a takeover is given by $\mathbb{E}[u_I|p_E, m_I, \omega_I] - \mathbb{E}[u_I|p_E, m_I', \omega_I] = s\mathbb{E}[\omega_E|p_E] - s\omega_I - B_I$ and thus strictly decreasing in ω_I. All types above ω_I^* prefer keeping control over the company. In the conjectured equilibrium, shareholders always follow the incumbent's message. Hence, he has no incentive to deviate as he obtains his maximal payoff.

Now consider $t = 1$ and the bidder's choice of p_E. For ease of exposition, we start by solving the bidder's problem for the special case of $J = 1$ and $\lambda = 1 - s$. Hence, a shareholder tenders all of her shares if and only if $p_E \geq \mathbb{E}[\omega_I | p_E, m_I(p_E)]$. By restricting attention to $J = 1$ and $\lambda = 1 - s$, we can focus on E's equilibrium price and leave the shareholders' tender weights γ_j aside. Afterwards we generalize our proof.

Step 1: Necessary condition for a fully separating bidder strategy

Suppose the bidder plays a fully separating strategy p_E, i.e. p_E is strictly increasing in ω_E (and thus invertible). In any fully separating equilibrium, $\gamma^* = \frac{\lambda}{1-s}$ must hold. The reason is that, as in the case without bias, the equilibrium has to entail $p_E^*(\omega_E) < \omega_E$. To see this, recall that in the conjectured equilibrium, all types larger than b_I have a positive takeover probability. Thus, all bidder types $\omega_E \geq b_I$ can imitate the equilibrium price offer by some type $\omega_E' \in [b_I, \omega_E)$ yielding a profitable deviation. Therefore, in any fully separating equilibrium, $p_E^*(\omega_E) < \omega_E$ must hold. Hence, if $\gamma^* > \frac{\lambda}{1-s}$, the shareholder has a profitable deviation to tender fewer shares, still making the takeover possible and gain on the expected increase in firm value.

Let ω_E be the bidder's true type. As γ^* is independent of p_E, the bidder's optimal bid price p is given by

$$\underset{p \in \mathbb{R}_+}{argmax} \;\; F_I[\omega_I^*(p_E^{-1}(p)] \,\lambda\, [\omega_E - p],$$

where $\omega_I^* = \omega_E - b_I$ for $\omega_E \geq b_I$ and zero, otherwise.

Suppose $\omega_E \geq b_I$. Replicating the same steps as in the proof of Theorem 1 (with $b_I = 0$) yields

$$p_E'(\omega_E) = \frac{f_I(\omega_E - b_I)}{F_I(\omega_E - b_I)}\Big(\omega_E - p_E(\omega_E)\Big). \tag{13}$$

It can be shown that the general solution to (13) is given by

$$p_E^*(\omega_E) = \frac{\int_{b_I}^{\omega_E} f_I(z - b_I) z dz + C}{F_I(\omega_E - b_I)}, \tag{14}$$

where $C = 0$ in equilibrium because the type $\omega_E = b_I$ has a takeover probability of zero.

Observe that we can further rewrite the price function stated in (14):

$$\begin{aligned}
&\frac{\int_{b_I}^{\omega_E} f_I(z - b_I) z dz}{F_I(\omega_E - b_I)} \\
&= \frac{\int_0^{\omega_E - b_I} f_I(z)(z + b_I) dz}{F_I(\omega_E - b_I)} = \frac{\int_0^{\omega_E - b_I} f_I(z) z dz}{F_I(\omega_E - b_I)} + b_I \frac{\int_0^{\omega_E - b_I} f_I(z) dz}{F_I(\omega_E - b_I)} \\
&= \mathbb{E}[\omega_I | \omega_I \leq \omega_I^*] + b_I.
\end{aligned}$$

Hence, $p_E^*(\omega_E) = \mathbb{E}[\omega_I | \omega_I \leq \omega_E - b_I] + b_I$ for $\omega_E \geq b_I$.

