

Takeover Bidding with Toeholds: The Case of the Owner's Curse

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This article demonstrates that a potential acquirer with a toehold bids aggressively and possibly overpays in equilibrium. The aggressiveness of a bidder with a toehold increases further if he is able to renege on his winning bid. A bidder without a toehold, however, responds by shading his bids. The target firm can increase competition and the expected sale price if it only entertains nonretractable bids. This article provides testable implications on the probability of bidder success, stock price reactions on bid revisions and on resolution of the contest, and expected gains to bidders and the target firm.

Theoretical models of takeover bidding have tended to concentrate on the case where no bidder has a prior toehold in the target firm.¹ Yet the acquisition of a block before the announcement of a takeover bid remains a commonly used tactic.² This article shows that toeholds affect the outcome of takeover contests by inducing a change in bidder behavior. In particular, a toehold makes a bidder bid more aggressively, even to the point of risking a loss-making

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¹ For surveys of theoretical models on takeover bidding, see, Spatt (1989) and Hirshleifer (1995).

² Betton and Eckbo (1995) report that in 36% of the 1353 acquisition attempts in their sample, an initial bidder owned more than 10% of the target's shares.

acquisition. Toeholds also serve to increase both the probability of a successful acquisition and the expected price obtained by the target's remaining shareholders. However, to obtain these benefits, a target firm may need to curb a bidder's incentive to withdraw a loss-making bid. In addition, the presence of toeholds makes it hard to assess the potential profitability of an acquisition from analyzing stock price reactions during the bidding process. Consequently, a complete analysis of their effects is important from both a theoretical and a policy perspective.

This article first shows that a toehold has a significant effect on bidder strategies: bidders now have incentives to optimally bid above their own valuations. Consequently, the probability of a successful acquisition is positively correlated with the level of initial blockholdings. Such aggressiveness has, however, significant attendant costs of brinksmanship: a bidder's attempt to lose the contest at a high enough price exposes him to the possibility of a loss-making acquisition.³ Such an outcome, solely due to the partial ownership of the bidder, is labeled the "owner's curse."

Target firms are shown to benefit from such aggressive contests: the increased benefit coming at the expense of bidders without toeholds. Even though the bidding strategy of a bidder without a block is unaffected by an opponent's blockholding level, both his probability of success and expected profits decrease with the opponent's blockholdings. To induce more of this beneficial aggressive bidding, target firms have incentives to enhance the blockholdings of a bidder even after a takeover contest is well under way. This implication is consistent with share repurchases and debt-for-equity swaps undertaken by target firms in the midst of takeover attempts.

Overpayment by an aggressive bidder with a toehold is, however, hard to detect with a focus on stock price reactions alone: even an unprofitable acquisition can generate a positive stock price reaction for a bidder with a block. The change in a bidder's stock price includes the value enhancement from the acquisition—as perceived by the market—along with a reassessment of the value of the block. Thus, to obtain empirical evidence of overpayment from stock price reactions, it is essential to separately account for the increase in the value of the preacquired block. Another possibility is to use long-term postmerger performance data instead of stock price reactions to test for blockholder overpayment. Stock price reactions for bidders with and without blocks are also shown to be qualitatively different across other events in the takeover process and thus need to be interpreted differently. For example, an opponent's willingness to compete further by raising his bid can have a positive stock price reaction for the blockholder. This can never happen for a bidder without a toehold.

³ This is consistent with the evidence documented by several authors suggesting that bidders often overpay. For example, see Bradley, Desai, and Kim (1988) and other articles on postmerger performance referenced in Jensen and Ruback (1983) and Scherer (1988). For a recent article see Bhagat and Hirshleifer (1995).

Overly aggressive bidding by a blockholder, however, also provides an incentive for him to renege on a winning bid if the acquisition is unprofitable. The possibility of reneging enhances the aggressiveness of bidding but, at the same time, reduces the chances of a loss-making acquisition. The increase in aggressiveness of the blockholder is not, however, accompanied by increased competition from bidders without blocks. Instead, competing bidders without blocks rationally respond by shading their own bids. The net result of such adjustments is that a target firm is worse off due to the possibility of reneging. Thus target firms need to ensure the credibility of bids by existing stockholders—especially those holding large blocks—in order for them to benefit from increased competition between bidders.

The usefulness of toeholds in alleviating the free-rider problem has been previously explored in a single-bidder model by Shleifer and Vishny (1986), Hirshleifer and Titman (1990), and Chowdhry and Jegadeesh (1994). Stulz (1988) provides a related model in which the target management is endowed with a block of shares. On the other hand, Fishman (1988), Hirshleifer and P'ng (1989), Bhattacharyya (1992), and Daniel and Hirshleifer (1992) have focused on competition among multiple potential acquirers. However, these articles assume that the bidders possess no toeholds. This article, in order to focus directly on the effect of toeholds on the competition among bidders, assumes away the free-rider problem. In a similar vein, Bulow, Huang, and Klemperer (1995) and Burkart (1995) have also introduced toeholds in models of bidder competition.⁴

Burkart (1995)⁵ derives a result similar to the first proposition in this article which establishes the incentives of a blockholder to bid above his own value. However, his analysis requires a winning bidder to carry through with even a loss-making bid. Consequently the distinction between overbidding and overpaying is not drawn in his article. In contrast, this article shows that the two are quite distinct phenomena: incentives to bid higher are enhanced by the possibility of reneging, but the chances of making an unprofitable acquisition are reduced. This distinction proves important for the analysis of competing bidders' strategies and has significant implications for the target's own strategies. In particular, this article establishes that toeholds benefit the target firm only when the possibility of reneging is reduced. The article's focus on outcomes for all players also facilitates the drawing of empirically testable predictions regarding the probability of success of takeover bids and the expected price obtained by target firms.⁶ Bulow, Huang, and Klemperer

⁴ Ravid and Spiegel (1996) introduce toeholds in the context of two-tier offers in a symmetric information model. However, they use symmetric information to justify restricting the bidding to be always below an acquirer's private value.

⁵ Burkart's analysis is contemporaneous with that of Singh (1993), the antecedent of this article.

⁶ Burkart (1995) also analyzes the incentives of bidders to incur search costs, an issue not explored in this article.

(1995) show that overbidding may also occur in a model with multiple blockholders who get independent signals and have common values.⁷

The article proceeds as follows. Section 1 sets up the model. Section 2 demonstrates that the blockholder is willing to bid above his private value and shows that this is value enhancing for the target firm. Section 3 analyzes the stock price reactions of bidding firms under specific parametric assumptions. Section 4 allows the blockholder to withdraw his bid and shows that he still overbids although he never overpays. The last section concludes. All proofs are in the Appendix.

