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Sandra Betton

B. Espen Eckbo

Karin S. Thorburn

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Author Karin S.Thorburn is a full time faculty member of Norwegian School of Economics. She is a visiting professor in the Finance Department of the Wharton School at the University of Pennsylvania.

Merger Negotiations and the Toehold Puzzle

Abstract

The substantial control premium typically observed in corporate takeovers makes a compelling case for acquiring target shares (a toehold) in the market prior to launching a bid. Moreover, auction theory suggests that toehold bidding may yield a competitive advantage over rival bidders. Nevertheless, with a sample exceeding 10,000 initial control bids for US public targets, we show that toehold bidding has declined steadily since the early 1980s and is now surprisingly rare. At the same time, the average toehold is large when it occurs (20%), and toeholds are the norm in hostile bids. To explain these puzzling observations, we develop and test a two-stage takeover model where attempted merger negotiations are followed by open auction. With optimal bidding, a toehold imposes a cost on target management, causing some targets to (rationally) reject merger negotiations. Optimal toeholds are therefore either zero (to avoid rejection costs) or greater than a threshold (so that toehold benefits offset rejection costs). The toehold threshold estimate averages 9% across initial bidders, reflecting in part the bidder's opportunity loss of a merger termination agreement. In the presence of market liquidity costs, a threshold of this size may well induce a broad range of bidders to select zero toehold. As predicted, the probability of toehold bidding decreases, and the toehold size increases, with the threshold estimate. The model also predicts a relatively high frequency of toehold bidding in hostile bids, as observed. Overall, our test results are consistent with rational bidder behavior with respect to the toehold decision.

Keywords

takeover premium, toehold, termination agreement, merger negotiation, auction, target resistance

Disciplines

Finance | Finance and Financial Management

Comments

Author Karin S.Thorburn is a full time faculty member of Norwegian School of Economics. She is a visiting professor in the Finance Department of the Wharton School at the University of Pennsylvania.

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Sandra Betton
Concordia University – Department of Finance

B. Espen Eckbo
Tuck School of Business at Dartmouth

Karin S. Thorburn
Tuck School of Business at Dartmouth

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Merger negotiations and the toehold puzzle[*]

Sandra Betton

John Molson School of Business, Concordia University

B. Espen Eckbo

Tuck School of Business at Dartmouth

Karin S. Thorburn

Tuck School of Business at Dartmouth

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Abstract

Surprisingly, bidders rarely acquire a target stake (toehold) prior to launching control bids, despite paying large takeover premiums. At the same time, toeholds are large when they occur, and toehold bidding is the norm in hostile takeovers. To explain these observations, we develop and test an auction-based takeover model in which toeholds antagonize some (rational) targets, causing these to reject merger negotiations. Optimal toeholds are either zero (to avoid rejection costs) or greater than a threshold so that toehold benefits offset rejection costs. We estimate the toehold threshold, which averages as much as 9% across 10,000+ initial control bids for U.S. public targets, and show that the probability of toehold bidding decreases in the threshold estimate as predicted. The threshold model is also consistent with higher toehold frequencies in hostile bids, and with the steady decline in toehold bidding since the 1980s.

1 Introduction

Given substantial takeover premiums, one would expect a large number of bidders to establish a toehold by purchasing target shares in the market prior to launching the bid. A toehold not only reduces the number of shares that must be purchased at the full takeover premium, it is sold at an even greater premium whenever a rival bidder wins the target. Moreover, since the expected toehold gain raises the bidder's valuation of the target, it induces more aggressive bidding which can help deter competition from rivals and overcome target free-rider problems.[1] Walkling (1985), Jennings and Mazzeo (1993), and Betton and Eckbo (2000) report that toehold bidding increases the probability of winning the target. Eckbo and Langohr (1989) and Betton and Eckbo (2000) also report that toeholds are associated with lower offer premiums in winning bids, which is consistent with a deterrent effect of toeholds on bidder competition.[2]

Bidder toehold benefits notwithstanding, we document that toehold bidding has declined dramatically since the 1980s and is now rare. Over the period 1973-2002, only 13% percent of 10,000+ initial bidders seeking control of publicly traded U.S. targets have toeholds. Even more striking, only 3% percent acquire toeholds during the six-month period leading up to the initial offer announcement, the period when the actual bid strategy is being worked out. The annual toehold frequency reached a high in the early 1980s and has since been steadily declining, despite a general increase in market liquidity over the same period. At the same time, toeholds tend to be large when they exist—on average 20%—so actual toeholds center on either zero or a substantial fraction of the target shares. We also show that toehold bidding is the norm in hostile bids (50% frequency), more frequent when the initial bid is a tender offer rather than a merger bid, and more frequent when the bidder is a private company rather than a publicly traded firm.

To help explain these puzzling observations, we develop and test a novel two-stage takeover model in which merger negotiations explicitly take place in the "shadow" of an open auction. The target's willingness to enter negotiations and the terms of the merger agreement, are determined by the expected auction outcome. This setup has two distinct advantages. First, it reflects an

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[1]Grossman and Hart (1980), Shleifer and Vishny (1986), Hirshleifer and Titman (1990), and Bulow, Huang, and Klemperer (1999).

[2]Betton and Eckbo (2000) show that rivals who enter the auction have toeholds of a similar size on average as the initial bidder—as if to level the playing field (Bulow, Huang, and Klemperer, 1999; Dasgupta and Tsui, 2004). Eckbo and Thorburn (2008) show that the degree of debt impairment, which has incentive effects analogous to toeholds, affects takeover premiums in bankruptcy auctions.

important fiduciary requirement under Delaware case law, namely that the target board of directors must consider any additional bids materializing in the interim period after concluding merger negotiations and before final shareholder approval of the merger agreement. Approval requires a target shareholder vote, a bidder shareholder vote if the bidder issues new shares of 20% or more to pay for the target, and regulatory (such as antitrust) consent. The approval process averages five months for the successful initial bidders in our sample below, which gives potential rival bidders ample time to compete. The fact that the target board must have a "fiduciary out" during this wait period has contributed to the widespread inclusion of provisions for target termination fees in merger agreements, which play a key role in our model as well.

The second advantage of our two-stage takeover game (merger negotiations followed by open auction) is that it allows us to solve explicitly for the optimal decision by target management to accept or reject the initial bidder's invitation to negotiate. The target decision criterion in turn dictates an equilibrium toehold strategy for the initial bidder which is testable—the ultimate goal of this paper. A key model feature is that approaching the target with a toehold may impede the bidder's attempt to start negotiations. Toeholds antagonize some targets because with optimal bidding toeholds directly reduce target management's expected private benefits of control. Thus, our model captures the notion frequently heard in practice that toehold bidding is "aggressive" towards the target. The implication is a dual "toehold threshold" strategy in equilibrium: approach the target with a zero toehold (to avoid rejection costs) or acquire a toehold greater than a certain threshold. The threshold is the toehold at which toehold benefits equal toehold-induced rejection costs. To our knowledge, ours is the only model in the literature which delivers the bimodal toehold distribution (either zero or large toeholds) observed in the data.

Cross-sectional tests of the toehold threshold model require estimating the threshold value for each initial bidder in the sample. An important input into this estimation is the cost to the bidder of the target refusing to negotiate. In practice, rejection costs range from extra due diligence costs whenever the target refuses to open its books to the bidder to wealth transfers from enforcing poison pills. We focus in this paper on a particular, quantifiable rejection cost: the loss of a target termination agreement. Termination provisions, which stipulate a form of bidder compensation if the target withdraws from the negotiated agreement, has evolved since the mid-1980s and is

now common in friendly deals.[3] Thus, our toehold threshold incorporates the opportunity loss of a breakup fee, fully accounting for the impact of the fee on the optimal auction bids. In this framework, toeholds and termination agreements arise endogenously as economic substitutes—in equilibrium you can have one but not necessarily both.