For $\omega_E < b_I$, a takeover never occurs in equilibrium because $\omega_I^* = 0$. Thus, all types below b_I do not want to deviate to a price posted by some $\omega_E \geq b_I$ since this would yield strictly negative profits. Hence, offering the true type $p_E = \omega_E < b_I$ is optimal.

Step 2: Sufficiency

This step is identical to the case with $b_I = 0$.

Step 3: Verification of Constraints

We must check that the shareholder follows I's recommendation and individual rationality for the bidder. To be precise, we must verify that the following constraints hold given p_E^*, m_I^* and γ^*:

$$\begin{aligned} &[I] \qquad p_E^*(\omega_E) \geq \mathbb{E}[\omega_I | \omega_I \leq \omega_I^*], \\ &[II] \qquad p_E^*(\omega_E) < \mathbb{E}[\omega_I | \omega_I > \omega_I^*], \\ &[III] \qquad \omega_E \geq p_E^*(\omega_E). \end{aligned}$$

We show that none of the constraints are binding and that the solution to the unconstrained problem derived above is also the solution to the constrained optimization problem.

We begin with the case that $\omega_E \leq b_I$. Note that we do not need to check constraint $[I]$ for $\omega_E \leq b_I$ since for these types a takeover occurs with probability zero. Similarly, constraint $[III]$ only has to hold if E's takeover probability is strictly positive. Thus, we do not need to check it for $\omega_E \leq b_I$.

Claim: Suppose $\omega_E \leq b_I$. Then, $b_I \leq \mu_I$ is a necessary and sufficient condition for constraint $[II]$ to hold.

1. $[II]$ holds only if $b_I \leq \mu_I$: Suppose, on the way to a contradiction, this was not true, i.e. $b_I > \mu_I$. Then, there exists $\omega_E' \in (\mu_I, b_I)$ by full support. As $\omega_E' < b_I$ it follows that $\omega_I^*(\omega_E') = 0$ and hence $[II]$ requires that $p_E(\omega_E') < \mathbb{E}[\omega_I | \omega_I > \omega_I^*(\omega_E') = 0] = \mu_I$. But then there is a profitable deviation for ω_E' by posting a price p_E' such that $\mu_I < p_E' < \omega_E' < b_I$ which generates a strictly positive profit because $\omega_E' > \mu_I$ by assumption. Since $p_E' > \mathbb{E}[\omega_I | \omega_I > (\omega_I^*(\omega_E') = 0)] = \mu_I$ the second constraint cannot be fulfilled and we have a contradiction.
2. Sufficiency: Assume $b_I \leq \mu_I$. Then, $\omega_E \leq b_I \leq \mu_I = \mathbb{E}[\omega_I | \omega_I > \omega_I^*(\omega_E) = 0]$. $[II]$ follows immediately because posting any p_E can generate at most zero profits: For any price inducing a takeover, we need $p_E \geq \mu_I = \mathbb{E}[\omega_I | \omega_I > \omega_I^*(\omega_E) = 0]$ which yields strictly negative profits and hence $p_E < \mathbb{E}[\omega_I | \omega_I > \omega_I^*(\omega_E)]$.

We now turn to $\omega_E > b_I$ and verify constraints $[I]$, $[II]$ and $[III]$. We begin with constraint $[I]$:

$$p_E^* \geq \mathbb{E}[\omega_I | \omega_I \leq \omega_E - b_I].$$

Plugging in p_E^* yields

$$\mathbb{E}[\omega_I|\omega_I \leq \omega_E - b_I] + b_I \geq \mathbb{E}[\omega_I|\omega_I \leq \omega_E - b_I],$$

which is trivially true because $b_I \geq 0$. In particular, the constraint is never binding for any $b_I > 0$.
We now turn to $[II]$, i.e. we want to show that

$$p_E^* < \mathbb{E}[\omega_I|\omega_I > \omega_I^*],$$

which can be written as

$$\mathbb{E}[\omega_I|\omega_I \leq \omega_E - b_I] + b_I < \mathbb{E}[\omega_I|\omega_I > \omega_E - b_I],$$

or

$$b_I < \mathbb{E}[\omega_I|\omega_I > \omega_E - b_I] - \mathbb{E}[\omega_I|\omega_I \leq \omega_E - b_I],$$

and the right-hand side is strictly positive by full support. By continuity, there exists a bias $\overline{b}_I^1$ such that the constraint is fulfilled for any $b_I \leq \overline{b}_I^1$.