1. The Model

Consider an all-equity firm which is an acquisition target. A majority of the firm's equity is held by a continuum of atomistic shareholders. There exist two potential acquirers who may bring synergistic gains to the firm which are unique to them. One of these acquirers, referred to as a blockholder, holds an $\alpha \in (0, 0.5)$ fraction⁸ of the firm's equity. The second potential acquirer, referred to as the outsider, does not hold any of the target firm's shares. Everyone is assumed to be risk neutral and the interest rate is normalized to 0. Offers are assumed to be in cash for all shares of the firm not held by the party making the offer. In particular, the outsider is required to make an offer to all shareholders, while the blockholder has to extend a cash offer to $(1 - \alpha)$ proportion of the shareholders. The current shareholders are assumed to sell all their shares to the highest bidder.⁹

The market value of the target firm under current management is denoted by v_c . Both the outsider and the blockholder are assumed to bring incremental value to the firm. Such incremental value could be due to synergies between the acquirer and the target or could be due to the bidder's ability to put the target's resources to a unique use. The value of incremental cash flows under the outsider's control and the blockholder's control are denoted by v_o and v_b , respectively. Both the blockholder and the outsider costlessly observe their private valuations, v_o and $v_b \in [\underline{v}, \bar{v}]$. The model follows most of the literature¹⁰ in the area and assumes that the values to

⁷ In a model without toeholds, Myerson (1981) has shown that, with independent signals, a common values model is essentially similar to a private values model. Bulow, Huang, and Klemperer (1995) show that the addition of toeholds to this analysis has a nontrivial effect on this conclusion.

⁸ It is hard to justify a contest for corporate control if α is greater than 0.5. In fact, in the sample of Betton and Eckbo (1995) there is not a single contested takeover attempt in which the blockholding is greater than 0.5.

⁹ The assumption of all shareholders tendering to the highest bidder abstracts away from the free-rider problem identified by Grossman and Hart (1980). The analysis in the article is especially relevant for transactions where potential threats of ex post dilution make the free-rider problem a nonissue.

¹⁰ For example, see Fishman (1988), Hirshleifer and P'ng (1989), Bhattacharyya (1992), and Daniel and Hirshleifer (1992). There always exist elements of common value in the target firm. All one needs to assume is that the private information is only on the private valuation components. The results in the

potential bidders are independent and identically distributed. The common density function of v_o and v_b is denoted by $f(\cdot)$, the distribution function by $F(\cdot)$ and the hazard function by $H(\cdot)$.¹¹ The hazard rate is assumed to be positive. Without loss of generality, $\underline{v}$ and v_c are normalized to 0. The normalization implies that the value of the target firm to each bidder is just v_o and v_b , respectively.

The game is played as follows: the outsider makes the first bid at v_c and the blockholder has the option to match or pass. As a matter of convention, it is assumed that the blockholder only has to match the outsider's offer in order for his bid to be considered more attractive.¹² The bidding space $[0, \bar{v}]$ is divided into N equal segments of length δ . If the blockholder matches, the outsider has the option to raise the bid by δ . The game continues until one of the players passes. At this point, the other player wins the contest and pays his bid.¹³ Imposing this rigid structure on the game circumvents the existence issues involved in games with infinite strategy spaces and allows for the game to be solved via backward induction. The equilibrium concept used is bayesian Nash. Finally, for ease of exposition, the results are presented in the limit as $\delta \rightarrow 0$. For the first part of the analysis, bidders are assumed to be committed to follow through on their bids and reselling after a takeover is assumed to be infeasible. This assumption is relaxed later in the article.

2. Overbidding

This section analyzes equilibrium bidding strategies. A bidding strategy is the highest price up to which an acquirer is willing to increment his bid. It is first established that, similar to the case in which neither bidder has a stake in the target, the outsider has a dominant bidding strategy.

Lemma 1. *The nonblockholder's dominant bidding strategy is to choose the largest $N_o \in \{1, 2, \dots, N\}$ that satisfies $N_o \delta \leq v_o$. In the limit, as δ goes to zero, the nonblockholder bids up to his valuation v_o .*

The blockholder does not have such a dominant strategy. However, given the outsider's dominant strategy, the blockholder's best response involves bidding up to values higher than his own private valuation.

article go through even when the value to each bidder is $V + v_b$ and $V + v_o$, respectively, and V is common knowledge. One would expect that the most refined information on the common component V will be possessed by the target firm and the bidders will be able to get it under strict discovery laws.

¹¹ The hazard function $H(v)$ is defined as $\frac{f(v)}{1-F(v)}$. The hazard rate is just the derivative of the hazard function.

¹² However, the qualitative results do not, in any way, depend on this assumption.

¹³ The model assumes costless entry as well as costless bid revision. Hirshleifer and P'ng (1989), and Daniel and Hirshleifer (1992) have shown that bidding costs have important implications for bidding strategies and results of models that assume costless bidding do not necessarily generalize to situations where bidding is costly. As the focus of the current paper is on studying the effect of blockholdings, zero bidding costs are assumed for tractability.

Proposition 1. (i) The blockholder will bid up to a level $z\delta$, where z is the largest integer such that

$$\alpha\delta(1 - F[(z + 1)\delta]) \geq (z\delta - v_b)(F[(z + 1)\delta] - F[z\delta]) \quad (1)$$

In the limit, as $\delta \rightarrow 0$, the blockholder bids up to a price level $P(v_b, \alpha)$, where

$$\alpha = (P(v_b, \alpha) - v_b)H(P(v_b, \alpha)) \quad (2)$$

(ii) $P(v_b, \alpha)$ is strictly greater than v_b ; thus, the blockholder overpays with strictly positive probability.

(iii) $P(v_b, \alpha)$ is increasing in α and v_b .

The intuition underlying Proposition 1 is as follows: the blockholder bids aggressively in an attempt to induce the outsider to bid higher than the blockholder's private value. The blockholder can then gain by selling his block at a price higher than his own value. However, such a strategy runs the risk of acquiring the target at a price higher than its value to the blockholder. Equation (1) characterizes the optimal trade-off between the two factors. Conditional on the outsider having bid $z\delta$, the left-hand side of Equation (1) is the increase in the expected gain on the block from matching the bid. The right-hand side is the expected loss from winning the contest. The blockholder continues to raise his bid as long as the increase in the expected gain exceeds the expected loss. Equation (2) follows immediately from rearranging Equation (1) and taking the limit. An increase in the size of the block results in bigger gains on losing and smaller losses on winning, once bid levels are higher than the blockholder's valuation. These two effects lead to an increase in the maximum price the blockholder is willing to pay, as the last statement of the proposition asserts.

Such overbidding brought about by toeholds is consistent with the empirical observation that a significant number of bidders overpay. Evidence of possible overpayment is provided by studies of long-term (1–3 years) postmerger performance of bidders. Most of these studies find that stocks of successful bidders earn negative excess returns over the long term.¹⁴ There also exists some evidence of reduction in postmerger accounting profitability for successful bidders.¹⁵ Event studies on takeovers have also reported that the stock market considers many acquisitions “bad news” for

¹⁴ See Jensen and Ruback (1983) and Jarrell, Brickley, and Netter (1988) for summaries of work examining postmerger excess returns.