The theoretical threshold value function is increasing in the bidder's private valuation of the target, the size of the termination fee, and the probability that the target rejects all bids. The latter probability is as high as 30% across the full sample and (surprisingly) greater when the initial bid is a merger rather than a tender offer. The no-bidder-wins probability plays an important role in the tradeoff between a toehold and a termination agreement because only the latter provides the bidder with a payment when the target rejects all offers. Thus, the greater no-bidder-wins probability, the greater the relative advantage of a termination agreement over a toehold, which is reflected in a greater toehold threshold value.

The estimated toehold threshold averages 9% across the total sample. In the presence of transaction costs of acquiring a toehold, a threshold of this size could well induce a broad range of bidders to prefer a zero toehold—as the data indicate. Cross-sectional regressions also confirm that the probability of toehold bidding decreases, and the actual toehold size increases, in the toehold threshold estimate.

Moreover, the toehold threshold model is consistent with the observed greater toehold frequency in hostile bids. Intuitively, given substantial toehold benefits, toehold bidding is always optimal when the target's decision to resist the takeover is *independent* of the bidder's toehold. When the target management is highly entrenched (enjoying substantial private benefits of control), it will defend itself against any bidder—toeholds or not. In this case, the toehold opportunity cost is zero, making toehold bidding optimal. Interestingly, if toeholds are primarily used as a means to overcome hostile target managements, then we would also expect the overall toehold bidding frequency to decline along with a decline in the frequency of hostile takeovers, which is precisely what we observe.

Finally, we present new evidence on the valuation effects of toehold bidding. Of particular interest is the potential for a negative return on the toehold investment when all bids fail. While

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[3]The typical form of compensation, used below, is a fixed breakup fee (Burch, 2001; Officer, 2003; Bates and Lemmon, 2003; Boone and Mulherin, 2007a).

our model abstracts from this type of toehold loss, significant negative target returns in the no-bidder-wins outcome could also deter toehold purchases ex ante (Goldman and Qian, 2005). As in Bradley, Desai, and Kim (1983), we show that target abnormal stock returns through the entire contest average zero when all bids are rejected. Moreover, we find that target returns in the no-bidder-wins outcome are increasing in bidder toeholds. Overall, the potential for negative toehold returns when all bids fail is unlikely to explain the pervasive bidder preference for zero toehold.

The paper is organized as follows. Section 2 develops the structure of the takeover game, explains the intuition behind the toehold threshold bidding, and presents the paper's main testable hypothesis. Section 3 explains the data collection and the construction of takeover contests, and describes our new evidence on toehold bidding frequencies. We test our toehold threshold theory in Section 4. Section 5 presents estimates of the impact of toeholds on expected bidder returns, and Section 6 concludes the paper.

2 Optimal toehold strategies

In this section, we develop the structure of our takeover game and discuss properties of the implied toehold threshold. All proofs are in the Appendix.

2.1 Game structure, payoffs, and optimal bids

The game structure is shown in Fig. 1. In the first stage, target management accepts or rejects an invitation by the initial bidder (B1) to negotiate a merger. In the second stage, there is always an auction for the target where B1 competes with a single rival bidder B2. If the target rejects B1's initial merger proposal (lower branch in Fig. 1), B1 launches an unsolicited tender offer in the second stage. If the target accepts negotiations (upper branch in Fig. 1), the second-stage auction is friendly and takes place in the interim period before final shareholder approval of the negotiated agreement. The key parameters are as follows:

(1) Toehold (α): B1 bids with a toehold $\alpha \in [0, 0.5)$, acquired at the normalized pre-game target share price of zero. B2's toehold is always zero.

(2) Termination fee (t): In merger negotiations, the target awards B1 a termination agreement with a breakup fee of $t \in [0, v]$, where $v \in [0, 1]$ is the bidder's private valuation of the

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target. The fee is payable to B1 whenever the target withdraws, which happens either if B2 wins or if the target rejects all bids.

(3) Private benefits (β): The target management enjoys private benefits of control $\beta \in [0, 1]$. If the target accepts negotiations, the winner of the second-stage auction (B1 or B2) removes β. If the target rejects merger negotiations, however, the target brings in B2 as a white knight in the hostile auction. The white knight allows target management to retain β if it wins. For simplicity, this retention of β does not reduce B2's valuation of the target.

(4) Resistance costs (r): When the target rejects negotiations and B1 launches a hostile bid, the target imposes a bidder-specific resistance cost $r \in [0, v]$ on B1, reducing B1's valuation from v to $v - r$.[4]

(5) No-bidder-wins probability (θ): The auction has three possible outcomes: B1 wins, B2 wins, or no bidder wins. The no-bidder-wins outcome occurs with probability θ, determined by exogenous factors that can derail merger negotiations or cause all bidders to abandon a takeover auction. θ is not to be confused with the conditional probability that B1 defeats B2 in the auction, which is determined endogenously by the bids.

This structure yields the payoff Π to B1 and the utility U of target management shown in Fig. 1 for each of the six outcomes in the game. The total utility of target management is given by $U \equiv \beta + p$, where p is the price paid by the winning bidder in the auction. Thus, we assume that target management's incentives are only partly aligned with those of its shareholders. On the one hand, the target management values the offer premium p as much as target shareholders do. On the other hand, the risk of losing β means that the target management will refuse merger negotiations in some states where target shareholders would have preferred to negotiate.

To derive the payoffs, suppose the auction is second-price (the winner pays the loser's bid), and let p^* and p_2 denote the bids of B1 and B2, respectively:

- When the auction follows merger negotiations, B1 pays p_2 for the remaining $1 - \alpha$ target shares if it wins, resulting in $\Pi = v - (1 - \alpha)p_2$ and $U = p_2$.

---

[4]In our sample below, B2 wins six times more often when the target is hostile rather than friendly, possibly a direct effect of r reducing the initial bidder's valuation.

- If B2 wins, it pays p^* for the target shares and the target pays t to B1, so $\Pi = \alpha p^* + t$ and $U = p^*$.

- If neither B1 nor B2 wins, the target pays t to B1 and the target share price falls back to $-t$ (the sum of the pre-takeover price of zero and the cost of the termination fee), yielding $\Pi = t(1 - \alpha)$ and $U = \beta - t$.

- If the auction follows target rejection of merger negotiations, B1 makes a hostile tender offer without a termination agreement. In this case, if neither B1 nor B2 wins, $\Pi = 0$ and $U = \beta$. If B1 wins, $\Pi = v - r - (1 - \alpha)p_2$ and $U = p_2$, and if B2 wins (now as a white knight) $\Pi = \alpha p^*$ and $U = \beta + p^*$.

Given these payoffs, Proposition 1 shows the optimal bids in the Stage-2 auction with risk-neutral bidders. Bidder private valuations are i.i.d with distribution and density functions $G(v)$ and $g(v)$, respectively:

Proposition 1 (auction bids): *If the target agrees to negotiate, optimal bids are*

$$
\begin{aligned}
B1: \quad p^* &= v + \alpha \frac{1 - G(p^* + t)}{g(p^* + t)} - t = \frac{v + \alpha}{1 + \alpha} - t \\
B2: \quad p_2 &= v_2 - t,
\end{aligned}
\tag{1}
$$

where the second equality for B1 invokes the uniform distribution $v \sim U[0, 1]$. If the target rejects merger negotiations, optimal bids are

$$
\begin{aligned}
B1: \quad p^* &= v + \alpha \frac{1 - G(p^*)}{g(p^*)} - r = \frac{v + \alpha - r}{1 + \alpha} \\
B2: \quad p_2 &= v_2.
\end{aligned}
\tag{2}
$$

As shown by Burkart (1995) as well, in this auction setting B1's optimal bid p^* increases with α as the toehold induces B1 to overbid relative to its private valuation v. In addition, Proposition 1 incorporates the effects of the termination fee t and the resistance cost r. The existence of the termination fee reduces p^* and p_2 by the full value of t (i.e., underbidding). Interestingly, although the fee is costly to B2 (who effectively pays t), t lowers B1's optimal bid to the point where t does *not* affect competition between the two bidders. The resistance cost r reduces B1's bid but not the bid of B2 and therefore provides a competitive advantage for B2 when it is playing the role as a

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white knight. Notice also that, because there are no price-dependent payoffs to either B1 or B2 in the no-bidder-wins outcome, none of the optimal bids in Proposition 1 are affected by θ.

