Takeover Bidding and Shareholder Information*

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Abstract

We study the role of shareholder information in tender offers. In the context of the "free-rider" problem associated with the takeover of widely held firms, we present a setting in which profitable takeovers are possible even with no prior holdings or ex post dilution as long as there is uncertainty regarding the motivation for the takeover attempt. When shareholders all share the same information concerning the post-takeover value of the firm, increasing the precision of their information has no effect on the expected price for a successful takeover. However, more precise information does aggravate the free-rider problem, allowing shareholders to better discern when it is worthwhile to hold out instead of tendering their shares. In contrast, when the information is dispersed among the shareholders then providing shareholders with superior information induces the raider to offer higher prices, thus increasing shareholder value. Furthermore, neither prices nor tendering decisions aggregate any information. We study implications of the design of the corporate charter on takeover activity.

1 Introduction

An important and long-standing question in the context of the market for corporate acquisitions is whether a new management team (a "raider") with the potential to increase value can successfully take over a target firm that is widely held. If such takeover is indeed possible, a follow-up question is the determination of the premium that must be offered to existing shareholders to induce them to sell their shares. The predominant answer found in the literature is that successful and profitable takeovers of firms with diffuse ownership is only possible if the raider has either the ability to exclude some shareholders from any post-takeover gains (e.g., via dilution, freezeouts, or because of private benefits), or holds an initial stake (a "toehold") in the target firm.[1] The intuition for this finding stems from the logic of the free-rider problem identified by Grossman and Hart (1980): if shareholders do not view themselves as pivotal in the success of the takeover, they will be unwilling to tender their shares whenever they suspect the bidder of having a higher valuation for their firm than what is being offered.

The incentive an individual shareholder may have to free-ride on the tendering decisions of his peers poses a problem for the efficacy of the takeover market as a form of corporate control, as it decreases a raider's incentive to bid for a firm. Moreover, since this problem is rooted in shareholders' beliefs about the value of the firm to the raider, it becomes particulary pernicious as shareholders become better informed about the value of their firm to outside parties. Our analysis revisits the free-rider problem in takeovers and focuses on the role of information in affecting shareholders' tendering decisions. In particular, we distinguish between information that is public and known by all shareholders, and private information, where each shareholder has some information but does not know everything that its peers know. We show that the role of information in shaping takeover bids depends crucially

[1] This argument is due to Grossman and Hart (1980). See Shleifer and Vishny (1986) and Singh (1998) for the role of large shareholders and toeholds, and Amihud, Kahan, and Sundaram (2004) and Gomes (2001) for freeze-outs. Grossman and Hart (1988) discuss the relevance of private benefits of control and its impact on the market for corporate control.

on this distinction, suggesting that the use of internal governance mechanisms, disclosure regulations, or analyst coverage, to name a few, will have important implications for the market for corporate control and for the value shareholders can extract from a takeover bid.

We present a model where a raider has one of two different motivations for undertaking an acquisition: either because he derives high cash flow (i.e., security) benefits from the transaction, or because he derives a private benefit that leads him to expand the resources under his control.[2] The key assumption in our analysis is that shareholders do not know the exact reason for a takeover bid, and so cannot perfectly distinguish whether the offer is one that understates the value of the firm, or over-states it by partly reflecting the private value the raider may have. Shareholders do, however, obtain an informative signal as to the value of the firm to the raider and can use this information in deciding whether to tender their shares for the offered price. We consider two alternative information structures, one where shareholders observe only a public signal and the other where each shareholders observes a private signal.

As our main focus is on the role of shareholder information, we first establish that a value-increasing takeover of a widely held firm can occur even if the raider has no private benefit of control or any initial holding in the target firm.[3] If both types of raider make the same offer in equilibrium, shareholders must surmise that with some probability the raider has a low valuation but is in fact over-bidding in order to obtain a private benefit of control. They will thus have an incentive to tender their shares for a sufficiently high offer, without being able to extract the entire surplus from a value-increasing raider.

We present our main results within this context. We first show that if shareholders all observe the same information, then increasing the precision of this information aggravates

[2]This latter rationale for an acquisition is analogous to the "empire-building" activities of corporate managers identified by Jensen (1986). Burkart, Gromb, and Panunzi (1998) offer an alternative explanation for private benefits of control as a strategic choice variable by the acquiring party. A private benefit can also be obtained through oligopolistic competition, where the drive to expropriate a competing firm may lead to over-bidding for a target firm. Since some of this expropriation accrues only to the acquirer, shareholders that hold out are prevented from reaping all the benefits associated with the takeover.

[3]Throughout, we refer to a successful takeover as one that is also profitable for the raider, in that it is able to capture some of the surplus generated from the acquisition.

the free-rider problem since it allows shareholders to hold out precisely when the raider is likely to create the most value. However, it also means that shareholders are more likely to recognize when there is less value to be gained from holding out, which is when the public signal is negative, allowing a takeover to occur at a lower price. On net, therefore, conditional on a takeover occurring, an increase in the precision of public shareholder information has no effect on the expected price. However, reducing the expected profit of the value increasing raider may have a negative impact on shareholder value as it may curb the incentive to take over and improve value. Therefore, if there is a cost associated with identifying a target and making a bid, then improving the quality of public information skews the distribution of acquisitions towards raiders who are motivated by private benefits rather than value creation.

Our second main result focuses on the case in which shareholders' information is private. In contrast to the case with public information, for this second case we show that for a successful takeover to occur the offered price must be above the expected value to a shareholder who has observed a positive signal regarding firm value. To illustrate why this is the case, consider the equilibrium strategies followed by shareholders. If shareholders with positive signals were to behave differently upon receiving an offer than those with negative signals, then the equilibrium outcome - a successful or a failed takeover bid - would reveal the type of the raider. But this means that no individual shareholder would be willing to tender his shares when the introspection obtained by conditioning on the outcome of the takeover bid implies that the raider derives a high cash flow benefit from the firm. Moreover, a similar logic shows that *all* shareholders would prefer to tender if the equilibrium outcome reveals the raider to have a low value for the firm. This argument implies that in order for a takeover bid to be successful all shareholders must behave in the same way independently of the information they have, contradicting the conjecture that they behave differently. We can now consider the choice of a shareholder who has observed a positive signal. Since the equilibrium outcome reveals nothing about either other shareholder's information or about the identity of the raider, the only rational thing for this shareholder to do is to tender only

if the offered price is above his expectation of the value of the firm to the raider.

We also show that, for the private information case, improving the quality of the information shareholders have about the post-takeover value of the firm raises the minimum price a raider must offer to ensure the tender offer is successful. The intuition for this result follows directly from the above. In order for a takeover bid to be successful it must induce shareholders to tender irrespective of their private information. This means that in equilibrium none of the shareholders' information is aggregated, as that would reveal the true post-takeover value and would give rise to a free-rider problem. Consequently, as shareholders' information about firm value becomes more precise, the raider must offer a higher price to induce shareholders to tender. Note, however, that while improving the quality of information available to shareholders raises the price they receive in case of a takeover, from an ex ante perspective it may decrease the likelihood that an offer is ever made as it reduces the rents earned by the raider. In this sense, unlike for public information, improving the precision of private information creates a trade-off for shareholder value.