Finally, we check $[III]$. Plugging in the price function yields $p_E^* = \mathbb{E}[\omega_I|\omega_I \leq \omega_E - b_I] + b_I < \omega_E - b_I + b_I = \omega_E$ and individual rationality obtains.

All in all, the solution to the unconstrained problem is also the solution to the constrained problem for sufficiently small bias b_I.
Although maximizing expected utility gives the optimal p_E^* on the interval of equilibrium prices $[0, p_E^*(1)]$, we have yet to check whether there exist profitable deviations by posting off-path prices above this interval (below is not feasible as $p_E \in \mathbb{R}_+$).

Step 4: Off-path Upward Deviation

To prove that there are no profitable upward deviations, we must show the following:

$$\forall \omega_E \in [0,1] \nexists \epsilon > 0 : \tag{15}$$
$$p_E^*(1) + \epsilon \geq \mathbb{E}[\omega_I|\omega_I > \omega_I^*(p_E^*(1)+\epsilon)] \text{ and } \mathbb{P}(\omega_I \leq \omega_I^*) u_E(\omega_E, p_E^*(1)) < u_E(\omega_E, p_E^*(1)+\epsilon).$$

Condition (15) requires that it is not profitable for any bidder type to post a price above $p_E^*(1)$, the price the highest type would post, to secure the takeover with probability one. This will not be profitable since ϵ, the premium paid beyond $p_E^*(1)$ to convince the shareholder to always tender, will be too large – at least for small b_I. We call this deviation price p^{dev}. After inserting ω_I^*, the inequality in condition (15) can be written as

$$p^{dev} \geq \mathbb{E}[\omega_I|\omega_I > \mathbb{E}[\omega_E|p^{dev}] - b_I].$$

By the intuitive criterion, off-path beliefs assign all probability mass to $\omega_E \geq p^{dev}$ because all other types would make strictly negative profits by such a deviation. It follows:

$$p^{dev} \geq \mathbb{E}[\omega_I|\omega_I > \mathbb{E}[\omega_E|p^{dev}] - b_I] \geq \mathbb{E}[\omega_I|\omega_I > p^{dev} - b_I].$$

Now, by continuity and full support, there is a $\overline{b}_I^2 > 0$ such that $\mathbb{E}[\omega_I|\omega_I > p^{dev} - \overline{b}_I^2] > p^{dev}$ which yields a contradiction and no upward deviation is profitable for $b_I \leq \overline{b}_I^2$. Take $\min\{\overline{b}_I^1, \overline{b}_I^2, \mu_I, \mu_E\}$ and the claim follows.

Step 5: General Case

We now extend the last result to a general condition λ and multiple shareholder ownership $j \in \{1, \ldots, J\}$. We conjecture that

$$p_E^* = \begin{cases} \mathbb{E}[\omega_I|\omega_I \leq \omega_I^*(\omega_E)] + b_I, & \text{if } \omega_E \geq b_I \\ \omega_E, & \text{otherwise.} \end{cases}$$

is an optimal price. Given this price function, we know that in the proposed equilibrium $\omega_E > p_E^*$ holds for all $\omega_E > b_I$, i.e. for all bidder types who have a strictly positive probability of taking over the company.

We claim that shareholders will jointly tender $T^* = \lambda$ if a takeover occurs. Suppose this was not true, i.e. $T^* > \lambda$. Consider some shareholder j who tenders a fraction $\hat{\gamma}_j > 0$ of her shares. Then, shareholder j can lower $\hat{\gamma}_j$ by some strictly positive amount and the takeover would still occur. This is a strictly profitable deviation because $\omega_E > p_E^*$ given the proposed price function.