2.2 Target management's optimal response

It follows from Proposition 1 that B1's toehold raises $E(p)$ (through overbidding) and lowers $E(\beta)$ (as overbidding raises the probability that B1 wins the auction). Moreover, a target rejection lowers $E(p)$ by lowering B1's bid. The relative importance of these effects for $E(U)$ gives rise to the three distinct regions for the private benefits of control β which determine the optimal target response to B1's invitation to negotiate a merger:

Proposition 2 (target response): *Suppose target management maximizes $E(U) \equiv E(\beta) + E(p)$ subject to the optimal bids in Proposition 1. The target accepts or rejects B1's offer to negotiate as follows:*

$$
\begin{array}{ll}
\textit{accept for any } \alpha \textit{ when } \beta < \underline{\beta} & \textit{(Region I)} \\
\textit{accept if } \alpha = 0 \textit{ and reject if } \alpha > 0 \textit{ when } \underline{\beta} \leq \beta \leq \overline{\beta} & \textit{(Region II)} \\
\textit{reject for any } \alpha \textit{ when } \beta > \overline{\beta} & \textit{(Region III)}
\end{array}
\tag{3}
$$

where the limits when $v \sim U[0, \ 1]$ are

$$
\begin{aligned}
\underline{\beta} &= [\frac{1}{2}r^2 + r(1-v) + (\frac{1}{2}t^2 - \frac{t}{1-\theta})(1+\alpha)^2](\frac{1}{(1-v+r)(1+\alpha)}) \\
\overline{\beta} &= [\frac{1}{2}r^2 + r(1-v) + \frac{1}{2}t^2 - \frac{t}{1-\theta}](\frac{1}{1-v+r}).
\end{aligned}
$$

The optimal target response is illustrated in Fig. 2. Targets that are only mildly entrenched (Region I with $\beta < \underline{\beta}$) value the expected takeover premium $E(p)$ sufficiently to always accept B1's invitation to negotiate. Conversely, highly entrenched targets (Region III where $\beta > \overline{\beta}$) always reject B1's invitation. This is because the reduction in $E(\beta)$ resulting from a takeover by B1 more than offsets the positive premium effect. In Region III, rejection is optimal despite the negative effect of the resistance cost r on $E(p)$ when B1 is forced to make a hostile bid, and the target optimally rejects regardless of B1's toehold.

However, B1's toehold plays a pivotal role for the target accept/reject decision when β falls in the middle range (Region II where $\underline{\beta} \leq \beta \leq \overline{\beta}$). In Region II, the marginal impact of the toehold is such that the target management optimally accepts negotiations if $\alpha = 0$ and rejects if $\alpha > 0$.

Targets in this region are willing to negotiate a takeover with B1, but only if B1 has no toehold. In other words, in this region, B1's toehold *by itself* antagonizes target management enough to impede merger negotiations.

2.3 Optimal toehold strategy

B1's optimal toehold strategy follows from optimal bidding (Proposition 1) and the target's response (Proposition 2):

Proposition 3 (toehold strategy): *Let $\hat{\alpha}$ denote a toehold threshold that makes B1 indifferent between a toehold of zero and $\hat{\alpha}$ in Region II of Proposition 2. B1's optimal toehold α is such that*

$$
\begin{aligned}
&\alpha > 0 \ if \ \beta < \underline{\beta} && (Region \ I) \\
&\alpha = 0 \ or \ \alpha \geq \hat{\alpha} \ if \ \underline{\beta} \leq \beta \leq \overline{\beta} && (Region \ II) \\
&\alpha > 0 \ if \ \beta > \overline{\beta} && (Region \ III)
\end{aligned}
\tag{4}
$$

where the toehold threshold when $v \sim U[0,1]$ is given by

$$
\begin{aligned}
\hat{\alpha} \ (\theta, \ t, \ v, \ r) \ &= \ -k_1 + \sqrt{k_1^2 + k_2} \tag{5} \\
k_1 \ &= \ v - r - \frac{1}{2}(v^2 - t^2) - \frac{t}{1 - \theta} \\
k_2 \ &= \ r(2v - r) + t(\frac{2}{1 - \theta} - t)
\end{aligned}
$$

Proposition 3 shows that in Region II toeholds are bimodal in equilibrium, centered on zero or the minimum threshold value $\hat{\alpha} > 0$. Figure 2 illustrates this strategy given the targets' optimal response. Obviously, when the target's response is independent of the toehold (Regions I and III), toehold bidding is always optimal. In this case, B1 captures toehold benefits without punity. Toehold benefits include reducing the fraction of the target shares that B1 must purchase at a premium to $1 - \alpha$, and providing a capital gain should B2 ultimately win the auction.

In Region II, however, the target rejects merger negotiations only if $\alpha > 0$. Because of this rejection, B1's choices are (i) approach the target with a zero toehold to avoid rejection, or (ii) acquire a toehold which is large enough to offset the expected cost of toehold-induced target rejection of merger negotiations. Recall that target rejection implies that B1 foregoes the termination agree-

ment (with a fee of t) and has to face resistance cost r when proceeding with the hostile auction in the second stage. The toehold threshold $\hat{\alpha}$ in Proposition 3 is the smallest toehold consistent with the choice under (ii). The choice between a zero toehold and one that greater than the toehold threshold depends on the transaction costs of acquiring a toehold in the market (which are not included in Proposition 1). The greater the toehold transaction costs, the more likely one is to observe zero toeholds.

2.4   Toehold threshold properties and testable hypothesis

The toehold threshold $\hat{\alpha}$ in Proposition 3 is an increasing function of the four parameters θ, t, v, and r. Intuitively, because the termination fee but not the toehold provides B1 with a payment in the no-bidder-wins outcome, the advantage of termination agreements over toeholds increases with θ. Second, v and t both raise the payoffs under the termination contract. Since $\hat{\alpha}$ reflects the opportunity loss of this contract, it increases in t and v as well. Third, because the threshold must overcome the expected cost of rejection and target resistance, $\hat{\alpha}$ is also increasing in r.

In the empirical analysis, we replace the unknown resistance cost r with its minimum value $\bar{r}$ necessary for Region II to exist. From Proposition 2, Region II exists only if $\bar{\beta} > 0$. Setting $\bar{\beta} = 0$ and solving for r yields

$$\bar{r} = v - 1 + \sqrt{(1-v)^2 + 2t/(1-\theta) - t^2}. \tag{6}$$

Substituting $\bar{r}$ for r ensures that the estimated threshold value is consistent with the existence of Region II for each target. To see why, recall that Region II is where the target accepts negotiations if and only if B1's toehold is zero. Accepting negotiations is costly as it reduces $E(\beta)$ and it requires granting a termination agreement which reduces $E(p)$ (Proposition 1). Thus, if rejection were costless, the target would always reject, and Region II would not exist. The cost r ensures that rejection is also costly for the target because it reduces the expected takeover premium $E(p)$ by reducing B1's optimal bid. The minimum resistance cost $\bar{r}$ is such that rejection is sufficiently costly for targets to accept negotiations when α is zero.

We test for the existence of toehold threshold bidding using values of θ, t, and v estimated from the data, and $\bar{r}$ computed using Eq. (6). The main empirical hypothesis is as follows:

H1 (Toehold threshold bidding): *Let $c(\alpha) > 0$ denote the transaction costs of*

acquiring a toehold of α, where ∂c/∂α > 0. The toehold strategy in Proposition 1 predicts that

   (i) the probability of observing α > 0 decreases in the threshold α̂,

   (ii) conditional on α > 0, α increases in α̂,

   (iii) the probability of observing α > 0 is greater when the bidder expects target management to reject all bids irrespective of α.