From a policy point of view, our results imply that whether nurturing an environment that allows and encourages shareholders to obtain information is beneficial depends to a large extent on whether it leads to more public information or to larger differences of opinion as some shareholders may be privately informed through monitoring or may be more sophisticated in analyzing any available data. Therefore, having more analyst following, higher disclosure and transparency requirements, and more blockholders monitoring should result in different levels of shareholder value creation as they all have different implications in terms of public vs. private information. For instance, the existence of institutional investors is more likely to lead to greater differences of opinion as compared to the effect of increased disclosure requirements or analyst coverage. Consequently, one would expect higher stock prices in the presence of institutional investors when analyst coverage is limited. This implication of our model is in line with recent empirical literature. For instance, Cremers and Nair (2005) find that among firms that are vulnerable to takeovers, those with institutional

investors and less analyst coverage have higher abnormal stock returns.

Our model also offers a new perspective on the issue of shareholder involvement and activism. For instance, Admati et al. (1994) demonstrate that large shareholders with access to a monitoring technology can play an important role in the governance structure of the firm. However, the resolution of the free-rider problem rests on the ability of a raider to hide his value for the target firm. Our analysis therefore highlights a countervailing force to the notion that having a more informed shareholder body promotes internal governance mechanisms, for which large shareholders are a crucial ingredient: information, by aggravating the incentives of smaller shareholders to hold out, may be counter-productive to the extent that the outside takeover market is used as an external governance mechanism aimed at increasing firm value.[4]

We also consider the role of the corporate charter in influencing activity in the market for corporate control. Specifically, we consider the choice of a "supermajority" rule and show that the corporate charter can be set so as to extract surplus from inefficient raiders who add no real value to the firm, while at the same time maximizing the return to raiders who bring true synergistic gains. In this respect, the corporate charter can act as a commitment device to increase shareholder value without overly reducing the incentives for value-increasing raiders to participate in the takeover market. We also show that the supermajority rule that achieves these objectives will be decreasing in the quality of information shareholders expect to have. The reason for this is that as the quality of information available to shareholders improves, a raider with a low securities value but with a private benefit will be less likely to be able to bid for a firm if, in addition to paying a higher price for each share, it also has to purchase a large fraction of the shares.

Earlier work on the free-rider problem in corporate takeovers has focused on the role of large blockholders (Shleifer and Vishny, 1986, Cornelli and Li, 2002), toeholds[5] (Hirshleifer

[4]See, e.g., Scharfstein (1988), for a theoretical study of role of an active takeover market in providing managerial discipline, and Kini et al. (2004) for recent empirical evidence on the effectiveness of takeovers as a form of corporate governance.

[5]There is also a broad literature on competitive bidding that abstracts from the free-rider problem and focuses on how the equilibrium bidding behavior is affected by the existence of a toehold. See, for instance, Singh (1998) and Bulow et al. (1999).

and Titman, 1990), or noise traders (Kyle and Vila, 1992) in resolving this problem. The possibility of making shareholders pivotal has also been studied (e.g., Bagnoli and Lipman, 1988, or Holmstrom and Nalebuff, 1992), as well as the dynamics of bidding behavior over time (e.g., Harrington and Prokop, 1993). More recently, Mueller and Panunzi (2004) focus on the role of leverage in reducing the impact of the free-rider problem. To the best of our knowledge, none of these papers study how shareholder information may interact with the free-rider problem to influence bidding behavior.[6]

The paper proceeds as follows. In Section 2 we present a model of bidding for a firm with diffuse ownership. We analyze this model in Section 3, and show that bidding behavior is affected by the extent of shareholder information. In Section 4 we consider the role of a supermajority rule. Section 5 offers a discussion and presents an extension to the case with a continuum of possible raider types. Section 6 concludes.

2 Model

There are a continuum of shareholders of measure 1, each of which owns an equal fractional share of the firm. Indexing shareholders by $i \in [0, 1]$, it is clear that there is a mapping between shareholders and their ownership of stock in the company, so that we may equally refer to the share owned by each shareholder with the same variable i.

There is a raider who is one of two possible types. One, which we refer to as a "good" raider, has a value for the target firm of v_g, while the other, referred to as a "bad" raider, has value v_b, with $v_g > v_b$. The bad raider also has a private benefit of control $B > 0$ and thus would like to take over the target firm for non-pecuniary reasons.[7] The likelihood that

[6] Grossman and Hart (1981) argues that uncertainty only about post takeover value does not allow successful takeovers. They do not study, however, how improving shareholder information affects the way a raider may behave.

[7] Following the literature on takeovers of widely held firms, we assume that the raider is a single entity maximizing cash surplus from the shares acquired plus private benefits of control. However, one can extend the model to allow an agency problem within the acquiring firm. In particular, the acquiring firm may have a manager whose interests are not perfectly aligned with those of the shareholders. Although our results are qualitatively robust to this extension, there is one quantitative difference as we discuss in the Section 3.2.

the raider is good is q, so that the ex ante distribution of value for the raider is therefore $\bar{v} = qv_g + (1-q)v_b$. The initial value of the firm (i.e., pre-takeover) is v_0. While we assume that the good raider indeed will add value to the firm relative to its current value, so that $v_g > v_0$, we impose no restriction for now on the value to the bad raider, v_b, relative to v_0, which we assume to be less than or equal to $\bar{v}$.

To model the information shareholders have or receive about their firm or about the market for corporate control, we assume that each shareholder i observes a signal $\eta_i \in \{b, g\}$ on the value the raider assigns to the target firm. This signal has quality $\phi > \frac{1}{2}$, defined as $\phi = \Pr(\eta_i = g|v_g) = \Pr(\eta_i = b|v_b)$. We consider two different information structures. The first is a setting where the signal is public, so that everyone observes the same signal and consequently all shareholders have the same information. The second setting is one where each shareholder's signal is private, and we assume that signals are conditionally independent across shareholders. This second setting corresponds to a situation where shareholders differ in the way they individually evaluate any relevant information or in the information to which they each have access.

We assume that making a takeover offer is costless (although we return to this issue later, as it is crucial for understanding the role of the free-rider problem in takeovers). We also assume that the raider uses restricted and conditional tender offers.[8]

The timing is as follows:

1. The raider's type is determined: either v_b or v_g.

2. Shareholders receive their signal(s) about the raider's type.

3. The raider, upon privately observing his type, submits a bid to shareholders that specifies a price, p, as well as the fraction of shares he is willing to purchase, θ. This offer is conditional on being successful in purchasing a majority of the shares necessary to acquire control.

[8] All results go through in similar fashion if instead we restrict the analysis to unconditional offers. See Yılmaz (1998).

4. All shareholders decide simultaneously whether to tender their shares or not. If more than a fraction θ of shares are tendered, the raider applies the following rationing scheme: if a mass $T > \theta$ shares are offered, the raider chooses randomly among these to determine which to purchase. Those not purchased revert back to the tendering shareholders. Takeover occurs if the raider obtains a fraction of shares greater than or equal to $\frac{1}{2}$.[9]

3 Analysis

Our focus will be on symmetric pure-strategy (Perfect Bayesian) equilibria in which all shareholders with the same information behave symmetrically. While this restriction simplifies the presentation of results in the text, we show in the appendix that allowing for mixed-strategy equilibria does not change the qualitative nature of results. In what follows we will also restrict the analysis to equilibria where tendering occurs with some positive probability, as with conditional offers there are a multiplicity of equilibria where no tendering ever occurs.[10] Finally, since our objective is to establish conditions for value-increasing takeovers to occur, we will focus on equilibria where at least the good type raider makes positive profits from a successful takeover.