Thus, for any λ, the amount of shares tendered cancels out of the first-order condition and the optimal p_E^* remains $\mathbb{E}[\omega_I|\omega_I \leq \omega_I^*] + b_I$, formally:

$$\max_{p \in \mathbb{R}_+} \; F_I[\omega_I^*(p_E^{-1}(p)] \; \lambda \; [\omega_E - p] = \max_{p \in \mathbb{R}_+} \; F_I[\omega_I^*(p_E^{-1}(p)] \; [\omega_E - p],$$

where $\omega_I^* = \omega_E - b_I$ for $\omega_E > b_I$ and zero otherwise. We now establish that all shareholders tendering $\gamma_j^* > 0$ still want to follow m_I^*. This is sufficient because all shareholders with $\gamma_j^* = 0$ do not tender any shares and the constraints do not have to hold for them.

As argued above, the solution to the unconstrained problem remains $p_E^* = \mathbb{E}[\omega_I|\omega_I \leq \omega_I^*] + b_I$. We now verify E's constraints.

Constraint $[I]$ becomes $\gamma_j^* p_E^* + (1 - \gamma_j^*)\mathbb{E}[\omega_E|p_E^*] \geq \mathbb{E}[\omega_I|\omega_I \leq \omega_I^*]$. Again we know that in a fully revealing equilibrium, it must hold that $\mathbb{E}[\omega_E|p_E^*] = \omega_E$. By the same reasoning as in the case with $J = 1$, we know that $\omega_E \geq p_E^*$. Thus, we can rewrite constraint $[I]$ as $\gamma_j^* p_E^* + (1 - \gamma_j^*)\omega_E \geq p_E^* \geq \mathbb{E}[\omega_I|\omega_I \leq \omega_I^*]$. The last inequality is true because of the same argument as in the single shareholder case.

Now observe that if $\gamma^*_{-j}(p^*_E, m^*_I(\omega_I > \omega^*_I)) = (0, \ldots, 0)$, then for any individual shareholder j it is a best response not to tender as well if she is not pivotal on her own (i.e. $s_j < \lambda$). Consequently, obedience in the multiple shareholder case is easier to support in equilibrium. We will show, however, that for sufficiently small bias, we need not exploit the coordination failure but can show that even if a shareholder was pivotal with some $\gamma^*_j > 0$, she would not like to tender. To see this, note that constraint $[II]$ becomes $\gamma^*_j p^*_E + (1-\gamma^*_j)\mathbb{E}[\omega_E|p^*_E] < \mathbb{E}[\omega_I|\omega_I > \omega^*_I]$. We focus on the case where b_I becomes small and plug in our expression for p^*_E to arrive at

$$\gamma^*_j(\mathbb{E}[\omega_I|\omega_I \leq \omega^*_I] + b_I) + (1-\gamma^*_j)\mathbb{E}[\omega_E|p^*_E] < \mathbb{E}[\omega_I|\omega_I > \omega^*_I].$$

The left-hand side converges to $\gamma^*_j\mathbb{E}[\omega_I|\omega_I \leq \omega_E] + (1-\gamma^*_j)\omega_E$ and the right-hand side becomes $\mathbb{E}[\omega_I|\omega_I > \omega_E]$ as b_I goes to zero. Thus, in the limit we have

$$\gamma^*_j\mathbb{E}[\omega_I|\omega_I \leq \omega_E] + (1-\gamma^*_j)\omega_E < \omega_E < \mathbb{E}[\omega_I|\omega_I > \omega_E],$$

where the strict inequalities follow from the full support assumption. Again, by continuity, there is a bias $\overline{b}_I^{J1} > 0$ such that for all smaller biases the constraint is fulfilled.

Constraint $[III]$ can be shown to hold in the same fashion as in the case where all shares are tendered.

Step 6: Off-path Upward Deviation for $J > 1$.