H1(i) and H1(ii) refer to Region II in Proposition 3, where bidders are indifferent between approaching the target with a zero toehold or with a toehold equal to the threshold α̂. The toehold transaction cost $c(\alpha)$ breaks this indifference in favor of selecting a zero toehold. The positive derivative ∂c/∂α reflects the increasing nature of illiquidity and information costs that are part of $c(\alpha)$, and it renders toehold bidding less likely for greater thresholds. H1(iii) refers to Region III, in which target management is sufficiently entrenched to resist all bids regardless of the toehold.

For the purpose of the empirical tests of H1 below, recall that target hostility is endogenously triggered by B1's toehold in Region II only. This endogeneity is accounted for by modeling B1's toehold decision as a function of α̂. In Region III, however, target hostility is exogenous to B1 while at the same time inducing B1 to bid with a toehold. To account for Region III, we therefore include proxies for expected hostility in the regressions determining B1's toehold choice. Moreover, since the no-bidder-wins outcome follows target resistance to all bids (regardless of toeholds), we also include these proxies when estimating θ.[5]

3   Sample of takeover contests

3.1   Definition and construction of contests

As in Betton and Eckbo (2000), we group successive bids for the same target into a takeover contest. A contest can have a single control bid, multiple bids by a single bidder, or multiple bidders. Our use of the term "contest" emphasizes the fact that, ex ante, any attempt to acquire control of the

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[5]Proposition 1 also predicts toehold bidding in Region I, where target managements driven largely by $E(p)$ always accept B1's invitation to negotiate. We do not pursue this prediction because we are essentially unable to empirically classify a target as being in Region I. However, we present some evidence suggestive of Region I by referring to private bidders below.

target is subject to a competing bid (including competition from the target management itself). As explained in the introduction, this is true also for signed merger agreements, as the target board has a fiduciary responsibility to consider any rival offer until the agreement is finally approved by shareholders. In our definition, a given control bid initiates the contest if there are no other public control bids for the same target over the preceding six months. All subsequent control bids within six months of a previous bid belong to the same contest. The contest ends when there are no additional control bids for the same target over the following six-month period.

To identify the initial control bidder, we first sample bids from the Thomson Financial SDC Merger & Acquisitions data base. From January 1980 through December 2002, SDC contains 13,896 control bids for U.S. publicly traded firms with transaction form M (merger) or AM (acquisition of majority interest). A control bid is defined as the bidder owning less than 50% of the target shares prior to the bid and seeking to own at least 50% of the target shares after completion of the transaction. We further include 1,106 tender offers for control identified by Betton and Eckbo (2000) that are not in SDC. In addition, a search for tender offers in the Wall Street Journal (WSJ) identifies 200 control bids also not in SDC, producing a total of 15,197 bids for control. With our contest definition, these bids take place in 12,721 takeover contests. Finally, we require the target to be listed on the Center for Research in Security Prices (CRSP) data base, which eliminates 1,915 contests, for a total sample of 10,806 control contests over the period 1973–2002.[6]

3.2   Sample characteristics

As shown in the second column of Table 1, two-thirds of the total number of initial bids (7,076 cases) are from the period 1990-2002, and 7,750 or 72% of the total are merger bids. A bid is a merger if it has transaction form M and is not flagged as a tender offer in SDC. All other bids are tender offers. A total of 6,726 or 62% of the bidders are publicly traded.[7] The target receives publicly announced control bids from two or more bidders in 862 or 8% of the contests. The target

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[6]The formation of contests and the CRSP listing requirement reduces the number of non-SDC cases from 1,306 to 400 (all tender offers), of which 395 are from Betton and Eckbo (2000) and 5 from the WSJ search. Moreover, of these 400 cases, three quarters are in the pre-SDC period 1973-1980 and the remainder from the early SDC years (the 1980s). These non-SDC cases have similar sample sample characteristics as the SDC sample and are not singled out below.

[7]The 4,080 private bidders include 754 subsidiaries, four government-owned companies, 19 investor groups, 45 joint ventures, and eight mutual companies. Private bidders select a merger bid somewhat less often than public bidders (64% versus 76%).

management is hostile in 511 (5%) of the contests. (The target's response is classified as friendly if SDC or the WSJ characterize the response as positive or neutral, or a response is not recorded, and hostile otherwise.) While not shown in the table, targets are hostile in 10% of the cases prior to 1990 and in 2% after 1989. Moreover, tender offers trigger hostility four times as often as merger bids (10% versus 2%), and multiple-bidder contests are associated with target hostility in 14% of the cases versus 4% in single-bidder contests. The initial bidder offers an all-cash payment to the target in 4,185 cases (39%).

Columns 3 and 4 of Table 1 show the mean and median deal values. Deal value is available for 8,271 targets, with missing information primarily for the no-bidder-wins outcome. The median is substantially smaller than the mean, indicating a skewed distribution. For the total sample, the average deal size is $715 million with a median of $89 million. The deal size is greater in the second part of the sample period, in merger deals (on average twice the size of tender offers), when the bidder is public, when the contest develops multiple bidders, and when the payment is all stock or mixed cash and securities. The largest average deal size in the sample occurs when the target is hostile: $1,204 million versus $688 million in friendly deals.

We are able to classify the outcome for 10,619 contests. The initial bidder wins in 67% of the cases. The initial bidder fails either because a rival bidder wins (4% of all contests) or because the target rejects all bids (30%). Interestingly, the initial bidder wins more often with a tender offer than with a merger bid (64% versus 75%). Initiating a merger bid is riskier than a tender offer primarily because targets are more likely to reject all bids in mergers: 33% versus 20% in tender offers. Not surprising, target hostility increases the percent of the sample where no bidder wins from 29% to almost half (49%). Notice also that, in the overall sample, the probability of the no-bidder-wins outcome is substantially greater for private than for public bidders: 44% versus 21%.

Conditional on a rival bidder entering, the rival wins the contest twice as often as the initial bidder (48% versus 21%). The entry of a rival does not materially change the sample proportion of the no-bidder-wins outcome. Moreover, when the initial bid is hostile, rivals win in 16% of the contests compared to only 3% when the target is friendly towards the initial bid. Thus, hostility increases both the chance of a rival bidder winning and the chance of a no-bidder-wins outcome. Overall, in hostile cases, the initial bidder succeeds in only 34% of the bids compared to a 68%

initial bidder success rate in friendly deals.

The last two columns of Table 1 show average initial and final offer premiums. We use the former in our estimation of the toehold threshold below. The initial offer premium is defined as $(p_{ini}/p_{-41}) - 1$, where p_{ini} is the initial offer price and p_{-41} is the target share price listed on CRSP on day -41 relative to the initial offer date (adjusted for splits and dividends). The final offer premium is $(p_{fin}/p_{-41}) - 1$, where p_{fin} is the final price offered. Thus, the final premium is the total premium relative to the pre-contest target share price. With SDC as our primary source, we have offer premium data on a total of 6,886 contests. When the initial offer price is missing in SDC, and SDC reports no bid revision by the same bidder, we use the final price offered by this bidder as our initial price.

The median offer premium is consistently a few percentage points lower than the mean, and we report only the mean in Table 1. The average initial offer premium is 44.5% across the total sample with premium data. The final premium is almost identical (46.1%) due to the large portion of contests in which the initial price is also the the final price (single-bid contests). There is no discernible difference in initial and final offer premiums in the first and second parts of the sample period. Initial (final) offer premiums are 43.6% (44.5%) in mergers and 46.5% (50.2%) in tender offers. Separating ex post single- and multiple-bidder contests, the average initial and final premiums in multiple-bidder contests are 41.1% and 53.2%, respectively. For single-bidder contests, the initial premium averages 44.8% (final 45.4%). Thus, as also found by Betton and Eckbo (2000), the initial bid in contests that develop bidder competition is slightly lower than the final (single) price in contests where no rival bidder enters to compete. While not a test of preemptive bidding, this finding is consistent with the argument that single-bid contests have only one bid because the initial bidder strategically raises the initial bid enough to deter comptetition (Fishman, 1989).