As a preliminary observation, note that no successful equilibrium can exist in which $\theta < \frac{1}{2}$, as then the takeover would not occur. We can therefore trivially restrict our analysis to offers in which $\theta \geq \frac{1}{2}$. Upon observing its signal, each shareholder forms a posterior on

[9] We relax this restriction later to allow for supermajority rules demanding that a higher fraction of shares be purchased in order for the takeover to occur.

[10] This is easily seen by looking at what happens if shareholders believe that no one else will tender. With conditional offers, it is then a weakly optimal strategy to also not tender, thus yielding an equilibrium where no one tenders no matter what offers have been made. These equilibria, however, are Pareto-dominated by any equilibrium where tendering occurs, since both the raider and the shareholders benefit from the takeover.

the type of the raider by Bayesian updating. Specifically,

$$\begin{aligned} \Pr(v_g|\eta_i = g) &= \frac{q\phi}{q\phi + (1-q)(1-\phi)} \equiv \Phi_g \\ \Pr(v_b|\eta_i = b) &= \frac{(1-q)\phi}{(1-q)\phi + q(1-\phi)} \equiv \Phi_b \end{aligned}$$

From this, it is easy to see that $E[v|\eta_i = g] = \Phi_g v_g + (1-\Phi_g)v_b$ and $E[v|\eta_i = b] = (1-\Phi_b)v_g + \Phi_b v_b$, where the expectation represents the expected value conditional on the takeover being successful. Note that, since $\phi > \frac{1}{2}$ (i.e., the signal is informative), we have that $E[v|\eta_i = g] > \bar{v} > E[v|\eta_i = b]$.

We first establish that the good raider can never make positive profits in a separating equilibrium.

Lemma 1 *There is no equilibrium in which the good raider makes positive expected profits from the takeover attempt if each type of raider offers a different price for the firm, or if they offer to buy different fractions of the firm.*

Proof: This is a straightforward application of the results on the free-rider problem found in Grossman and Hart (1980). If each type of raider offers a different price, then the offer reveals the type of the raider to shareholders. Knowing the raider is good, each (infinitesimal) shareholder would refuse to tender for a price less than v_g, thus leaving no profit to the good raider. The same argument holds if the fraction of shares each type of raider offers to buy differs. □

The previous result establishes the simple observation that if shareholders perfectly know the valuation the raider assigns to their firm, they will have an incentive to hold on to their shares any time the raider's bid does not reflect this valuation. In other words, the previous result simply lays out the classic free-rider problem in the context of our model.

An implication of the above is that, in order for a value-increasing raider to make strictly positive profits from the takeover attempt, it must be that both types of raider pool on the

same offer.[11] From the perspective of a bad raider, it is also worth noting that in order to separate and for the takeover to succeed he would need to bid a price at or above the value to the good raider, v_g (for completeness, we analyze these equilibria in Section 3.3). In the pooling equilibrium we characterize below, successful takeovers can be achieved by both raiders at lower prices.

3.1 The Effect of Public Information

Assume that the signal is public information. When shareholders' information is public, i.e., when $\eta_i = \eta \in b, g$ for all $i \in [0, 1]$ and the realization of η is common knowledge, all shareholders will share the same posterior probabilities on the firm's post takeover value. We can now establish the following result.

Proposition 1 *For a given η, there exists an equilibrium outcome in which a successful takeover occurs if and only if $B \geq \frac{1}{2}\Phi_\eta(v_g - v_b)$. In such an equilibrium outcome both types of raider make the same tender offer (p, θ), where $p \in [E[v|\eta], v_b + \frac{B}{\theta}]$ and $\theta \geq \frac{1}{2}$, and all shareholders tender at the offer (p, θ).*

Proof: If both raider types pool and make the same offer (p, θ), no information is revealed by the offer, so that shareholders' beliefs conditional on seeing the offer are the same as their posterior beliefs on firm value given by $E[v|\eta]$. It is therefore individually optimal for any shareholder to accept any price $p \geq E[v|\eta]$. Moreover, there does not exist a successful takeover with any price less than $E[v|\eta]$, as no shareholder would want to tender to such an offer, preferring instead to hold on to their shares and enjoy the post-takeover value, which in expectation would be $E[v|\eta]$.

Conversely, given that all shareholders tender if and only if the offered price is sufficiently high, both types of raider have an incentive to offer a price $p \geq E[v|\eta]$. To show that offering the price p is an equilibrium, simply fix the off the equilibrium path beliefs such that for

[11] We discuss how our results extend to semi-pooling equilibria in the appendix.

any price $p' \neq p$, or any fraction $\theta' \neq \theta$, all shareholders believe with probability one that the raider offering the (deviating) price p' or fraction θ' is good. Given these beliefs, neither raider has an incentive to deviate from the proposed pooling equilibrium.

Note that the bad type raider's profit is $B - \theta[p - v_b]$ in equilibrium. Therefore, his profit is bounded above by $B - \frac{1}{2}[E[v|\eta] - v_b]$. Thus, for $B < \frac{1}{2}\Phi_\eta(v_g - v_b)$, it is never profitable for a bad raider with value v_b to offer $p \geq E[v|\eta]$. Since his return from bidding must also be non-negative, the offered price must be no greater than $v_b + \frac{B}{\theta}$.

Finally, the takeover will only occur if $\theta \geq \frac{1}{2}$, so any raider must offer to buy a fraction at least equal to one-half of the outstanding shares. □

The proposition establishes that it is an equilibrium for both types of raider to pool and offer the same price in the tender offer, as long as this price is high enough. Specifically, the minimum price that must be paid in equilibrium is equal to the expected value of the firm conditional on the public signal, as shareholders will be unwilling to tender for any price lower than what they anticipate the firm being worth under the raider.[12] Moreover, the proposition demonstrates that, as long as a sufficient number of shares are purchased so that the takeover is successful, any offer with a price $p \geq E[v|\eta]$ can constitute an equilibrium. The intuition for the result is that a raider may initiate a takeover attempt either because he anticipates producing high expected cash flows from the acquisition or because he derives some private benefits from the acquisition. In the latter case, the raider may be willing to overpay for the shares in the tender offer relative to what those shares are worth post-takeover. These two possible rationales for an acquisition introduce uncertainty on the side of shareholders concerning the post-takeover value of the firm, thus making it difficult for them to extract the entire value of the takeover from a high-valuation raider. Since the bid may be submitted by a bidder with a private benefit, it may thus represent over-bidding relative to the post-takeover value of the firm. The possibility of such over-bidding induces

[12]It is straightforward to show that the low price equilibrium outcome is the only robust equilibrium outcome in the sense of satisfying the requirements for a version of the Perfect Sequential Equilibrium concept (Grossman and Perry, 1986) when restricted to the set of Pareto undominated outcomes.

shareholders to tender once the price is sufficiently high.

However, Proposition 1 also establishes that, given that the signal can be either good (g) or bad (b), the minimum bid price may be higher or lower than the prior value of the firm, $\bar{v}$. Focusing on the lowest possible price, $\hat{p} = E[v|\eta]$, we obtain the following immediate implication.