¹⁵ Scherer (1988) surveys the evidence of reduction in accounting profitability. However, recent studies have cast some doubt on this apparent reduction. Healy, Palepu, and Ruback (1992) show that even though postmerger operating income is lower than the premerger benchmark, the asset productivity is higher when compared to the industry. Jarrell (1996) reexamines the evidence on accounting profitability and concludes that even though the performance is impaired over 1 to 2 years, it significantly improves in years 4 to 6.

the acquiring firms [see Mikkelson and Ruback (1985), Bradley, Desai, and Kim (1988), and Berkovitch and Narayanan (1993)]. However, the results of the standard event study methodology, which examines changes in stock price over the acquisition window, need to be interpreted carefully. Section 3 analyzes the change in market value for a successful blockholder and shows that instances of overpayment by blockholders may not be detected by solely examining the changes in a bidder's stock price over the course of the bidding contest. Since the change in the bidder's stock price is due to both the market's assessment of the profitability of the acquisition and the reassessment of the toehold's value, one would first need to separate out the two effects to obtain evidence of possible overpayment by the bidder. Bhagat and Hirshleifer (1995) introduce the "intervention methodology"¹⁶ to estimate potential gains to a merger and provide evidence of bidder overbidding even when they control for the value increase of the toehold.

Previous theoretical work has identified several agency problems as possible reasons for acquirers to incur losses in equilibrium. Some examples of agency considerations are the diversification of managers' personal portfolios [Amihud and Lev (1981)], the use of free cash flow to increase the size of the firm [Jensen (1976)], and an increase in the firm's dependence on management [Shleifer and Vishny (1989)]. Roll (1986), on the other hand, puts forward the "hubris" hypothesis to explain why many acquiring firms incur losses, even when there is no apparent conflict of interest between the target shareholders and the management. According to Roll (1986) there are no gains to takeover activity; however, takeovers occur because managers fail to account for positive valuation errors. This article provides an alternate explanation for observed losses in takeover settings by taking into account the empirical fact of acquirer toeholds. The proposition above shows that a blockholder overpays with strictly positive probability, which is called the "owner's curse" in this article. The owner's curse is due neither to agency problems nor to valuation errors: it arises solely due to the blockholder bidding optimally in order to obtain a higher price for his previously acquired stake.¹⁷

The probability of the blockholder winning, and also that of his overpaying, are both affected by the level of his blockholdings. The blockholder

¹⁶ They study the initial bidder's stock price reaction around events uncontrolled by the bidder himself, for example, the arrival of a second bidder. They use the change in the target firm's share price to estimate the bidder's gain on his initial stake and show that even though, on average, mergers in their sample created value, 24 out of the 45 initial bidders in multiple-bidder contests overpaid.

¹⁷ Bidders in Chowdhry and Nanda (1993) are also committed to bid above their private values. In their model, the successful acquirer finances his acquisition with debt of the same priority as the preexisting debt, thus reducing the value of existing debt claims. This possibility of expropriating value enables the acquirer to bid higher than his own valuation. The level of overbidding in Chowdhry and Nanda (1993) is, however, limited to the amount of expropriation. Thus successful bidders in their model do not have any ex post regret. However, in this article, a blockholder strictly prefers to lose the contest when his bid is above his own value.

wins the bidding contest whenever v_o is less than his maximum bid $P(v_b, \alpha)$. Since the price he pays is v_o , an overpayment occurs only when v_o falls between v_b and $P(v_b, \alpha)$. But $P(v_b, \alpha)$ increases with α . This implies the following result:

Corollary 1. *An increase in the size of the toehold increases:*

- (i) *the probability of the blockholder winning; and*
- (ii) *the probability of his overpaying.*

The corollary's first prediction is consistent with evidence reported in Walkling (1985). He finds that the probability of a successful tender offer in contested transactions is significantly increasing in the size of the winner's toehold. In addition, Betton and Eckbo (1995) report that the probability of a toehold holder outbidding a rival bidder is increasing in the size of his toehold, though this effect is statistically insignificant in their sample.¹⁸

Hirshleifer and Titman (1990) also obtain an implication similar to the first conclusion in Corollary 1. In their model, the potential acquirer has a toehold and the target firm's shareholders choose probabilistically whether or not to tender their shares to him. They show that in equilibrium the probability of the bidder's success has to increase in the size of his toehold. In their analysis, a bidder with a smaller toehold derives less profit from it and thus has a greater incentive to underbid. However, the shareholders' tendering decision provides appropriate incentives for the acquirer to bid his value estimate. In this article, the increased probability of success comes not from such tendering decisions, but from the blockholder's willingness to compete with an outside bidder, even at the risk of a possible overpayment.

There does not seem to have been any empirical analyses of the long-term gains to acquirers taking into account blockholdings at the time of the acquisition. The second part of the corollary implies that blockholdings should be a good predictor of poor acquisitions. Specifically the model predicts that the frequency of poor acquisitions should be higher in a subsample of contested transactions where the successful acquirer had a significant blockholding.

Blockholdings also play a significant role in the division of surplus between potential acquirers and the target firm. As shown above, an increase in his holdings results in a higher willingness to overbid on the part of the blockholder. Therefore, for every realization of v_b , the price paid by the outsider conditional on his winning increases with α . In addition, Corollary 1 also implies that the outsider's probability of winning decreases in α . Together, these two observations imply the following result:

¹⁸ Betton and Eckbo (1995) also show that the probability of the toehold holder succeeding in a sample of contested and uncontested offers is increasing in the size of the toehold. The probability of outbidding is, however, different from the probability of success, since the target firm's shareholders might still reject the highest offer.

Corollary 2. *The ex ante expected profit of the outsider is decreasing in the toehold held by the rival bidder.*

Although the current article does not explicitly model the entry decision of either bidder, it is clear from the above result that, if entry were costly, large blockholdings would deter entry by some outside bidders. Evidence reported in Betton and Eckbo (1995) provides support to Corollary 2. They show that in a subsample of uncontested offers the average size of the toehold is 18.7% compared to 4.8% in a subsample of contested offers. They also estimate the probability of a rival bidder entering as a function of the toehold and show that the coefficient is negative and significant. Corroborating evidence is also reported in Stulz, Walkling, and Song (1990).

Corollary 2's prediction contrasts with results in Bagnoli and Lipman (1988) and Homstrom and Nalebuff (1992), who show that blockholdings, in fact, help a takeover attempt by alleviating the free-rider problem. In their models, a bigger block, *ceteris paribus*, increases the probability of the shareholder being pivotal and thus makes it easier for the outsider to gain control. Their result follows directly from their assumption that the blockholder is *only* allowed a tendering decision. In particular, the blockholder is not allowed to compete in the takeover process. When, as in this article, the blockholder is allowed to compete, the expected gains made by the outsider decrease.

The aggressiveness of a bidder with a toehold not only hurts the outsider but also directly benefits the remaining shareholders of the target firm. Consequently, the establishment of a blockholding in a potential target should be taken as good news by the market. The next proposition shows that the stock price impact of the announcement of a block is increasing in the size of the block.¹⁹ Since the market value of the potential target, prior to the commencement of bidding, is just the expected payment by the winning bidder, the blockholder's aggressive bidding benefits the target firm irrespective of the identity of the winning bidder.