Table 1 also shows that initial (and final) offer premiums are lower at 40.1% when the bidder is private, versus 46.1% for public acquirers. Premiums are almost identical in all-cash and all-stock/mixed offers. Finally, contests with hostile targets have both the highest initial bid premium at 49.0% (versus 44.1% for friendly targets) and final offer premium at 60.9% (versus 45.1% for friendly targets).

3.3 Toeholds

A toehold is an ownership stake in the target held at the announcement of the initial bid. With our definition of a control bid, toeholds are less than 50% of the target shares. Beginning in 1980, the primary source of our toehold data is SDC for both mergers and tender offers. There are a total of 1,363 positive toeholds in the sample. Of these 1,363 toeholds, 885 are from SDC and 180 are from the 400 non-SDC cases. Of the remaining 298 toeholds, 202 are from the tender offers in Betton and Eckbo (2000) that overlap with SDC. Another 83 are found in SDC records of acquisitions of partial interest (form AP) in the target by the bidder within six months of the initial control bid, and the remaining 13 toeholds are from the WSJ and the SDC history field.

Missing toehold data are classified as a toehold of zero. As indicated above, the hand-collected information in Betton and Eckbo (2000) and the WSJ search allow us to replace some toeholds that are missing from SDC in the early period. SDC's overall reporting accuracy increases over the sample period. In fact, the WSJ search for toeholds in tender offers during the 1990s failed to identify any toeholds missing from SDC. Note that our tests below, which condition on the toehold being positive, are unlikely to be affected by the potential for missing toeholds. Also, while missing toehold data will introduce noise into our estimates of the probability of toehold bidding, lack of power is not an issue in the subsequent empirical analysis.

Fig. 3 shows the annual toehold frequency for the initial merger bids and tender offers in our sample. The toehold frequency in tender offers increases during the 1970s and starts declining in the mid-1980s. For merger bids, the toehold frequency peaks in 1980 and again in 1986-1988, and then falls steadily towards the end of the sample period. Notice that this decline coincides with a general increase in stock market liquidity. Notice also that the increase in toehold frequency throughout the 1970s continues well after the passage of the 1968 Williams Act (mandating information disclosure in tender offers) and the 1976 Hart-Scott-Rodino Act (mandating pre-notification of mergers for antitrust review).

Table 2 lists additional information on the toehold frequency and size across bid categories. Of the 10,806 initial bidders, 13% have toeholds. The toehold frequency is substantially lower in the second half of our sample period (7% versus 22%), and it is lower in merger bids (7%) than in tender offers (26%). There are toeholds in 12% of single-bidder contests, versus 18% in multiple-bidder

contests. Toeholds are four times more frequent in hostile bids (50%) than in friendly bids (11%). There are also more toeholds among private bidders than public bidders (16% versus 11%), and when a rival wins the contest.

We classify toeholds as long-term and short-term using the reporting practice of SDC. A long-term toehold is defined as target shares held six months prior to the initial bid date. A short-term toehold is the incremental toehold purchased during the six-month period leading up to the bid. Note that the merger negotiation process in itself limits short-term toehold acquisitions as defined here. It is common practice for bidders to sign a standstill agreement at the start of the negotiations. The length of these negotiations, which take place prior to the public announcement of the merger, typically ranges from two to six months (Bruner, 2004; Boone and Mulherin, 2007b). Thus, for some bidders, negotiations could have prevented a short-term toehold acquisition in the six-month look-back period prior to the announcement date. In the context of our threshold theory, signing a standstill agreement is itself a decision that involves the tradeoff between negotiations and an unsolicited bid. Thus, observing a zero short-term toehold carries information regardless of the constraint imposed by the negotiation process.

Of the 1,363 toehold bidders, we are able to classify 970 toeholds as either long or short term. As shown in Table 2, 91% of these toehold bidders have a long-term toehold, and 22% acquire a short-term toehold. This means that in the overall sample of 10,000+ initial control bidders, only 3% have short-term toeholds. Moreover, 13% of the toehold bidders have both short- and long-term toeholds, and 14% of the bidders with a long-term toehold also acquire a short-term stake. Of the bidders with short-term toeholds, 41% have no long-term toehold. Table 2 also shows that the percentage of long-term toeholds is somewhat higher, and of short-term toeholds somewhat lower, in the second half of the sample period, in tender offers, and when the target is friendly.

Private toehold bidders have a high proportion of short-term toeholds at 25% versus 18% for public toehold bidders. Moreover, in hostile bids, 31% of toehold bidders have a short-term toehold versus 20% in friendly bids with toeholds. Thus, 15% of all bidders in hostile deals acquire a short-term toehold versus only 2% of all bidders in friendly deals.

Conditional on being positive, the average toehold size is large: 20% of the target shares. The average size of a long-term toehold is also 20% of the target equity, while the average short-term toehold size is 13%. Since large toeholds can trigger significant costs associated with liquidity

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and information disclosure (Ravid and Spiegel, 1999; Bris, 2002), this short-term toehold size is particularly surprising. The average toehold size increases somewhat from the 1980s to the 1990s. Toeholds are larger in friendly than in hostile bids (22% versus 11%), and in single-bidder contests versus multiple-bidder contests (21% versus 13%). Moreover, toeholds are on average greater in contests where the initial bidder wins. The average size of long-term and short-term toeholds displays a similar pattern as the total toehold.

Panel A of Fig. 4 plots the frequency distribution of the toehold size. About half of the toeholds exceed 15% of the target shares and are relatively evenly distributed between 15% and 50%. One-sixth of the toeholds are less than 5% with a peak in the distribution of toeholds between 5% and 10%. Panel B of Fig. 4 shows the relative distribution of short-term and long-term toeholds across different toehold sizes. Long-term toeholds have a fatter right tail than short-term toeholds, with two-thirds exceeding 10% of the target shares and one-third exceeding 25%. For short-term toeholds, 40% are greater than 10% and 10% exceed 25%.

4 Does toehold threshold bidding exist?

4.1 Estimating the threshold

As discussed in Section 2, the toehold threshold $\hat{\alpha} = f(\theta, t, v, r)$ is estimated as a function of the first three parameters only, where the resistance cost r is replaced by its minimum value $\bar{r} = f(\theta, t, v)$ in Eq. (6). With the estimates of θ, t and v discussed below, $\bar{r}$ averages 3% in the data, with a median of 2%. We begin the estimation with the probability θ of the no-bidder-wins outcome. Recall from Table 1 that 30% of all contests end up with no bidder winning the target. We estimate θ using binomial logit, where the dependent variable equals one if the target rejects all bids. The explanatory variables are defined in Table 3, while Table 4 shows the coefficient estimates. The variables represent target, bidder, and contest characteristics. Target characteristics include (log of) market value of equity (*Target size*), measures of target stock liquidity such as an indicator for a share price below $1 on day -41 (*Penny stock*), average stock turnover on days -166 through -42 (*Turnover*), and whether the target is listed on a major stock exchange (*NYSE/Amex*). Moreover, the logit regression contains a poison pill indicator.

We include as bidder characteristics the public status of the bidder (*Acquirer public*) and an

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indicator for the product market relation with the target. The acquisition is classified as horizontal if the two firms have the same primary four-digit SIC code (*Horizontal*). With this definition, 27% of the contests start with a horizontal bid. The regression further includes contest characteristics such as indicators for tender offer (*Tender offer*), the payment method being cash only (*Cash*), target hostility (*Hostile*), and the entry of a rival bidder (*Multiple bidders*). As discussed in Section 2.3 above, *Hostile* is included to capture targets in Region III of the takeover game, where target management reject all bids (irrespective of toeholds). Finally, we include industry fixed effects (not shown) for financial, manufacturing, trade, and service industries.

The process of takeover negotiations changes over time as the investment banking industry becomes more actively involved in promoting takeovers and develops new deal protection devices such as termination agreements. Since these changes are likely to affect θ, we estimate the model separately for the 1973-1989 and 1990-2002 time periods. Moreover, to check the sensitivity of our results to the inclusion of *Hostile* and *Multiple bidders*, we use two model specifications for θ, as reported in Table 4.