Corollary 1 *The expected minimum price paid for the firm, $\hat{p}$, is equal to $\bar{v}$, the prior value of the firm. An increase in the quality of the public signal, ϕ, has no effect on the expected lowest price $\hat{p}$.*

Proof: The expected value of the minimum price $\hat{p}$ can be obtained by the Law of Iterated Expectations as $E\left[E[v|\eta]\right] = E[v] = \bar{v}$, which is clearly independent of ϕ. □

The corollary establishes that improving the quality of the public signal has no effect on the price shareholders can expect to obtain from a raider. Better general knowledge about the extent of mismanagement of the firm or about possible synergies that can be created by a new management team aggravates the free-rider problem since it allows shareholders to hold out precisely when the raider is likely to create the most value. Shareholders will therefore be less willing to tender their shares the more they think the firm will be worth post takeover. This effect, while not developed formally within a context where shareholders' information can be improved, has been discussed in the literature on takeover bidding (see, e.g., the survey by Becht et al., 2003).[13]

However, the corollary also points out that shareholders should recognize when there is less value to be gained from holding out (i.e., when the public signal is negative), allowing a takeover to occur at a lower price. This aspect of an increase in the quality of public information has, to our knowledge, not been discussed before. The implication is that, on average, there is no effect on the value conditional on a takeover bid occurring. As we

[13] "Paradoxically, disclosure and insider trading laws may actually make hostile takeovers harder ... Indeed, the market for corporate control should work better in regulatory environments with low shareholder protection and lax disclosure standards, so bidder incentives are not eroded by the free-rider problem," (p. 50).

show in the next section, this contrasts markedly with the results for the case where each shareholder's information is private.

One interesting effect that arises from an improvement in the quality of public information is that it skews the distribution of successful takeovers away from those that increase value and toward ones that are motivated by attempts to obtain a private control benefit. More formally, conditional on the raider being good, an increase in ϕ increases the probability that shareholders will observe a high ($\eta = g$) signal and will thus demand a high price. This reduces the incentive for a good type raider to bid. Conversely, conditional on the raider being bad, an increase in ϕ also increases the likelihood that the public signal will be low ($\eta = b$), leading shareholders to be willing to tender for a lower price. This reduction in the price increases the incentive for a bad type raider to bid. On net, this implies that bad raiders should be more likely to bid successfully (and profitably) for a firm relative to good raiders, thus tilting the distribution of realized bids away from those that create value. Taking into account the possibility that a raider incurs a cost with placing a bid therefore implies that the price shareholders obtain should on average be lower as ϕ increases.

3.2 Private Information and Offer Prices

So far, we have analyzed the case where all investors observe a public signal about firm value, and use that information to update their priors to a common posterior. Here, we analyze the alternative case where the signals shareholders observe about the post-takeover value of the firm are instead private, i.e., each shareholder i receives a signal $\eta_i \in \{b, g\}$ independently drawn conditional on the type of the raider. We show here that the results for this case are significantly different from those obtained in the previous section.

We proceed now in steps to establish the conditions for a pooling equilibrium with strictly positive profits to exist. The following preliminary result characterizes a restriction on equilibrium shareholder behavior.

Lemma 2 *If both types of raider pool and make the same tender offer (p, θ), there is no*

equilibrium for $p < v_g$ in which each shareholder's tendering decision is a function of the realization of his signal η_i, and the good raider makes positive profits.

Proof: Suppose to the contrary, and that, for instance, shareholders with a good signal ($\eta_i = g$) all tender for a bid $p < v_g$, and shareholders with a bad signal ($\eta_i = b$) do not tender at this bid price. Consider the choice for shareholder i, having observed a good signal, $\eta_i = g$. Suppose that the tender offer is successful and the takeover is expected to take place. This implies that a fraction greater than or equal to $\frac{1}{2}$ of shareholders must be tendering. Since the precision of each signal is $\phi > \frac{1}{2}$, by the Law of Large Numbers we know that a fraction ϕ of shareholders must have observed the correct signal and, assuming everyone else follows the equilibrium strategies, are therefore tendering. In order for this to be consistent, it must be that the type of the raider is in fact good. But if this is the case, shareholder i is better off not tendering since the post-takeover value of the firm can now be inferred to be $v_g > p$. Therefore, a shareholder with a good signal does not in fact want to follow the proposed equilibrium strategy.

If instead we conjecture that shareholders with a bad signal ($\eta_i = b$) tender for a certain bid price p, and shareholders with a good signal ($\eta_i = g$) do not tender at this bid price, then a similar argument leads us to a contradiction as shareholders with a good signal wish to tender their shares. This shows that the case where both raiders offer a price less than v_g cannot be an equilibrium, as desired. Note as well that this argument is independent of θ, the fraction of shares the raider offers to purchase. □

This result demonstrates that it will never be an equilibrium for shareholders to condition their tendering decisions on the realizations of their signals if raiders pool at any price below the full value of the takeover target to the good raider. The intuition for this result can be obtained by focusing on the tendering decision of one individual shareholder. If all other shareholders follow a strategy that is a function of the information they received, then the expected success (or failure) of a takeover bid reveals information as to the aggregate

information obtained by shareholders, and thus perfectly reveals the type of the raider.[14] Therefore, any individual shareholder would not find it optimal to tender for a price less than the full value to the raider, implying that no equilibrium of this type can exist. Put differently, the lemma establishes that in order for the high quality raider to make positive profits from the takeover attempt, in equilibrium shareholders must act independently of their information so that none of their information is aggregated, as that would reveal the true post-takeover value and would give rise to the well-known free-rider problem.

However, we also know that pooling at some price is a necessary condition for the good type raider to make positive profits in equilibrium. Therefore, if an equilibrium in which the good raider makes positive profits exists, it must be that shareholders' tendering strategies are independent of the realizations of their signals, and all shareholders follow the same strategy. The following result formalizes this intuition and sets a lower bound for a feasible, profitable pooling equilibrium price.

Lemma 3 *There is no equilibrium with positive profits for the good raider in which both types of raider pool and make the same tender offer* (p, θ)*, with price* $p < E[v|\eta_i = g]$*, and all shareholders follow the same tendering strategy.*

Proof: Suppose that shareholders follow the strategy that requires them to tender for some price $p \geq p_0$. Consider the decision of shareholder i having observed $\eta_i = g$. Since all shareholders are following the same strategy and will be tendering, the likelihood that the takeover will be successful provides no additional information to this shareholder. Therefore, this shareholder should tender only if $p \geq E[v|\eta_i = g]$, since that represents his beliefs about the value of each share if the takeover succeeds. Since all shareholders make the same evaluation, no shareholder observing a good signal will tender for a price less than $E[v|\eta_i = g]$. Since a good raider expects that a fraction $\phi > \frac{1}{2}$ of shareholders will observe

[14] See Yılmaz (2000) for a formalization, in the context of proxy fights, of the idea that agents aggregate information about other agents' information from the realized outcome. Austen-Smith and Banks (1996) and Feddersen and Pesendorfer (1996) are among the first to explore the implications of this so-called "strategic voting", which represents a situation similar to that modeled here.

a high signal and will therefore not tender, offering a price $p < E[v|\eta_i = g]$ cannot be an equilibrium in which tendering occurs with positive probability. □

The above demonstrates that there is no pooling equilibrium in which tendering occurs with some probability and in which both raiders make an offer lower than the value conditional on observing a good signal ($\eta_i = g$). The intuition for this result follows from the fact that, if in equilibrium all shareholders were to follow the same tendering strategy independently of the realization of their signal, the takeover would be successful or not independently of what a single shareholder chooses to do. But if the tender offer is expected to lead to a successful takeover, any shareholder receiving a positive signal ($\eta_i = g$) would prefer to hang on to his share instead of tendering at a lower price, since he expects that the value of the firm after the takeover will be higher than what is being offered. Hence, such a low price cannot succeed in acquiring the target firm. In essence, the lemma establishes as a necessary condition that the raider offer a price that is sufficiently high so as to induce shareholders to act independently of their signals.