Proposition 2. *The price paid by the winning bidder is weakly increasing and the ex ante market value of the target firm is strictly increasing in the size of the block accumulated by a potential bidder.*

Mikkelsen and Ruback (1985) show that a firm's value substantially increases whenever someone acquires a toehold of 5% or more. Such a reaction could be due to the market using the block acquisition as a signal of the firm being in play.²⁰ Proposition 2 establishes another possibility: the

¹⁹ The model assumes that entry decisions are exogenous. In a model in which entry decisions were endogenous, higher blockholdings could deter entry and thus give rise to an optimal block size.

²⁰ The value enhancement could also be due to other reasons previously recognized in the literature, for example (i) the well-recognized monitoring incentives of a large shareholder; (ii) a higher probability of a takeover if the shareholders are either following a mixed strategy on tendering or they have random

increase in value could, instead, be due to an increase in the expected bid premium from a potential contest. Thus, even if the market had anticipated a possible takeover before significant blockholdings were declared, such a declaration would still have a positive price impact on the target firm's market value. Empirical support for higher realized premia accompanying higher blockholdings is mixed. Franks and Harris (1989) analyze a large dataset of acquisitions in the UK and show that target firms in which a bidder has a toehold have higher abnormal returns than firms with no toeholds.²¹ However, Stulz, Walkling, and Song (1990) show that the cumulative abnormal returns to the target firm are decreasing in the size of the toehold. A similar result is obtained by Walkling and Edmister (1985).

3. Stock Price Reactions of Bidding Firms

The reactions of stock prices to specific events have been widely used to evaluate different facets of takeover activity. This section examines the effect of blockholdings on the change in the acquirer's stock price at different stages of the takeover process. For tractability, v_b and v_o are assumed to be uniformly distributed over the interval $[0, 1]$. This additional structure allows for the blockholder's bidding strategy to be obtained in closed form.

Corollary 3. *When $v_b, v_o \sim U[0, 1]$, the blockholder's maximum bid is given by*

$$P(v_b, \alpha) = \frac{v_b + \alpha}{1 + \alpha}. \quad (3)$$

Given a current outstanding bid of K , let $V_b(K, \alpha)$ and $V_o(K, \alpha)$ be the blockholder's and the outsider's market values, respectively. An outstanding bid of K implies that $v_o \geq K$ and $v_b \geq P^{-1}(K, \alpha)$. The price paid by the successful bidder will be weakly greater than K and thus the bidding firms' market values are

$$V_b(K, \alpha) = \int_{v_b=P^{-1}(K, \alpha)}^1 \left(\int_{v_o=K}^{P(v_b, \alpha)} \frac{(v_b - (1 - \alpha) v_o)}{(1 - K)} dv_o + \int_{v_o=P(v_b, \alpha)}^1 \frac{\alpha P(v_b, \alpha)}{(1 - K)} dv_o \right) \frac{1}{1 - P^{-1}(K, \alpha)} dv_b \quad (4)$$

tendering costs [Hirshleifer and Titman (1990)]; (iii) a lower number of shares being available for the potential acquirer, if the blockholder is assumed to never tender, thus forcing the acquirer to bid higher [Stulz (1988)]; (iv) a higher probability of the blockholder being pivotal and thus increasing the probability of a takeover at possibly lower bids [Bagnoli and Lipman (1988) and Holmstrom and Nalebuff (1992)]; et cetera.

²¹ The abnormal returns are, however, not monotonic in the size of the toehold. Target firms with toeholds larger than 30% obtain lower abnormal returns than target firms with toeholds less than 30%, but still obtain higher returns than target firms with no toeholds.

$$V_o(K, \alpha) = \int_{v_o=K}^1 \int_{v_b=P^{-1}(K, \alpha)}^{P^{-1}(v_o, \alpha)} \frac{(v_o - P(v_b, \alpha))}{(1 - P^{-1}(K, \alpha))} dv_b \frac{1}{(1 - K)} dv_o \quad (5)$$

The next proposition analyzes the effect of bid revisions on the bidding firms' market values.

Proposition 3. *With v_b and v_o distributed uniformly, an increase in the level of the outstanding bid, K , implies*

- (i) *The outsider's market value, $V_o(K, \alpha)$, always decreases;*
- (ii) *The blockholder's market value, $V_b(K, \alpha)$, decreases (increases) for $\alpha \leq \frac{1}{5}$ ($\alpha > \frac{1}{5}$); and,*
- (iii) *The change in the blockholder's market value is always greater than the change in the outsider's market value, that is, $\frac{\partial V_b(K, \alpha)}{\partial K} > \frac{\partial V_o(K, \alpha)}{\partial K}$.*

An increase in the current bid increases the expected payment to the target firm and consequently reduces the outsider's market value. For the blockholder, however, market value is also affected by the value of his previously acquired block. An increase in the outstanding bid increases the value estimate of this block, which cushions the fall in market value for the small blockholder and may even increase the market value for a large enough blockholder. Thus stock price reactions during the course of bidding may be quite different for a bidder with a block and have to be interpreted accordingly.

To analyze changes in the acquirer's market value over the entire bidding contest, define K_f to be the price paid by the winning bidder and $V_j^i(K_f, \alpha)$ to be the bidders' market value after the resolution of the contest, where the superscript $i \in \{W, L\}$ denotes whether the bidder won or lost and the subscript $j \in \{b, o\}$ denotes the identity of the bidder. Then,

$$\begin{aligned} V_b^W(K_f, \alpha) &= \int_{v_b=P^{-1}(K_f, \alpha)}^1 \frac{v_b}{(1 - P^{-1}(K_f, \alpha))} dv_b - (1 - \alpha) K_f \\ V_b^L(K_f, \alpha) &= \alpha K_f \\ V_o^W(K_f, \alpha) &= \int_{v_o=K_f}^1 \frac{v_o}{(1 - K_f)} dv_o - K_f \\ V_o^L(K_f, \alpha) &= 0. \end{aligned} \quad (6)$$

Let $\Delta_j^i(K_f, \alpha)$ be the cumulative price change for each of the bidders from the price before bidding commences to the price after the resolution of the contest. Thus,

$$\Delta_j^i(K_f, \alpha) = V_j^i(K_f, \alpha) - V_j(0, \alpha) \quad i \in \{W, L\}, j \in \{b, o\}. \quad (7)$$

The next proposition compares the outsider's cumulative price change with that of the blockholder.

Proposition 4. With v_b and v_o distributed uniformly,

- (i) The cumulative price change on winning for the outsider or a small blockholder ($\alpha \leq \frac{1}{5}$) is positive for low K_f and negative for high K_f . However, for a large blockholder ($\alpha > \frac{1}{5}$) it is always positive; and
- (ii) The cumulative price change on losing is always negative for the outsider or a small blockholder ($\alpha \leq \frac{1}{5}$). However, for a large blockholder ($\alpha > \frac{1}{5}$) it is positive for a high enough K_f .