The regressions are all significant at the 1% level. For both time periods, the estimated probability of the no-bidder-wins outcome θ increases with target hostility (both *Hostile* and *Poison pill*). In other words, target hostility to the *initial* bid lowers the probability of success of *all* bids. This is consistent with hostility reflecting high target management entrenchment, as predicted in Region III of Proposition 1. It is also interesting that having a poison pill by itself increases θ. Since we show below that poison pills have no discernible impact on offer premiums, this means that pills reduce expected premiums. This result extends the finding of Comment and Schwert (1995) on the impact of pills.

Moreover, θ decreases when the initial bidder is publicly traded and if the target is listed on NYSE/Amex. After 1989, θ is also greater for penny stocks and lower for horizontal bids. These results indicate that targets are more likely to accept an offer the more liquid the bidder (public status) and target shares. Moreover, targets are more likely to be acquired in tender offers and when the payment method is cash. In the following, we use the predicted value of θ for each initial bidder, using either Model I or Model II.

Second, the threshold requires an estimate of the target termination fee t. Target termination agreements come in two forms: a fixed dollar payment or a lock-up option to purchase target

assets below market value. We restrict our attention to fixed breakup fees which are also the most prevalent in the data. Using SDC information, termination agreements are rare prior to 1990, increasing to 50% of our control bidders in the late 1990s. The average termination fee is \$34 million or 4% of the deal value. In our sample, target termination agreements are observed almost three times as often for public bidders (33% of the bids) as for private bidders (13%).

We require an estimate of t for each initial bidder in the sample, regardless of whether or not an agreement is observed ex post. Since B1 makes the toehold decision prior to initiating the takeover, it must predict t. We use the average fee for the target's four-digit industry and year of takeover bid as the predictor. The conclusions below do not change if we instead use the actual termination fee received ex post by B1. SDC does not report any termination agreement before 1985, and we set $t = 0$ for takeover bids prior to this year. The average industry-estimate of t in the sample is 3%. Note that this estimation benefits from the substantial standardization of termination contracts in the 1990s.

Third, we approximate the initial bidder's private valuation v with the initial bid premium $(p_{ini}/p_{-41}) - 1$. Thus, bidders are assumed to differ in their synergy gains with the target (giving rise to different offer premiums), while the the stand-alone, no-information target share value (p_{-41}) is common across bidders. As in the model, we fit the premium observations to the uniform cumulative distribution function. As robustness checks, we replace the initial offer premium with the initial bidder's *final* offer premium (whether or not this is the last premium in the contest), and use the normal rather than the uniform distribution for v. These alterations do not change our conclusions below.

Fig. 5 shows the frequency distribution of the threshold estimate. The threshold is estimated for a total of 6,155 initial bidders with available offer premiums. The estimate averages 9% (median 8%) for the total sample. While not shown, the threshold distribution shifts to the right over the sample period, averaging 7% (median 4%) over 1973-1989 and 11% (median 9%) over 1990-2002. As discussed above, offer premiums (used to estimate v) do not change materially between the two periods. Moreover, the probability of the no-bidder-wins outcome decreases after the first subperiod. Therefore, the shift in the sample toehold threshold distribution is most likely driven by the absence of termination contracts prior to the mid 1980s.

4.2 Testing the toehold threshold hypothesis

Table 5 shows the coefficients in regressions for the probability of observing a toehold (logit estimates) and for the toehold size (OLS estimates). The explanatory variables are as in the earlier regressions for the probability θ with the addition of our estimate of the toehold threshold $\hat{\alpha}$. *Threshold I* and *Threshold II* refer to estimates of $\hat{\alpha}$ using Model I and Model II in Table 4, respectively, for the probability θ. The regressions are significant and yield several interesting results. First, recall that the main prediction of H1 is that the probability of observing toehold bidding is greater for lower values of $\hat{\alpha}$. The logit regressions provide strong support for this prediction. In the first two regressions, the coefficients on *Threshold I* and *Threshold II* are both negative and significant at the 1% level. Second, toehold bidding is more likely when liquidity costs are lower, here indicated by the target trading on NYSE or Amex. Liquidity does not seem to play a role beyond stock exchange listing, as the variable *Turnover* enters with a small but negative coefficient and *Penny stock* is statistically insignificant.

Third, the univariate information in Table 2 suggests that toehold bidding is frequent in hostile takeovers. This is also the prediction of H1(iii) (Region III in Proposition 1). As shown in Table 5, toehold bidding is significantly more likely when the target has a poison pill (*Poison*) and when the target response to the initial bid is hostile (*Hostile*). Importantly, the inclusion of *Hostile* in the second regression does not materially alter the significance level of *Threshold*. Thus, *Threshold* and *Hostile* provide two independent and important sources of toehold bidding behavior, again as implied by our takeover model (Regions II and III, respectively).

Fourth, toehold bidding is significantly less likely when the bidder is a public firm (*Acquirer public*) and more likely when the payment method is all cash (*Cash*). Since a private bidder is less likely to offer stock as payment, this all-cash effect likely also emanates from the private status of the bidder. While public bidders offer all cash (all stock) as the payment method in 32% (36%) of the cases, private bidders use all-cash offers in 50% of the deals and all stock in only 3%. Recall that the targets are all publicly traded so accepting stock from a private bidder means converting a liquid target stock into an illiquid bidder stock, which is generally unattractive to target shareholders.

Our finding of a significantly greater toehold bidding probability for private bidders is intriguing. Recall that toehold bidding is optimal when the target's accept/reject criterion is independent of

the toehold (Regions I and III in Proposition 1). Target hostility (Region III) is unlikely to explain the greater toehold propensity of private bidders, however, as there is no discernible difference in the sample proportions of public and private bidders that are hostile (5% in both categories). Alternatively, private bidders could have a comparative advantage over public bidders in identifying less entrenched target managements whose accept/reject decision is driven primarily by the offer price (Region I). Thus, a consistent interpretation is that the greater toehold frequency for private bidders reflects a greater proportion of the targets belonging to Region I.

Turning to the bidder's decision on the toehold size, recall from Table 2 that the average toehold conditional on being positive is 20%. As expected under threshold bidding, the average threshold estimate conditional on $\hat{\alpha} > 0$ is lower: 11%. The last two columns of Table 5 examine whether the toehold size is also increasing in the threshold. For this test we condition on the toehold being positive. The coefficients on $Threshold\ I * Positive\ toehold$ and $Threshold\ II * Positive\ toehold$ are both positive and highly significant. Thus, when bidders elect to bid with a positive toehold, the toehold size is increasing in the toehold threshold, as predicted by H1(ii).

The impact of the remaining explanatory variables for the toehold size is somewhat weaker than their effect on the probability of observing a positive toehold. For example, neither target hostility nor cash payment impact the average toehold size. Toehold size does increase, however, when the target is traded on NYSE/Amex and when the initial bid is a tender offer. The average toehold size is smaller when the target has a poison pill, possibly reflecting the constraint on the toehold of the pill itself (pills are often triggered for toeholds greater than fifteen percent) and when the auction attracts multiple bidders. The latter finding is consistent with the proposition that relatively large initial bidder toeholds help deter competition from rival bidders with smaller or no toeholds (Bulow, Huang, and Klemperer, 1999; Dasgupta and Tsui, 2004).

5 Toeholds and takeover gains

The analysis so far has focused on the likelihood and size of toehold bidding. Our tests indicate that actual toehold bidding is consistent with the existence of a toehold threshold. In this section we examine two additional issues of interest to the overall toehold puzzle. First, we examine whether toehold bidding impacts takeover gains, either directly through prices or indirectly through the

probability that the bidder wins the contest. Second, we study valuation effects of toeholds in the no-bidder-wins outcome. This allows us to examine the assumption in Section 2 that the target share price falls back to its pre-takeover level when all bids fail. A greater price drop in the no-bidder-wins outcome implies an additional source of toehold costs that in itself could deter toehold bidding.