What remains is to show that offering a price $p \geq E[v|\eta_i = g]$ can in fact constitute an equilibrium. To highlight the relationship between the lowest possible tender offer price and the quality of information, we define $\tilde{p}(\phi) \equiv E[v|\eta_i = g]$.

Proposition 2 *There exists an equilibrium outcome in which a successful takeover occurs if and only if* $B \geq \frac{1}{2}\Phi_g(v_g - v_b)$. *In such an equilibrium outcome both types of raider make the same tender offer* (p, θ), *where* $p \in [\tilde{p}(\phi), v_b + \frac{B}{\theta}]$ *and* $\theta \geq \frac{1}{2}$, *and all shareholders tender at the offer* (p, θ).

Proof: From Lemma 3, we can restrict our analysis to offers with $p \geq \tilde{p}$. If both types of raider make the same tender offer (p, θ), the offer itself reveals no additional information concerning the type of the raider. Given that all shareholders tender for an offer $p \geq \tilde{p}(\phi)$, the success of the takeover attempt also provides no additional information on the post-takeover value of the firm. Therefore, independently of the signal received, it is individually

optimal for any shareholder i to tender as long as the price offered is greater than or equal to $\tilde{p}(\phi)$.

Conversely, given that all shareholders tender if and only if the tender offer is sufficiently high, both types of raider have an incentive to offer the price $p \geq \tilde{p}(\phi)$. To show that offering the same price is an equilibrium, simply assume that for any price $p^{'} \neq p$, or any fraction $\theta^{'} \neq \theta$, all shareholders believe with probability one that the raider offering the (deviating) price $p^{'}$ or fraction $\theta^{'}$ is good. Given these beliefs, neither raider has an incentive to deviate from the proposed pooling equilibrium.

The conditions on B, p and θ are obtained in a fashion analogous to that in the proof of Proposition 1. □

This last result is similar to that of Proposition 1 in that it shows that it is indeed an equilibrium for both types of raider to pool and offer the same price in the tender offer, as long as this price is high enough. The intuition is likewise similar, in that shareholders recognize that a raider may initiate a takeover attempt for one of two reasons, implying that he may sometimes be willing to overpay for the shares in the tender offer relative to what those shares are worth post-takeover, which will be the case when the raider's motivation for bidding is to obtain a private benefit. The key difference between this result and that in Proposition 1 is that here the offered price on the shares must be at least as high as the posterior on firm value for a shareholder who observed a positive signal.

Combined with the previous results, we have established that the equilibrium set of offers that yield positive profits for the good raider and for which tendering occurs are offers with a price in the half-open interval $[E[v|\eta_i = g], v_g)$, and that no such equilibrium exists for prices lower than $E[v|\eta_i = g]$. Similarly, any offer with $\theta \in \left[\frac{1}{2}, 1\right]$ can also constitute an equilibrium with positive profits for the good raider. It is worth noting that while we have restricted the presentation of results to the analysis of pure-strategy equilibria, the restriction that successful takeovers are only possible for prices at or above $E[v|\eta_i = g]$ applies more generally. Specifically, in the appendix we show that there is also no mixed

strategy equilibrium in which there is both a positive probability of a takeover and in which the good raider makes positive expected profits for $p < E[v|\eta_i = g]$, implying that all positive-profit equilibria must have prices at or above $E[v|\eta_i = g]$.

We can now use this result to study how the set of equilibria varies with the quality of information. To emphasize the relationship between information and the lowest level of private benefits that allow for a profitable takeover, we define this lower bound as $\underline{B} \equiv \frac{1}{2}\Phi_g(v_g - v_b)$.[15]

Proposition 3 *Both the lowest price that produces a successful takeover if both types of raiders pool and the lowest level of private benefits necessary for a successful takeover are increasing in the quality of information shareholders have:* $\tilde{p}'(\phi) > 0$ *and* $\underline{B}'(\phi) > 0$.

Proof: The first part is immediate from observing that $\tilde{p}(\phi) = \Phi_g v_g + (1 - \Phi_g)v_b$, and that $\frac{\partial \Phi_g}{\partial \phi} = \frac{(1-q)q}{(q\phi+(1-q)(1-\phi))^2} > 0$. Combining this with the fact that $v_g > v_b$ establishes the first part. For the second part note that $\underline{B}$ is a linear function of Φ_g so that the result follows from the fact that $\frac{\partial \Phi_g}{\partial \phi} > 0$. □

The intuition for the first part is as follows. Shareholders anticipate that the expected value of the firm to a raider yielding a good signal is higher than average, and is increasing in the quality of the signal observed. Therefore, the lowest price shareholders will be willing to accept if they have observed a good signal will be increasing in the informativeness of their signals. Put differently, shareholders benefit from superior access to information since the minimum price a raider must bid increases. This implies as well that the equilibrium set of successful tender offers is strictly smaller (and a strict subset) for higher values of ϕ. Moreover, it is straightforward to show that the equilibrium outcome $(\tilde{p}, \frac{1}{2})$ – low price, low number of shares – is in fact the only robust outcome in the sense of satisfying the requirements for a version of the Perfect Sequential Equilibrium concept (Grossman and

[15]This lower bound on private benefits can be significantly lower if the acquiring firm suffers from an agency problem. For example, if the manager of the acquiring firm owns only a fraction δ of the firm's equity, then this bound becomes $\frac{\delta}{2}\Phi_g(v_g - v_b)$ as the manager only incurs a fraction δ of the overpayment.

Perry, 1986) when restricted to the set of Pareto undominated outcomes. The conclusions of Proposition 3 therefore apply as well to this unique robust equilibrium outcome.

The results from this section differ significantly from the case where all information is public, as studied in the previous section. Here, Propositions 2 and 3 combined demonstrate that an increase in the quality of shareholders' private information unambiguously increases the price a raider needs to pay for the firm, since the raider must bid in a way that discourages shareholders from actually making use of their private information.[16] This is true irrespective of whether the raider is likely to be of the good or the bad type as both types need to offer a higher price in order to induce shareholders to tender. From the perspective of a possible raider, therefore, an increase in ϕ reduces the profit he can hope to obtain from the takeover. Although shareholders obtain higher prices conditional on a bid being made, takeover activity is likely to be lower if raiders incur costs in the process of putting a bid together.[17] Moreover, from the second part of the previous proposition it is clear that, as shareholder information improves, a successful takeover requires the possibility of higher private benefits of control. This provides another reason why takeover activity can decrease as ϕ increases. Even with high private benefits, increases in ϕ are likely to reduce activity in the takeover market as raiders find it less worthwhile to invest resources in locating good takeover targets. This implication of an improvement in the precision of private information differs significantly from the public signal case, since it implies that any raider should find it less beneficial to bid for a firm, regardless of his motivation for bidding. By contrast, the public information case predicts that takeovers for reasons other than value improvements are more likely as the quality of information increases.