The resolution of the contest at a high price gives two pieces of information to the market: (1) the valuation of the winner is higher than the ex ante expectation, and (2) the price paid is higher than the ex ante expectation. The proposition shows that when the outsider or the small blockholder wins, the second effect dominates at a high enough price. The cumulative price change on losing is negative for the outsider, since he fails to realize any of the ex ante expected gains that were impounded into his stock price on his entry into the bidding process. In the blockholder's case, resolution of the contest not only gives information on the profit to be made from the acquisition but also gives information on the value of the preowned block. Winning or losing at a high price puts a high value on the existing block. For a large enough block, this value is high enough to wipe out the negative price impact due to losing or that due to winning at a price higher than the ex ante expected price. For the larger blockholder, the cumulative price change can never be negative on winning and can, in fact, be positive on losing, both of which are contrary to the predictions for the outsider and the small blockholder. Franks and Harris (1989) provide partial support for Proposition 4. They show that in the month of the acquisition, abnormal returns of winning bidders with large toeholds (more than 30%) are significantly higher than those of bidders with small toeholds. They do not report on abnormal returns of losing bidders.

Corollary 1 has shown that a larger block size implies a higher probability of a non-value-enhancing acquisition by the blockholder. However, the probability of an undesirable acquisition is not the same as the probability of observing a negative cumulative price change. In fact, Proposition 4 has shown that, for a large enough block size, the winning blockholder's cumulative price change, which includes the value increase of the block, is always positive. Consequently, empirical studies that simply examine stock price changes for the bidders, may fail to uncover instances of overpayment due to aggressive bidding. However, empirical evidence of overbidding can be obtained by analyzing long-term performance data or by adjusting the stock price change for the value enhancement of the block.²²

²² For example, Bhagat and Hirshleifer (1995) control for an increase in value of the block and report evidence of overbidding.

This section has examined the stock price reaction to two events: the incrementing of bids by both bidders and the resolution of the contest. The stock price reactions for a large blockholder have been shown to be qualitatively different from those of a nonblockholder. Testing these empirical predictions by controlling for the size of the toehold and examining the complete distribution of abnormal returns instead of just the average abnormal return—for both successful and unsuccessful bidders—is left for future work.

4. The Reneging Blockholder

The analysis in earlier sections assumed that bidders were committed to going through with their bids under all circumstances.²³ This assumption is especially critical in situations where the blockholder wins the takeover auction by bidding above his private value. If possible, the blockholder in this case would be better off reneging on his bid and selling his stake to the outsider at any price higher than his own valuation. The possibility of reneging by the blockholder in this situation changes the equilibrium bidding strategies of *both* bidders.

This section allows the blockholder to withdraw his bid if following through with it is unprofitable. The possibility of such a withdrawal is modeled by the following extensive form: first, the two bidders compete in an auction identical to the one defined in Section 1. If the outsider wins, he pays his bid and takes over the target firm. However, if the blockholder wins, he either pays his bid and takes over the firm or withdraws his bid. If the blockholder withdraws his bid, the outsider pays his own outstanding bid and takes over the target firm.²⁴

The equilibrium is obtained by solving the game backwards. In Section 2, the blockholder has been shown to have the incentive to bid above his private value, hoping to elicit a higher bid from the outsider. However, he is always better off losing at a price higher than his value than winning at such a price. Consequently, given the option to withdraw in the subgame after the auction, the blockholder always finds it optimal to withdraw his winning bid if it is above his own valuation. The option to withdraw his last bid gives the blockholder a dominant strategy: he *always* matches the outsider's bid. Matching the outsider's bid at a price higher than his own value gives the blockholder increased expected profits without any risk of overpayment.

The blockholder's option to withdraw his bid not only changes his own bidding strategy but also that of the outsider. The outsider no longer finds it

²³ Alternatively, withdrawal is assumed to be costly enough to prevent reneging.

²⁴ Allowing the blockholder to withdraw his bid and accepting the outsider's last bid is isomorphic to assuming that the blockholder can, instead, resell the target firm to the outsider at the outsider's last bid. All the results in this section go through with this alternative assumption.

optimal to bid up to his own valuation, the dominant strategy in the earlier game. He realizes that if he were now to bid up to his value, he could only win at a price equal to his value and thus obtain no surplus. As a result, he now chooses to shade his bid: this gives him the possibility of at least some expected gains. The next proposition describes the equilibrium of this amended game.

Proposition 5. (i) *The blockholder never drops out and thus always wins the auction. In the second stage, the blockholder withdraws his bid if the price at which he wins is above his own valuation.*

(ii) *The outsider bids up to $B(v_o)$, where*

$$B(v_o) = v_o - \frac{F(B(v_o))}{f(B(v_o))} < v_o \quad (8)$$

(iii) *Independent of the realization of v_b , the target firm is always taken over at $B(v_o)$.*

The option to withdraw his winning bid ultimately undermines the credibility of the competition provided by the blockholder. With this option, the blockholder's bidding strategy no longer depends on either his own valuation or the size of his block. This extreme aggressiveness forces the outsider to adopt a more conservative bidding strategy of effectively making a single nonreversible take-it-or-leave-it offer to the target firm. The net result is a diminution of the competition in the bidding process which guarantees a takeover at the shaded bid of the outsider.

The net impact of giving this option to the blockholder on the target firm's market value is, however, not obvious. This is because, in instances where the blockholder has a high valuation, the target firm is worse off in the no-commitment case, as it now obtains a price equal only to the shaded bid of the outsider. On the other hand, in instances where the blockholder has a low enough valuation, the outsider wins at a higher price in the no-commitment case than in the commitment case. This is because the shaded bid of the outsider in the no-commitment case could well be higher than the inflated bid of the blockholder in the commitment case. In this case, the target firm obtains a higher revenue by encouraging the blockholder to provide even greater competition. The next proposition establishes that the option to withdraw ultimately hurts the target firm.

Proposition 6. *Allowing the blockholder to withdraw his winning bid results in a lower expected revenue for the target firm. The loss in expected revenue is increasing in the size of the block.*

Proposition 6 clearly implies that target firms should attempt to curtail a blockholder's ability to withdraw his winning bid. Even though bidders generally avoid withdrawing offers on account of an attendant loss of rep-

utation, a target firm often chooses to further increase the credibility of offers. For example, to counter the financing contingencies often written into offers, target firms usually insist that offers be accompanied by letters of assurance from investment banks. Such letters assure the market that the investment bank has satisfied itself about the ability of the bidder to raise the required capital. Consequently, the risk of financial contingencies being invoked is reduced by tying in the reputational capital of the investment bank.

Proposition 6 argues for the target firm to be even more proactive in increasing the credibility of a bid. This is especially true in the case of a large blockholder since he provides a higher level of beneficial aggressive bidding in the commitment case. Put differently, the difference in expected price between the commitment case and the no-commitment case is increasing in the size of the block. The target firm can improve the credibility of the bid by insisting on breakup fees or withdrawal penalties in the event of default. High enough penalties will make withdrawal of a winning bid unattractive for the bidder.²⁵ This recommendation on breakup fees is consistent with some recently observed merger contracts. For example, Bell Atlantic Corporation and Nynex have, in their merger agreement, agreed to some half a billion dollars of default penalties if either party were to back out of the merger. Similarly, Pacific Telesis and SBC Communications have agreed to \$300 million in breakup fees (*Wall Street Journal*, April 24, 1996, p. A3).