5.1 Toeholds and average abnormal stock returns

We estimate abnormal stock returns from trading day -41 relative to the first bid through the contest end. The ending date is the earlier of the target delisting date and the day of the last bid in the contest plus 126 trading days. Let AR_k denote the average daily abnormal stock return over the k'th event window, $k = 1, 2, 3$. The first event window covers trading days [-41, -2] (the runup period), the second is [-1, 1] (the announcement period), and the third is [2, end] (the post-announcement period). The three event parameters AR_k are estimated using the following market model:

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=1}^{3} AR_{jk} d_{kt} + \epsilon_{jt}, \quad t = day(-291), ..., day(contest\ ends), \quad (7)$$

where r_{jt} is the return to firm j over day t, r_{mt} is the value-weighted market return, and d_{kt} is a dummy variable that takes a value of one if day t is in the k'th event window and zero otherwise. We estimate the event parameter for the total contest window [-41, end] separately using the market model with a single event parameter for the entire event period. To be included in this analysis, a firm must have at least one valid return observation in each of the event windows and the pre-event period. The estimation uses ordinary least squares with White's heteroskedastic-consistent covariance matrix. The cumulative abnormal return for event period k is $CAR_{jk} = \omega_k AR_{jk}$, where ω_k is the number of trading days in the event window. In a sample of N firms, the average cumulative abnormal return is $ACAR_k = (1/N) \sum_j CAR_{jk}$, which is reported in Table 6. The table also reports the z-value for ACAR, where $z = (1/\sqrt{N}) \sum_j AR_{jk}/\sigma_{AR_{jk}}$ and $\sigma_{AR_{jk}}$ is the estimated standard error of AR_{jk}. Under the null of $ACAR_k = 0$, z is distributed standard normal for large N.

Starting with bidder abnormal returns, the ACAR for the total sample of 5,297 publicly traded

bidders in Panel A is negative and strongly significant over the announcement period (-1.24%, z-value -18.40) and over the total contest period (-10.19%, z-value -12.71). Our announcement-return estimate is similar to the significant -1% bidder abnormal return reported by Fuller, Netter, and Stegemoller (2002) in acquisitions of public targets.[8] In our subsample of 566 toehold bidders, however, the bidder ACAR is close to zero over the announcement period and a marginally significant -4.05% (z-value -1.97) for the total contest period. The difference between the bidder ACAR in the zero-toehold sample and in the positive-toehold sample is statistically significant at the 1% level. Furthermore, sorting on toehold bidding generates the largest relative benefit of toeholds for the subsample of 1,107 contests where no bidder wins. In Panel C, the bidder ACAR in the zero-toehold sample is -20.11% for the total contest (z-value -8.28) compared to -7.83% (z-value -2.27) for 133 toehold bidders. The difference of 12.28% in these two ACARs is again statistically significant at the 1% level. In sum, the univariate sorts in Table 6 indicate that toehold bidders on average outperform bidders without toeholds, and particularly so when the target rejects all bids.

Turning to the sample of 9,418 target firms with sufficient data for CAR estimation, the target ACAR is a significant 6.84% for the runup period, 13.43% over the announcement period, and 17.17% over the entire contest. The total contest gain for the 6,520 successful targets is a significant 26.90%, while the corresponding ACAR for 2,898 contests where no bidder wins is a statistically insignificant -4.71% (z-value 0.80). The latter finding updates the evidence on failed contests first presented by Bradley, Desai, and Kim (1983): the target share price on average falls back to its pre-contest level when all bids fail. Note that while Bradley, Desai and Kim estimate the price drop over two years following the initial bid, our event window ends within 126 days of the final offer.

Table 6 further shows that there is no discernible impact of toehold bidding on the target ACAR for either the total sample or the sample of successful targets. The contest-period ACAR for unsuccessful targets, however, is a significantly positive 13.90% (z-value 5.56) when the bidder has a toehold. In other words, when no bidder wins, the target stock price falls back to the pre-contest level only if the initial bidder has a zero toehold. This finding is of particular interest as the target price decline represents an ex post toehold cost by reducing the market value of the toehold investment. Panel C of Table 6 suggests that toehold bidding itself is correlated with factors that

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[8]For a comprehensive review of bidder returns in takeovers, see Betton, Eckbo, and Thorburn (2008a).

lower this cost. We return to this issue below.

5.2 Cross-sectional determinants of bidder gains

Table 7 presents parameter estimates in two sets of cross-sectional regressions with either bidder abnormal returns (CAR[-41,1] and CAR[-41,end]) or offer premiums (initial and final) as dependent variables. The bidder abnormal return regressions use WLS, while the premium regressions use OLS. The last column of the table shows logit-estimates of the determinants of the probability π that the initial bidder wins the contest. Note that π differs from the probability θ estimated earlier in Table 4, as $1 - \theta$ is the probability that either the initial or rival bidder wins.

There are several interesting results. We follow Betton, Eckbo, and Thorburn (2008b) and include the target stock price runup prior to the initial bid as a determinant for the bidder CARs and premiums. The significantly positive effect of the variable $Target\ runup$ suggests that takeovers associated with relatively large target runups are also relatively profitable for both bidders and targets. Also, the greater the target runup, the greater is the probability π that the initial bidder succeeds. Moreover, bidder CARs measured over the total contest are significantly lower when no bidder wins. This result, which is consistent with the average CARs reported earlier in Table 6, indicates that winning is marginally better than losing for the bidder. While this does not explain why the overall market reaction to takeover bidding is negative for acquiring firms, it does indicate that withdrawing from the takeover attempt could be suboptimal once the bid has been launched.

In addition to $Target\ runup$ and $No\ bidder\ wins$, significant determinants of total contest-induced bidder CARs include the liquidity variables ($Penny\ stock$, $Turnover$, $NYSE/Amex$), the payment method, and the bid occurring prior to 1990. With the exception of $Penny\ stock$, these variables tend to affect offer premiums in the same direction as bidder CARs. Notice also that $Hostile$ increases the final offer premium but does not impact total bidder CARs. As discussed earlier in Table 1, offer premiums are greater for public than for private bidders (see also Bargeron, Schlingemann, Stulz, and Zutter (2007)). Moreover, the size of the target is insignificant across the board. $Toehold\ size$ also receives a statistically insignificant coefficient in the bidder CAR regressions. This suggests that the other variables in the cross-sectional regression pick up the tendency for toehold bidding to be associated with greater (less negative) bidder CARs shown in Panels A and C of Table 6.

Finally, Table 7 shows that greater toeholds lower offer premiums (both initial and final premiums) and increase the probability π that the initial bidder wins. Thus, toeholds play two potentially opposing roles related to the no-bidder-wins outcome. On the one hand, this outcome reduces the value of the toehold itself (Panel C of Table 6). On the other hand, toehold bidding increases the probability π, which generally reduces the probability of the no-bidder-wins outcome. It appears that the net effect on bidder gains is zero at the margin as the coefficients on *Toehold size* in the two bidder CAR regressions are statistically insignificant.[9]

5.3 When all bids fail

Recall from Section 2.1 that, in our model, toeholds are assumed to be acquired at the pre-game target share price of zero, which is also the final target share price if all bids fail. Consequently, as also shown in Fig. 1, the toehold bidder's payoff in this outcome is $\Pi = 0$ if the target rejects the initial invitation to negotiate. Furthermore, B1's payoff is $\Pi = t(1 - \alpha)$ if the target rejects all bids after having accepted merger negotiations and awarded B1 a termination agreement. However, what if the target stock price falls to a level below the toehold acquisition price? As theorized by Goldman and Qian (2005), outside investors might react negatively to news that the target management has defeated all bids. If so, the negative market reaction possibly reduces the target's stand-alone value and result in a loss on the initial bidder's toehold investment.