The model has a number of empirical implications with regards to abnormal returns, frequency of takeover attempts and value creation. The first empirical prediction of the model

[16]In Section 5.3, we discuss how this difference persists even if we allow shareholders' information to be correlated, as long as such correlation is not perfect. If the correlation is perfect, the private information framework we analyze collapses to the public information framework presented here.

[17]Such costs may be a result of disclosure requirements mandated by the SEC, actual costs associated with registering the bid and keeping it open for a certain period of time, or costs associated with advising services the raider may choose to obtain in the process of bidding.

is that improved shareholder information leads to higher takeover prices. However, these abnormal returns should be associated more with the production of shareholder information that leads to differences of opinion. For instance, the existence of institutional investors is more likely to cause higher prices than either the strengthening of disclosure requirements for the bidder or an increase in analyst coverage. From this perspective, our results can be seen as consistent with the findings in Cremers and Nair (2005), who show that (i) firms with public pension fund ownership experience abnormal positive stock returns when the threat of a takeover is high; and (ii) this effect is higher for smaller firms which usually have less analyst coverage. Another implication of our model is that improved shareholder information results in a lower fraction of firms being takeover targets, as the resulting higher prices decrease a raider's incentive to bid for the firm. However, according to our model, the nature of shareholder information should play a crucial role here as well. In particular, in the presence of improved public information the distribution of successful takeovers is skewed away from those that create firm value and toward those that do not. On the other hand, the lower frequency of takeovers is independent of the motives of the raider when shareholders holding private knowledge have access to more precise information. Our model therefore offers a number of predictions on when and if shareholders in practice benefit from superior information.

3.3 Other Equilibria

For completeness, we discuss here other equilibria that may arise for the private information case. In particular, there are potentially two types of separating equilibria in which a takeover may occur. Depending on the level of the private benefit of control, B, only one or both may exist. For low levels of B, ($B < \frac{v_g - v_b}{2}$), the type g raider offers a price $p = v_g$, whereas the type b raider either makes no offer or offers a price so low that no shareholder would be willing to accept. For high levels of B, ($B > v_g - v_b$), the type b raider offers $p = v_g$, whereas the type g raider either makes no offer or offers an unacceptably low price. For intermediate

levels of B, both types of separating equilibrium exist. Furthermore, the equilibria in which the type b raider is successful involves a low fraction of shares being purchased, whereas a higher fraction of shares are purchased in the equilibria in which type g is successful.

As noted in Lemma 1, however, all such separating equilibria yield zero profits for the value-increasing, type g raider. This explains our focus primarily on the pooling equilibria from the previous sections. Moreover, none of the separating equilibrium outcomes are robust, in the sense of failing to satisfy a version of the Perfect Sequential equilibrium concept (Grossman and Perry, 1986) augmented with Pareto optimality.

4 Corporate Control and the Corporate Charter

In the analysis so far, we have assumed that a simple majority of shares (50%) must be purchased in order for the takeover to be successful. Under that scenario, we showed that while there are a multiplicity of possible equilibria, a requirement for each of them is that the price be sufficiently high so as to induce shareholders to tender their shares. Here, we consider the case where the corporate charter can be designed to put in place a supermajority rule that requires a higher fraction of shares to be purchased in order to effect a takeover. This is an important issue, as supermajority rules are often seen as antitakeover measures for public firms. By contrast, we show that a higher supermajority rule in fact benefits the good raider by eliminating less profitable equilibrium outcomes, and thus should create greater incentives to sink resources into finding targets for acquisition. Since only the private information case was shown to have any implications for the expected price of a takeover, we restrict our analysis to that case.

Consider the return to bidding for the low-value raider. For any private benefit B, his willingness to bid is restricted by the fact that he must earn a non-negative return, or that

$$\theta(v_b - p) + B \geq 0,$$

where θ is the fraction of shares he agrees to purchase and p is his tender offer price. Satisfying the preceding expression with equality, we can solve for the maximum number of shares that the low-value raider is willing to purchase, for any given bid price p, as

$$\theta_b(p) = \frac{B}{p - v_b} \tag{1}$$

Note that, by purchasing a fraction θ_b of the shares at price p, the low-value raider earns no rents from the transaction.

Consider now the choice of supermajority rule. Specifically, let γ represent the fraction of shares that must be purchased in order for the takeover to be effected. Since, absent other restrictions, the equilibrium price is indeterminate (see Proposition 2), Equation 1 does not pin down a unique fraction of shares that must be purchased. Consider, however, the supermajority rule $\gamma^* = \theta_b(\tilde{p}) = \frac{B}{\tilde{p}(\phi) - v_b}$. Given this choice of γ, a low value raider can still bid the lowest price that will induce tendering, $\tilde{p}(\phi)$, but earns no additional rents from the takeover bid. Note as well that bidding any other price $p > \tilde{p}$ is infeasible since the low value raider would earn negative rents from the takeover attempt and so would simply refuse to participate, thus unravelling the pooling equilibrium from the previous section.

The preceding shows that the supermajority rule γ^* defined above not only extracts all surplus from the low-value raider, but also selects out a unique equilibrium outcome without resorting to other equilibrium selection concepts. More importantly, it is also true that, among all the possible equilibrium outcomes, the one selected by this supermajority rule, $(\tilde{p}(\phi), \gamma^*)$, is the most favorable to the good type raider as it involves the lowest possible price and the highest fraction of shares that can be purchased in a successful takeover.

The one remaining detail is to verify that such a supermajority rule is indeed well-defined,

i.e., that $\gamma^* \in \left[\frac{1}{2}, 1\right]$. This will be satisfied as long as

$$\begin{aligned} & \gamma^* = \frac{B}{\tilde{p}(\phi) - v_b} \in \left[\frac{1}{2}, 1\right] \\ \Leftrightarrow \quad & B \in \left[\frac{1}{2}\Phi_g(v_g - v_b), \tilde{p} - v_b\right] \equiv \left[\underline{B}, \overline{B}\right] \end{aligned}$$

We note that the requirement that the private benefit obtained by the low value raider, B, be greater than $\underline{B} = \frac{1}{2}\Phi_g(v_g - v_b)$ is simply the requirement for an equilibrium where tendering occurs to exist (see Proposition 2). Otherwise, if the private benefit is too low, there is no combination of bid price and fraction of shares purchased such that the low value raider at least breaks even and shareholders are willing to tender.

We can now summarize the results of this section in the following proposition.

Proposition 4 *For $B \in [\underline{B}, \overline{B}]$, the highest supermajority rule that allows a successful takeover is $\gamma^* = \frac{B}{\tilde{p}(\phi) - v_b}$, resulting in a unique equilibrium outcome $(\tilde{p}, \gamma^*)$. This is the most profitable outcome for the good type raider from the set of equilibrium outcomes characterized in Proposition 2. For $B < \underline{B}$, no profitable takeover exists.*

We can also derive a simple comparative statics result on the relationship between the highest supermajority rule and the quality of information available to shareholders.