5. Conclusion

This article has analyzed the behavior of bidders who have already gained a toehold in a takeover contest. These bidders have been shown to have incentives not only to bid aggressively but also, in some instances, to withdraw their successful bids. If bidders are committed to follow through on their bids, then aggressive bidding by the blockholder may lead to an overpayment. The blockholder's aggressive bidding has also been shown to increase the probability of his success and to reduce both the probability of success and the expected profit of a competitor without a block. It follows that a large block impedes the chances of a successful takeover by a rival. This is in direct contrast to articles analyzing the free-rider problem, where a blockholder, in fact, aids the takeover attempt of an acquirer without a toehold.

This article also analyzes the case in which the blockholder can costlessly

²⁵ A complete analysis of contractual features is beyond the scope of this article. In a takeover setting target firms often contract with bidders before the resolution of the contest. Lockup options and standby agreements are examples of such contracts. Burch (1997) provides a model of target firms using lockup options to enhance value.

renege on a successful bid. An ability to costlessly renege, although it makes the blockholder extremely aggressive, also leads to significant underbidding by the outside bidder. The combined effect is a reduction in value for the target firm compared to the case in which bidders are committed to follow through on their bids.

This article thus provides policy implications for a target firm in play. First, the target firm should ensure that the bids are credible. This is especially important for large blockholders who may provide a higher level of beneficial aggressive bidding. The normative conclusion, that target firms should only accept credible bids from toeholders, can be implemented by requiring specific clauses in the bid which provide for compensatory payments to the target firm in case of a default. Contingency provisions similar to the above are not uncommon in merger agreements. Second, the target firm can choose to increase blockholdings in order to increase the level of competition among bidders. This increase in effective block size can be implemented via share repurchases or debt-for-equity swaps in the face of a contested takeover attempt. This is consistent with observed positive stock price reactions of target firms on the accumulation of blocks.

This article provides a number of testable implications of a blockholder's aggressive bidding in the commitment case. The principal ones are

- A blockholder's maximum bid, his probability of winning, and his probability of overpaying are all increasing in the size of his toehold.
- An outsider's probability of winning and his expected profit are decreasing in the size of an opponent's toehold.
- The price paid by the winning bidder and, consequently, the target firm's market value increases on acquisition of a toehold by a potential bidder.
- An increase in the level of the outstanding bid increases the market value of a large blockholder and decreases the market value of a small blockholder and of an outside bidder.
- On winning the contest, the market value for a large blockholder is always higher than the prebidding market value. However, the reverse can happen for a small blockholder or an outsider.
- Contractual arrangements which increase the credibility of bids are more likely to be observed for large blockholders.

Though there is support for the existence of bidder overpayment in the literature, more work is required to test what factors contribute to such overpayment. This article's specific implication on blockholder overpayment can be tested by controlling for the size of the block and examining either (i) the long-term performance of merged firms, or (ii) the changes in a bidder's stock price during the acquisition process after adjusting it for the value increase of his toehold. Results of such studies would be useful in further clarifying the role of toeholds in acquisition contests.

Appendix

Proof of Lemma 1. The proof mimics the proof of the well-known result in settings with no blockholdings. As the proof is obvious it is omitted.

Proof of Proposition 1.

(i) The proof is by backward induction. The blockholder has the option to match outsider's every bid. Let δ be small enough such that $v_b < (N - 1)\delta$. The blockholder will not match the outsider's bid at $(N - 1)\delta$ because then he will win the bidding game with probability 1 and thus make a loss for sure. Next, examine whether he would match a bid at $(N - 2)\delta$, given that he will not match at $(N - 1)\delta$, and so on. Let $z\delta$ be the outsider's existing bid. The blockholder will continue to bid as long as the increase in expected profit is higher than the expected loss. Note that if he chooses not to bid he incurs no loss. Thus the blockholder will match the highest integer z such that

$$\alpha \delta (1 - F[(z + 1)\delta]) \geq (z\delta - v_b) (F[(z + 1)\delta] - F[z\delta]).$$

Rearranging the above obtains

$$\alpha \geq (z\delta - v_b) \frac{F[(z + 1)\delta] - F[z\delta]}{\delta(1 - F[(z + 1)\delta])}. \quad (9)$$

For $z\delta \leq v_b$, RHS ≤ 0 which implies the inequality is satisfied and the blockholder will match the bid up to v_b . For $z = (N - 1)$, $F[(z + 1)\delta] = F[\bar{v}] = 1$ and thus RHS is ∞ and the blockholder will never match at $(N - 1)\delta$.

The limit result. Replacing $z\delta$ with $P(v_b, \alpha)$ in the RHS of Equation (9) one gets

$$(P(\cdot) - v_b) \frac{F[P(\cdot) + \delta] - F[P(\cdot)]}{\delta(1 - F[P(\cdot) + \delta])}. \quad (10)$$

As δ approaches 0, $(\frac{F[P(\cdot) + \delta] - F[P(\cdot)]}{\delta})$ approaches $f(P(\cdot))$ and $F[P(\cdot) + \delta]$ approaches $F[P(\cdot)]$. Using the definition of the hazard function, Equation (10) reduces to

$$\alpha = (P(v_b, \alpha) - v_b) H(P(v_b, \alpha)).$$

Given the positive hazard rate, the RHS is strictly increasing in $P(\cdot)$, is equal to 0 at $P(\cdot) = v_b$, and is unbounded from above as $P(\cdot)$ approaches $\bar{v}$. Thus there will exist a $P(v_b, \alpha) \in [v_b, \bar{v}]$ which satisfies the above as an equality.

(ii) To show the second part of the proposition examine Equation (2). Both α and $H(\cdot)$ are positive, which implies $P(v_b, \alpha)$ is greater than v_b . Thus, for all v_o s.t. $v_b < v_o < P(v_b, \alpha)$ the blockholder will overpay.

(iii) Using the implicit function theorem on Equation (2) gives

$$\frac{\partial P(\cdot)}{\partial \alpha} = \frac{1}{H(P(\cdot)) + (P(\cdot) - v_b)H'(P(\cdot))},$$

which is positive because $P(\cdot) > v_b$ and $H'(\cdot)$ is positive by assumption. Similarly,

$$\frac{\partial P(\cdot)}{\partial v_b} = \frac{1}{H(P(\cdot)) + (P(\cdot) - v_b)H'(P(\cdot))},$$

which is also positive. ■

Proof of Corollary 1.