By definition, there exists no off-path upward deviation if

$$\begin{aligned}
&\forall \omega_E \in [0,1] \nexists \epsilon > 0 : \\
&\gamma^*_j(p^*_E(1) + \epsilon) + (1-\gamma^*_j)\mathbb{E}[\omega_E|p^*_E(1) + \epsilon] \geq \mathbb{E}[\omega_I|\omega_I > \omega^*_I(p^*_E(1) + \epsilon)] \\
&\text{ and } \mathbb{P}(\omega_I \leq \omega^*_I)u_E(\omega_E, p^*_E(1)) < u_E(\omega_E, p^*_E(1) + \epsilon).
\end{aligned}$$

The argument is similar to the single shareholder case. Again define the deviation price $p^{dev} := p^*_E(1) + \epsilon$. Suppose such a deviation is profitable, then it holds

$$\gamma^*_j p^{dev} + (1-\gamma^*_j)\mathbb{E}[\omega_E|p^{dev}] \geq \mathbb{E}[\omega_I|\omega_I > \mathbb{E}[\omega_E|p^{dev}] - b_I]. \tag{16}$$

The intuitive criterion excludes off-path beliefs assigning positive probability to types $\omega_E < p^{dev}$ as they would make a strict loss by such a deviation. Thus, $\mathbb{E}[\omega_E|p^{dev}] \geq p^{dev}$. As $\gamma^*_j \in (0,1]$, the LHS in (16) is weakly smaller than $\mathbb{E}[\omega_E|p^{dev}]$. Hence,

$$\mathbb{E}[\omega_E|p^{dev}] \geq \mathbb{E}[\omega_I|\omega_I > \mathbb{E}[\omega_E|p^{dev}] - b_I].$$

But by continuity and full support, there exists a $\overline{b}_I^{J2} > 0$ such that for all $b_I \leq \overline{b}_I^{J2}$:
$\mathbb{E}[\omega_E|p^{dev}] < \mathbb{E}[\omega_I|\omega_I > \mathbb{E}[\omega_E|p^{dev}] - b_I]$ which yields a contradiction. Now define $\overline{b}_I :=$

$\min\{\overline{b}_I^{J1}, \overline{b}_I^{J2}, \overline{b}_I^1, \overline{b}_I^2, \mu_I, \mu_E\}$ and the equilibrium exists for every $b_I \leq \overline{b}_I$. □

Proof of Proposition 5. In the fully revealing equilibrium of Theorem 2, a takeover occurs whenever $\omega_I \leq \omega_I^* = \mathbb{E}[\omega_E | p_E^*] - b_I = \omega_E - b_I$ and $\lim_{b_I \to 0} \omega_I^* = \omega_E$. The decision rule whether a takeover occurs or not is thus the optimal allocation rule in the sense of Definition 1. Hence, in the limit we attain first-best firm value. The existence of an upper bound $\overline{b}_I^{FV}$ on b_I follows from continuity of ω_I^* in b_I. □

B Appendix: Information Structures and Shareholder Learning

Let X be a signal about ω_I with realization $x \in [0,1]$ and suppose the shareholder can choose an information structure G at zero costs as follows. Given the prior $F_I \in \Delta([0,1])$, the distribution of X induces a joint distribution over signals and states $G : [0,1] \times [0,1] \to [0,1]$. Given x, the shareholder forms a posterior mean $\mathbb{E}[\omega_I | x]$. At the time of tendering, her decision whether to tender or to keep the shares depends only on $\mathbb{E}[\omega_I | x]$. Hence, without loss of generality, we identify the signal with its induced posterior mean: $\mathbb{E}[\omega_I | x] = x$. Thus, the shareholder is only interested in the marginal distribution of the signal X. Doing so, we identify each signal with the cdf of its marginal distribution and denote it by G_X.[41] We define the set of admissible information structures as mean-preserving spreads (MPS) of the prior F_I:

$$\begin{aligned}\mathcal{G} :=\Big\{ & G_X \text{ cdf over } [0,1] : \int_0^y F_I(\omega_I) d\omega_I \geq \int_0^y G_X(x) dx \ \forall\, y \in [0,1], \\ & \int_0^1 F_I(\omega_I) d\omega_I = \int_0^1 G_X(x) dx \Big\}.\end{aligned}$$

Lemma B.1. Let X be a signal about ω_I with realization $x \in [0,1]$ and suppose the shareholder can choose any information structure from $\mathcal{G}$ at zero costs. Then, the shareholder chooses the fully informative signal structure $\overline{G}_X$.