Corollary 2 *For $B \in [\underline{B}, \overline{B}]$, the highest supermajority rule γ^* is decreasing in ϕ, the quality of the information available to shareholders.*

Proof: Since $\frac{\partial \tilde{p}}{\partial \phi} > 0$, for $B \in [\underline{B}, \overline{B}]$ simple differentiation of $\gamma^* = \frac{B}{\tilde{p} - v_b}$ with respect to ϕ shows that $\frac{\partial \gamma^*}{\partial \phi} < 0$. □

The corollary establishes an intuitive comparative statics result for the highest supermajority rule. As the quality of information shareholders receive, ϕ, improves, the minimum price required to induce them to tender, $\tilde{p}$, increases as well. This is a consequence of the free-rider problem identified earlier, in that better information makes it less likely that

shareholders will be willing to tender when their information identifies the raider as having a high valuation for their firm. However, the increase in the minimum bid price reduces the expected number of shares that the bad type raider is able to profitably purchase. In other words, in order to allow both types of raider to participate, the supermajority rule that maximizes the good raider's profit ex ante must be decreasing in the quality of information shareholders have.

Proposition 4 highlights a novel channel by which the corporate charter can influence takeover activity. The standard reason why the free-rider problem precludes takeovers is that a raider whose motive is identified as being solely to create higher cash flows cannot profit from its own value creation. Given the low expected returns due to the free-rider problem, good raiders (with high firm values) may not have sufficient incentives to participate in the market for control of widely held firms. Our previous proposition, however, illustrates an explicit link between the corporate charter and the minimum profit of such a raider, and thus activity in the takeover market. The tradeoff, however, is that a higher supermajority rule increases not only the minimum profitability for the good raider, but also increases the probability that a bad raider will be unable to participate, thus inducing a breakdown in the market for corporate control. Nevertheless, if identifying value-enhancing takeover targets is a costly activity, such a supermajority rule maximizes the incentive for a raider to invest in such prospects while at the same time extracting the surplus from raiders whose primary motivation stems from private control benefits.

Finally, it is worth noting that the model can easily be adapted to incorporate a fixed cost associated with bidding, as alluded to above. For example, let c represent the cost of bidding or, alternatively, a measure of the minimum surplus a raider needs to obtain in order to be willing to bid. Adding this term to the low-value raider's return changes the expressions for the lower bound only slightly, as now $\underline{B} = \frac{1}{2}\Phi_g(v_g - v_b) + c$, and the optimal supermajority rule becomes $\gamma^* = \frac{B-c}{\tilde{p}(\phi)-v_b}$. With these changes, all results go through exactly as stated. Note that this also establishes that shareholders can internalize the expected cost of takeovers or

surplus that raiders need to obtain in the process of choosing the supermajority rule.

5 Discussion

5.1 Surplus Extraction and Shareholder Information

A broad literature on takeovers has focused on settings where the bidders make take-it or leave-it offers to shareholders. In a framework with just one bidder and one seller, this typically results in the bidder capturing the entire surplus. In the context of the classic free-rider problem (e.g., Grossman and Hart, 1980), the incentive shareholders have to hold out and not tender their shares drives the result to the opposite extreme, so that the bidder receives no surplus. This result hinges, of course, on the fact that shareholders are unable to be pivotal when they hold only a negligible fraction of the shares. More recent work has highlighted how the addition of freeze-out clauses restores the result of full surplus extraction for the bidder as it eliminates any rewards from free-riding for shareholders (see, e.g., Amihud et al., 2004).

These arguments suggest that the framework of the widely held firm produces two extreme cases for the allocation of surplus. Although clearly neither conforms on its own to empirical regularities, we believe that both of these models are successful in identifying important forces in the market for corporate control. One way to close the gap between these two extremes may be to incorporate additional features of this market that have been neglected in this literature, such as a more complete formalization of the bilateral negotiation process.

Our focus, by contrast, abstracts from the specifics of the negotiation process and instead analyzes the effect of shareholder information, whether public or private, on takeover bidding. We show that, even in the absence of freeze-out clauses, the free-rider problem does not preclude profitable takeovers as long as there is uncertainty about the motives of the raider. More importantly, we analyze how prices and shareholder wealth is affected by the amount of information available to shareholders, and our framework allows us to

present empirical predictions consistent with stylized facts concerning the market for corporate control. As an example, we demonstrate that when information shareholders have is private, positive premiums must be offered in order to effect a successful takeover, and our framework establishes an explicit link between the quality of this information and the size of this takeover premium. Our framework also introduces a new perspective on the tradeoff between promoting shareholder activism by improving access to information while at the same time decreasing the efficacy of the external market for corporate control. By focusing on the distinction between the different types of information, our analysis provides a better understanding of how shareholders may fare as a result of proposals to improve access to information.

5.2 Competitive Bidding

A natural reason for uncertainty on the part of shareholders concerning the post-takeover value of the firm stems from the possibility that the observed offers may be the result of a process of competitive bidding. It is well-known that in many models of competitive bidding, competition often drives the price up until at least one bidder earns no rents from the planned purchase. Moreover, in settings with information asymmetries, there is often no guarantee that the outcome of the bidding process will deliver the target firm to the bidder with the highest ex ante valuation.[18]

While we have focused on the possibility of uncertainty concerning firm value for a single raider only, a formal model of competitive bidding under uncertainty could be introduced in a number of ways. To give an example, consider two raiders, each with a possibly different valuation (and private benefit) for the takeover target, bidding for a firm. Observing the winning offer, shareholders may be unaware as to whether this winning bid comes from a raider with a high valuation for the firm, or one with a somewhat lower valuation who may

[18]This is evident in the literature on bidding in auctions under asymmetric information, where the equilibrium of the bidding process often results in a mixed strategy equilibrium where each bidder has a strictly positive probability of winning the auction. See, for instance, Engelbrecht-Wiggans et al. (1982), or Hendricks et al. (1994).

have over-bid for the target firm. For instance, such overbidding may be due to oligopolistic competition in the industry, where the drive to prevent a competing firm from gaining a competitive advantage may lead to over-bidding for a target firm, thus preventing shareholders that hold out from reaping all the benefits associated with the takeover.[19] Since there is a strictly positive probability that the bid may have come from a raider who, as a result of the competitive bidding process, has bid away most of his surplus, shareholders must assign a strictly positive probability to the event that holding out for the post-takeover value will entail little further gain, and may in fact decrease the expected value of the bid if the transaction fails to close and there is no other bid forthcoming. In this case, shareholders may be better off tendering if the bid is sufficiently high simply because of the uncertainty related to the identity of the winning bid.

While the analysis of the competitive bidding process takes us far afield of the current paper, we would expect similar effects to be at work. Giving shareholders more information concerning the post-takeover value to the winning bidder increases the likelihood that they will hold out precisely when the winning bidder has a high valuation for the firm, but not when he has a low valuation. This aggravates the free-rider problem, and induces a change in the bidding behavior of the potential raiders. We leave the formal analysis of the effect of information and the free-rider problem on the bidding process for future research.