(i) The derivative of the blockholder's probability of winning w.r.t. α is

$$\begin{aligned} \frac{\partial}{\partial \alpha} \int_{v_b} \int_{v_o=0}^{P(v_b, \alpha)} f(v_o) dv_o f(v_b) dv_b \\ = \int_{v_b} \frac{\partial P(v_b, \alpha)}{\partial \alpha} f(P(v_b, \alpha)) f(v_b) dv_b. \end{aligned}$$

(ii) The derivative of the blockholder's probability of overpayment w.r.t. α is

$$\begin{aligned} \frac{\partial}{\partial \alpha} \int_{v_b} \int_{v_o=v_b}^{P(v_b, \alpha)} f(v_o) dv_o f(v_b) dv_b \\ = \int_{v_b} \frac{\partial P(v_b, \alpha)}{\partial \alpha} f(P(v_b, \alpha)) f(v_b) dv_b. \end{aligned}$$

As $P(v_b, \alpha)$ is increasing in α (Proposition 1), both of the above expressions are positive. ■

Proof of Corollary 2. The ex ante expected profit of the outsider is given by

$$\int_{v_o} \int_{v_b=0}^{P^{-1}(v_o, \alpha)} (v_o - P(v_b, \alpha)) f(v_b) f(v_o) dv_b dv_o.$$

Now $P(v_b, \alpha)$ is increasing and its inverse is decreasing in α (Proposition 1). Using the fact that the integrand is weakly positive, it is easy to see that the above expression is decreasing in α . ■

Proof of Proposition 2. The market value of the target firm prior to commencement of bidding is given by

$$v_m(\alpha) = \int_{v_o} \int_{v_b} \min[v_o, P(v_b, \alpha)] f(v_o) f(v_b) dv_o dv_b.$$

The bidding strategy of the outsider is invariant to the size of the block

(Lemma 1). However, the bid of the blockholder $P(v_b, \alpha)$ is increasing in α (Proposition 1). Thus $\forall v_0 > P(v_b, \alpha) \min[v_0, P(v_b, \alpha)]$ is strictly increasing in α and $\forall v_0 \leq P(v_b, \alpha) \min[v_0, P(v_b, \alpha)]$ is nondecreasing in α . Using $f(v_0) > 0$ gives us the result.

Let $\alpha_1 < \alpha_2$ and $v_o < P(v_b, \alpha_1)$, the price paid by the winning blockholder is the same for both α_1 and α_2 . However, for $P(v_b, \alpha_1) < v_o < P(v_b, \alpha_2)$ the blockholder now wins instead of the outsider and pays a price higher than the outsider would have paid, which gives us the result on the price paid by the winning bidder. ■

Proof of Corollary 3. Substituting $f(\cdot) = 1$ and $H(\cdot) = \frac{f(\cdot)}{1-F(\cdot)} = \frac{1}{(1-v_b)}$ in Equation (2) gives the result in the statement of the corollary. ■

Proof of Proposition 3. The blockholder's bidding function ($P(v_b, \alpha) = \frac{v_b + \alpha}{1 + \alpha}$) can be inverted to obtain

$$P^{-1}(b, \alpha) = b(1 + \alpha) - \alpha. \quad (11)$$

Now using the definition of $P(v_b, \alpha)$ from above in Equation (4), one obtains

$$V_b(K, \alpha) = \frac{1}{(1 - K)(1 - P^{-1}(K, \alpha))} \Gamma, \quad (12)$$

where

$$\begin{aligned} \Gamma &= \int_{v_b=P^{-1}(K, \alpha)}^1 \left(\frac{v_b(v_b + \alpha)}{1 + \alpha} - \frac{1}{2} \frac{(1 - \alpha)(v_b + \alpha)^2}{(1 + \alpha)^2} \right. \\ &\quad \left. - v_b K + \frac{1}{2} (1 - \alpha) K^2 + \frac{\alpha(v_b + \alpha)}{1 + \alpha} - \frac{\alpha(v_b + \alpha)^2}{(1 + \alpha)^2} \right) dv_b \\ &= \frac{1}{2(1 + \alpha)} \int_{v_b=P^{-1}(K, \alpha)}^1 [v_b^2 + (2\alpha - 2K\alpha - 2K)v_b \\ &\quad + \alpha^2 - K^2\alpha^2 + K^2] dv_b \\ &= \frac{1}{2(1 + \alpha)} \left[\frac{1}{3} (1 - K)^2 (1 + \alpha)^2 (5K\alpha + \alpha - K + 1) \right]. \end{aligned}$$

Now using the above obtained value of Γ in Equation (12) one obtains

$$\begin{aligned} V_b(K, \alpha) &= \frac{1}{(1 - K)(1 - P^{-1}(K, \alpha))} \frac{(1 - K)^2 (1 + \alpha)}{6} \\ &\quad \times (5K\alpha + \alpha - K + 1). \end{aligned} \quad (13)$$

Equation (11) gives

$$(1 - P^{-1}(K, \alpha)) = (1 + \alpha)(1 - K). \quad (14)$$

Using the above in Equation (13) one obtains

$$V_b(K, \alpha) = \frac{(5K\alpha + \alpha - K + 1)}{6}. \quad (15)$$

Thus

$$\frac{\partial V_b(K, \alpha)}{\partial K} = \frac{(5\alpha - 1)}{6},$$

which is positive for $\alpha > \frac{1}{5}$ and negative otherwise.

Now for the outsider, Equation (5) gives

$$V_o(K, \alpha) = \frac{1}{(1 - K)(1 - P^{-1}(K, \alpha))} \Lambda, \quad (16)$$

where

$$\Lambda = \int_{v_o=K}^1 \int_{v_b=P^{-1}(K, \alpha)}^{P^{-1}(v_o, \alpha)} (v_o - P(v_b, \alpha)) dv_b dv_o.$$

Using the definition of $P^{-1}(\cdot)$ from Equation (11) one obtains

$$\Lambda = \int_{v_o=K}^1 (1 + \alpha) \left(\frac{v_o^2}{2} - K v_o + \frac{K^2}{2} \right) dv_o = \frac{(1 + \alpha)(1 - K)^3}{6}.$$

Substituting the value of Λ in Equation (16) obtains

$$V_o(K, \alpha) = \frac{1}{(1 - K)(1 - P^{-1}(K, \alpha))} \frac{(1 + \alpha)(1 - K)^3}{6} = \frac{(1 - K)}{6}.$$

The last equality is obtained by using Equation (14). Thus

$$\frac{\partial V_o(K, \alpha)}{\partial K} = -\frac{1}{6} < 0.$$

To show the second part of the proposition, note $V_b(K, \alpha) = V_o(K, \alpha) + \frac{5\alpha(1+K)}{6}$. Thus,

$$\begin{aligned} \frac{\partial V_b(K, \alpha)}{\partial K} &= \frac{\partial V_o(K, \alpha)}{\partial K} + \frac{5(1 + K)}{6} \\ \Rightarrow \frac{\partial V_b(K, \alpha)}{\partial K} &> \frac{\partial V_o(K, \alpha)}{\partial K} \quad \forall \alpha, K. \end{aligned}$$