Proof of Lemma B.1. Define $z := \frac{\lambda p_E + (1-s-\lambda)\mathbb{E}[\omega_E | p_E]}{(1-s)}$. As $\gamma^* = \frac{\lambda}{1-s}$, the shareholder tenders whenever $z \geq x$. Given some $G_X \in \mathcal{G}$, the expected utility per share of the shareholder is then given by

$$\int_0^z z dG_X(x) + \int_z^1 x dG_X(x) = zG_X(z) + 1 - zG_X(z) - \int_z^1 G_X(x) dx = 1 - \int_z^1 G_X(x) dx. \tag{17}$$

[41] This is equivalent to saying that each signal x provides the shareholder with an unbiased estimate about ω_I. For two papers that model signals in the same way, see Roesler and Szentes (2017) and Ravid et al. (2019).

Now take $\overline{G}_X$ which is an MPS of any $G_X \in \mathcal{G}$ and it follows from (17) that her utility under $\overline{G}_X$ minus her utility under G_X equals

$$1 - \int_z^1 \overline{G}_X dx - 1 + \int_z^1 G_X dx = \int_z^1 G_X - \overline{G}_X dx = \int_0^z \overline{G}_X - G_X dx \geq 0.$$

The inequality follows from $\overline{G}_X$ being an MPS of G_X. To see this, note that

$$\int_z^1 \overline{G}_X dx = \int_0^1 \overline{G}_X dx - \int_0^z \overline{G}_X dx,$$

and recall that $\int_0^1 \overline{G}_X dx = \int_0^1 G_X dx$. □

By Lemma B.1 the shareholder, endogenously, wants to become perfectly informed. Thus, by Proposition 1, first-best is not attainable if shareholders can acquire additional information. This result also holds if the shareholder could acquire information about both states of the world:

Lemma B.2. Suppose the shareholder is perfectly informed about ω_E and ω_I. Then, the first-best allocation is never implemented.

Proof of Lemma B.2. Suppose the shareholder can choose information structures H_E and H_I at zero costs as follows: there are two independent signals $X_E, X_I \in [0,1]$ inducing joint distributions over signals and states $H_I : [0,1] \times [0,1] \to [0,1]$ and $H_E : [0,1] \times [0,1] \to [0,1]$. As before we focus on signals that fulfill $\mathbb{E}[\omega_E | x_E] = x_E$ and $\mathbb{E}[\omega_I | x_I] = x_I$. We denote the marginals by H_{X_E} and H_{X_I}. Now, the shareholder can acquire any information $(H_{X_E}, H_{X_I}) \in \mathcal{H}$ where

$$\mathcal{H} := \Big\{ (H_{X_E}, H_{X_I}) \text{ cdfs over } [0,1] :$$

$$\int_0^y F_I(\omega_I) d\omega_I \geq \int_0^y H_{X_I}(x_I) dx_I \ \forall\, y \in [0,1], \int_0^1 F_I(\omega_I) d\omega_I = \int_0^1 H_{X_I}(x_I) dx$$

$$\text{and} \int_0^y F_E(\omega_E) d\omega_E \geq \int_0^y H_{X_E}(x_E) dx_E \ \forall\, y \in [0,1], \int_0^1 F_E(\omega_E) d\omega_E = \int_0^1 H_{X_E}(x_E) dx \Big\}.$$

In the same way as in Lemma B.1, one can show that it is optimal for her to acquire full information about ω_E, as well. Her tendering decision becomes $\gamma p_E + (1-\gamma)\omega_E \geq \omega_I$ and suppose first-best is implementable, so it follows that $p_E = \omega_E$. Given full separation, we obtain the result with the same arguments as in the proof of Proposition 1. □

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