5.3 Correlation of Shareholders' Information

Throughout, we consider two polar cases, one with only a public signal and the other with private signals which are independent of each other conditional on the true value v_b or v_g. The latter case implies that even though the signals are clearly correlated by virtue of being informative, observing two signals should nevertheless provide more information than observing just one. Therefore, since there is a continuum of shareholders, aggregating signals

[19] A case in point is the acquisition of Consolidated Rail Corporation, where two rivals railroads, CSX and Norfolk Southern, were widely perceived as tendering competing offers primarily to prevent the other railroad from completing the acquisition. See, for instance, Esty (1998) for further discussion.

across all shareholders would reveal the true underlying state.

In practice, however, the information shareholders have may have both public and private components. This may occur if, for instance, all shareholders have access to the same information, but interpret the information differently, giving rise to different (informative) signals. In this case, some subset of shareholders may have similar biases in interpreting the facts, or may follow similar approaches in filtering the available data, and so may produce information that is conditionally correlated.

It is straightforward to establish that allowing for such correlation across shareholders' information does not change the results as long as such correlation is not perfect. The assumption that the signals are informative implies that, with a continuum of infinitesimal shareholders, aggregating the information of any randomly selected subset of shareholders having positive mass will again reveal the underlying state. Therefore, as long as the correlation between shareholders' signals is not perfect, the dichotomy between the two cases continues to hold as stated.

5.4 Richer Type Space

So far, we have considered the case with only two types of raider with perfectly negatively correlated security and private benefits. However, our results can be extended to a richer type space. One natural extension is to allow for a continuum of types $v \in [v_b, v_g]$, where a higher v is associated with a lower private benefit of control, $B(v)$.[20] Again, we focus here on the private information case.

In terms of shareholder information, we can assume that each shareholder observes a good ($\eta_i = g$) or bad ($\eta_i = b$) signal where the probability ϕ of getting a good signal is greater than one-half if and only if $v > \bar{v}$, with $\bar{v} = E[v]$. As before, increasing ϕ improves shareholders' inference as to whether the security benefit is likely to be high or low relative to the average. This setup preserves the binary signal structure and allows us to obtain qualitatively identical

[20]This follows Burkart, Gromb, and Panunzi (1998), that private benefits are captured by diluting shareholder value, thus implying a negative correlation between security values and private benefits.

results for a continuum of types. In particular, for $v + B(v) \geq E[v|v > \bar{v}]$, there exists a set of pooling equilibria with successful takeovers in which the minimum price p is equal to $E[v|\eta_i = g]$. Furthermore, this price is increasing in ϕ. In other words, as long as the private benefit is sufficiently high for a raider with a low valuation, a successful takeover will be possible, with a minimum price that is increasing in the precision of information.

6 Conclusion

In this paper we present a model of the market for corporate control in which shareholders are uncertain about the raider's motivation for a takeover. When shareholders do not know the exact reason for a takeover bid, in that it can arise either because the bidder derives high cash flow benefits from the transaction or because he derives a private benefit from expanding the resources under his control, a value-increasing takeover of a widely held firm can occur without requiring that a raider have any initial holding in the target firm, or any private benefit of control. This kind of "two-dimensional uncertainty" therefore implies that shareholders will be willing to tender their shares even if they are unable to extract the entire surplus from a value-increasing raider.

In this framework, we analyze the role of shareholder information, focusing on the distinction between public versus private information. While improving the quality of public information about the extent of mismanagement of the firm, or about the possible synergies that can be created by a new management, is likely to aggravate the free-rider problem, it does not increase average transaction prices conditional on a successful takeover. In contrast, when shareholders are asymmetrically informed, more precise shareholder information forces a raider to raise the minimum price he can offer that still ensures the success of the tender offer.

The analysis presented here suggests not only the importance of shareholder information in corporate takeovers, but also the dichotomy between public and private information.

Hence, different means of generating shareholder information have remarkably dissimilar consequences in terms of shareholder value and efficacy of the market for corporate control. From a policy dimension we therefore offer a new perspective on the role of information for the promotion of proper governance that relies both on internal governance through shareholder activism as well as external governance by way of the market for corporate control.

Appendix

In this section, we extend our analysis and consider the case in which at least one type of the raider plays a mixed strategy in equilibrium. As in the pure strategy case, a raider of type g whose equilibrium strategy involves taking an action that is not part of type b's equilibrium (mixed) strategy would reveal his type whenever that action is played, and would thus earn zero profits for that action. Since in any mixed strategy the raider must be indifferent across the set of strategies played with positive probability, this implies that the good type raider would make zero profits under such equilibrium strategy. Therefore, we can restrict ourselves to only consider candidate equilibria in which both types of raider mix across the same set of strategies or type g's equilibrium strategies are a strict subset of type b's equilibrium strategies.

Lemma 4 *There is no equilibrium in which the good raider plays a strictly mixed strategy and makes positive expected profits from the takeover attempt.*

Proof: Suppose there was such a strictly mixed strategy. Given that type g makes positive profits, there must exist a distinct pair of tender offers (p, θ) and (p', θ'), that both types of raider offer in equilibrium. If $\theta \neq \theta'$, indifference between these two offers implies that $p \neq p'$. Without loss of generality we assume that $p' > p$. Given that type b is indifferent between the two offers, we must have that $\theta > \theta'$. However, it is clear now that type g cannot be indifferent between these two offers as he always prefers to buy more shares at a lower price: he strictly prefers (p, θ) over (p', θ'). $\square$

The above lemma rules out equilibria in which the good type raider plays a strictly mixed strategy and makes positive profits, independently of the actions of the bad raider. We can therefore further restrict our candidate set of equilibria to those where: type g plays a pure strategy and type b strictly mixes across a set of strategies that include type g's equilibrium strategy. The following proposition shows that our results qualitatively remain unchanged

for the private information setting if we allow the raider to play mixed strategies. The proof for the public information case is analogous.

Proposition 5 *There exists a mixed strategy equilibrium outcome in which the good raider makes positive expected profits from the takeover attempt if and only if* $B > \frac{1}{2}\Phi_g(v_g - v_b)$. *In such an equilibrium outcome the good raider makes a tender offer* (p, θ) *whereas the bad raider offers* (p, θ) *with some probability* $\lambda \in (0, 1)$ *and mixes across offers* (p', θ') *with probability* $1 - \lambda$, *where* $p' > p \in (\tilde{p}(\phi), v_b + \frac{B}{\theta}]$, $\theta' > \theta$, *and* $\theta \geq \frac{1}{2}$. *All shareholders tender at such an offer.*

Proof: In order to construct such an equilibrium we need to have at least a pair of tender offers (p, θ) and (p', θ') such that type b is indifferent between these offers, where $p' > p$. Note that type b's profits are continuously decreasing in both p and θ. Therefore, existence of such a pair of contracts is immediate. From the proof of Lemma 4, we know that type g strictly prefers (p, θ) over (p', θ'). Therefore, in any mixed strategy equilibrium in which type g makes positive profits, type g must offer the lowest-price tender offer among those played by type b with positive probability. The rest of the construction is identical to that of Proposition 2. To show the necessity part of the result, note that, following an offer (p, θ) the posterior probability of the offer coming from a raider of type g is higher than the prior since $\lambda < 1$. Therefore, the minimum price at which shareholders tender must be strictly greater than $\tilde{p}$, and converges to $\tilde{p}$ as $\lambda \to 1$. □

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