Proof of Proposition 4. Conditional on a bidder winning at K_f , the market

value is given by:

$$\begin{aligned} V_b^W(K_f, \alpha) &= \frac{(P^{-1}(K_f, \alpha) + 1)}{2} - (1 - \alpha) K_f \\ &= \left(\frac{1}{2}\right) (1 - K_f + 3 K_f \alpha - \alpha) \end{aligned} \quad (17)$$

$$\begin{aligned} V_o^W(K_f, \alpha) &= \frac{(1 + K_f)}{2} - K_f \\ &= \frac{(1 - K_f)}{2} \end{aligned} \quad (18)$$

The cumulative price change is given by

$$\begin{aligned} \Delta_b^W(K_f, \alpha) &= V_b^W(K_f, \alpha) - V_b(0, \alpha) \\ &= \frac{1}{6} (2 - 3K_f + 9K_f\alpha - 4\alpha) \end{aligned} \quad (19)$$

The second equality is obtained by substituting from Equations (17) and (15). For a given $\alpha < \frac{1}{5}$, Equation (19) is positive if $K_f < \hat{K}_f$ and negative otherwise, where

$$\hat{K}_f = \frac{2(1 - 2\alpha)}{3(1 - 3\alpha)}$$

For $\alpha > \frac{1}{5}$, $\hat{K}_f$ is greater than 1, which implies that the cumulative price change is always positive.

Similarly, the cumulative price change for the outsider is given by

$$\begin{aligned} \Delta_o^W(K_f, \alpha) &= V_o^W(K_f, \alpha) - V_o(0, \alpha) \\ &= \frac{1}{6} (2 - 3k_f), \end{aligned} \quad (20)$$

which is negative for $k_f > \frac{2}{3}$ and positive otherwise.

Similarly, for the losing bidder the market value is

$$\begin{aligned} V_b^L(K_f, \alpha) &= \alpha K_f \\ V_o^L(K_f, \alpha) &= 0. \end{aligned}$$

The cumulative price change for the outsider on losing is obviously negative. For the blockholder the cumulative price change on losing is

$$\begin{aligned} \Delta_b^L(K_f, \alpha) &= V_b^L(K_f, \alpha) - V_b(0, \alpha) \\ &= \frac{1}{6} (6\alpha K_f - 1 - \alpha). \end{aligned} \quad (21)$$

For $\alpha > \frac{1}{5}$, Equation (21) is positive for every $K_f > \hat{K}_f$ and negative otherwise, where

$$\hat{K}_f = \frac{(1 + \alpha)}{6\alpha}$$

For $\alpha < \frac{1}{5}$, $\hat{K}_f$ is greater than 1, which implies that the cumulative price change is always negative. ■

Proof of Proposition 5.

(i) The blockholder's withdrawal strategy is examined first. Let K be the price at which the blockholder has won the contest. That is, the outsider's current bid is also K and he did not increment his bid. The blockholder has two options. If he withdraws, the target firm is taken over by the outsider at price K and the blockholder obtains αK . On the other hand, if the blockholder takes over the firm he has to pay $(1 - \alpha)K$. The blockholder's gain on takeover is given by $v_b - (1 - \alpha)K$. Comparing the above implies

$$\alpha K > v_b - (1 - \alpha)K \Leftrightarrow K > v_b.$$

Thus the blockholder will withdraw for all K greater than v_b .

To analyze the blockholder's bidding strategy, let the current bid of the outsider be K . The blockholder can match it or let the outsider win at K . The gain to the blockholder if he does not match is αK . Consider the case when the blockholder matches. Either the outsider will drop out or increment his bid to $K + \delta$. If the outsider drops out the blockholder has an option to take over the firm at K or withdraw his bid and thus sell his stake to the outsider at αK . Having this option makes him, at least weakly, better off than not matching. Now, if the outsider increments his bid, then the blockholder is assured a minimum payoff of $\alpha(K + \delta)$, which is strictly higher than the payoff of not matching. Thus always matching and winning is a dominant strategy for the blockholder.

(ii) For ease of exposition the limit case when δ goes to zero is analyzed. Let the outsider's bid be $B(v_o)$. The outsider wins if the blockholder's valuation is less than $B(v_o)$ and pays $B(v_o)$, otherwise the blockholder takeovers the target firm. The outsider's market value if he bids up to $B(v_o)$ for a given v_o is thus given by

$$\begin{aligned} V(v_o, B(v_o)) &= \int_{v_b=0}^{B(v_o)} (v_o - B(v_o)) f(v_b) dv_b \\ &= (v_o - B(v_o)) F(B(v_o)). \end{aligned}$$

Differentiating, the following F.O.C.²⁶ is obtained:

$$\frac{\partial V(\cdot)}{\partial B(v_o)} = (v_o - B(v_o)) f(B(v_o)) - F(B(v_o)).$$

The above implies

$$v_o = \frac{F(B(v_o))}{f(B(v_o))} + B(v_o).$$

As $F(\cdot)$ and $f(\cdot)$ are positive, $B(v_o) < v_o$.

(iii) The blockholder always wins the auction until the outsider drops out (shown above). Thus either he takes over at the outsider's bid or lets the outsider takeover at his own bid. This implies that the firm is always taken over at the outsider's bid independent of the realization of v_b . ■

Proof of Proposition 6. Let ERB be the expected revenue to the target firm if the blockholder has an option to withdraw his bid. Let ERC_α be the expected revenue in the auction with blockholdings and credible commitment. Let ERA be the expected revenue in the case with $\alpha = 0$ and one of the bidders has an option to withdraw. Let ERO be the expected revenue in the standard ascending bid auction with no blockholdings.

From Proposition 5, the bidding strategies of both bidders do not depend on the size of the block, which implies ERB is independent of the blocksize. Thus

$$ERB = ERA. \quad (22)$$

However, it can be shown that the standard ascending bid auction in the case with symmetric valuations (assumed in the present article) and no blockholdings is a member of the class of optimal auctions without a reserve price [see Myerson (1981) and Riley and Samuelson (1981)]. Thus absent blockholdings allowing the blockholder to withdraw can do no better than standard ascending bid auction. Thus using Equation (22),

$$ERA \leq ERO \Rightarrow ERB \leq ERO. \quad (23)$$

Now consider ERC_α and compare it to ERO . ERO is the expected revenue of an ascending bid auction with $\alpha = 0$, that is $ERO = ERC_{(\alpha=0)}$. Proposition 2 has shown that the expected revenue to the target firm is increasing in block size. Specifically,

$$ERO = ERC_{(\alpha=0)} < ERC_{(\alpha>0)}.$$

²⁶ The S.O.C. is satisfied if $\frac{\partial}{\partial v} \left(\frac{-1}{f(v)} \right) = \frac{f'(v)}{f^2(v)} < 2$.

Combining the above and Equation (23) we get the desired result, $ERB < ERC_\alpha$. That is, the target firm is better off with credible bids.

The second part of the proposition is just an implication of Proposition 2 and Proposition 5. In the no-commitment case the expected price paid for the target is independent of α (Proposition 5). However, in the commitment case the expected price paid is increasing in α (Proposition 2). Consequently the loss due to no commitment is also increasing in α . ■

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