What is the likely importance of this potential toehold cost? If we assume that toeholds are acquired at the pre-contest target market price p_{-41}, then the average abnormal returns to targets shown earlier in Table 6 fail to support this toehold-cost argument: on average, the target stock

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[9]To further check for a toehold impact on bidder CARs, notice that market rationality implies

$$CAR[-41, 1] = \mu_u(1 - \pi(x)) + \mu_s\pi(x),$$

where μ_u and μ_s are the expected bidder returns conditional on the bid failing or succeeding, respectively, and x is a vector of offer characteristics, including *Toehold size*. We estimate μ_u and μ_s using the full sample of N=7,470 bidders in Table 7 as coefficients in the following cross-sectional regression:

$$CAR_i[-41, 1] = \mu_u + (\mu_s - \mu_u)\hat{\pi}_i(x_i) + \epsilon_i, \quad i = 1, .., N,$$

where $\hat{\pi}_i(x_i)$ is bidder i's predicted $\hat{\pi}_i$ from Table 7 and ϵ_i is a mean-zero error term. Here, the estimated values $\hat{\mu}_s$ and $\hat{\mu}_u$ are the average expected abnormal bidder returns in the two outcomes. Weighted with $\hat{\pi}_i$, these estimates provide a prediction model for each initial bidder's expected return conditional on x_i, $E(CAR_i[-41, 1]|x_i)$. We find that the partial derivative of this expected return with respect to *Toehold size* is positive. Since $\hat{\mu}_s$ and $\hat{\mu}_u$ are constants, this effect is a manifestation of the positive impact of *Toehold size* on $\hat{\pi}$ and therefore on $E(CAR_i[-41, 1]|x_i)$. This partial derivative is of particular interest because it controls for the effect on bidder CARs of the other explanatory variables in $\hat{\pi}(x)$.

price falls back to the pre-contest level when all bids fail. To examine this question in greater detail, however, Table 8 shows the results of regressing the target's total contest return in the no-bidder-wins outcome on the bidder's toehold. We are particularly interested in whether this target return is (1) greater for toehold bidders and (2) increasing in the toehold size, conditional on the other target and bidder characteristics used in the empirical analysis above.

In the first two regressions in Table 8, the dependent variable is the target CAR[-41,end]. For robustness, we also use as a dependent variable the total target raw return $ln(p_{end}/p_{-41})$, where p_{end} is the target stock price six months following the date of the last bid in the contest (the results do not change if we instead define p_{end} as the target price on the last bid date plus either three months or twelve months). The raw return avoids the estimation error in the market model parameters embedded in CAR[-41,end], which could be non-negligible given the long contest duration of some defeated contests (on average 130 trading days, median 127).

The variable *Toehold size* receives a positive and statistically significant coefficient in the CAR regression, as does the dummy variable *Positive toehold*. There is also no evidence of a negative price impact of toeholds when using the target's raw return. This finding complements the results reported earlier in Panel C of Table 6, which show that the target CAR[-41,end] averages a statistically significant 14% when all bids fail and the bidder has a toehold. Importantly, the evidence fails to support the notion that toehold bidding is deterred by the expected target price drop when no bidder wins.

Several of the other regressors in Table 8 are also significant. The target CAR in ultimately defeated contests increases with target characteristics such as runup and NYSE/Amex listing. The CAR—but not the premium measure—is also greater if the bid is horizontal and is an all-cash offer. Notice that while several extant empirical studies report positive effects on target gains from an all-cash payment, the evidence in Table 8 further shows that such valuation effects are also present in total target returns when all bids are defeated.

6   Conclusions

With control premiums averaging 45% in our sample, the case for toehold bidding is compelling. If the toehold bidder succeeds, or if the toehold is sold to a rival bidder, the return on the toehold

investment approaches the takeover premium itself. Also, bidding theory points to a potential deterrent effect of toeholds on competing bids. Nevertheless, we show that toehold bidding in U.S. mergers and tender offers has been steadily declining since the early 1980s and is now surprisingly rare. In the sample of 10,000+ initial control bidders, only 13% bid with a toehold. Moreover, as few as 3% acquire toehold shares in the six-month period leading up to the initial offer. In mergers, bidders by and large reject the idea of acquiring toeholds.

The puzzle extends beyond a surprising aversion to toehold bidding. When bidders do have toeholds, we find that they are large, on average 20% of the target, with toeholds purchased within six months of the bid averaging thirteen percent. Thus, a theory purporting to explain the puzzle must produce a form of threshold bidding centered on either zero or a substantial toehold size. Also, the theory should explain our finding that toehold bidding is the norm for hostile bids, and greater for private than for publicly traded acquirers.

We develop and test a takeover model that addresses all of these findings. The model formalizes the often-heard notion that toehold bidding is "aggressive", antagonizing entrenched target managements in particular. The model makes this notion explicit as a toehold increases the probability that the bidder succeeds in winning control of the target and proceeds to eliminate target management's private benefits of control. As a result, some target managements who would otherwise accept merger negotiations refuse to negotiate with a toehold bidder. Bidders trade off toehold gains with costs of target rejection. Rejection is costly because it forces bidders to launch unsolicited tender offers without the benefit of a termination agreement should a rival win the target or should the target withdraw. In equilibrium, bidders either approach the target with a zero toehold to avoid rejection or acquire a toehold with expected benefits that outweigh expected rejection costs.

In addition to being an increasing function of the termination fee, our toehold threshold increases with the initial takeover premium, and with the probability that no bidder wins. In our sample, this probability is 30%, and higher for mergers than for tender offers. The toehold threshold increases with the no-bidder-wins probability because only the termination agreement provides the bidder with a positive payoff when all bids fail. The toehold threshold estimate averages 9% across the total sample. In the presence of toehold transaction costs, a threshold of this magnitude could well cause the typical bidder to prefer a zero toehold (and avoid rejection). We find that toehold

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bidding is more likely the lower is the threshold estimate. Moreover, when the observed toehold is positive, the toehold size increases with the threshold value, again as predicted.

Our model also highlights the point that, for sufficiently large private benefits of control, target management will reject any bid, regardless of bidder toeholds. In this case, toehold bidding is optimal, provided of course that the bidder is prepared to make a hostile offer. Our finding of a 50% toehold frequency in hostile bids is consistent with this argument. The argument is also supported by the marked decline in toehold frequency after the mid-1980s. This decline coincides with a widespread adoption of structural takeover defenses, and a concomitant decline in hostile takeovers. Moreover, our finding of a greater toehold frequency and lower takeover premiums for private than for public bidders is suggestive of private bidders having a comparative advantage in identifying targets with a low level of managerial entrenchment.

Finally, we present evidence on the valuation effects of toeholds, focusing in particular on the return on the toehold investment when all bids fail. Target abnormal stock returns through the entire contest average zero when all bids are rejected. If toeholds are purchased at the pre-contest target share price (which the threshold model assumes), this evidence suggests that toehold losses ex post are negligible. Since we also find that target abnormal returns in the no-bidder-wins outcome are increasing in bidder toeholds, we conclude that the potential for negative toehold returns when all bids fail is very unlikely to deter toehold purchases ex ante.

A Appendix: Proof of Propositions

A.1 Proposition 1: Optimal auction bids

Starting with B2, if the target rejects merger negotiations, B1 does not have a termination agreement, and B2 bids its private valuation, $p_2 = v_2$. This follows because a bid less than v_2 risks forgoing a profitable takeover, while bidding more than v_2 risks overpaying for the target. If the target accepts merger negotiations, B1 has a termination agrement which reduces B2's valuation and optimal bid to $p_2 = v_2 - t$. We assume that B1 wins the target and pays a price of zero when $v_2 < t$. B1's expected profit from bidding p with a termination agreement, and given B2's optimal bid, is

$$
\begin{aligned}
E(\Pi) &= \left\{ (v)G(p+t) - (1-\alpha)\int_t^{p+t}(v_2 - t)g(v_2)dv_2 + (t+\alpha p)[1 - G(p+t)] \right\}(1-\theta) + t(1-\alpha)\theta \\
&= \left[v(p+t) - \frac{1}{2}(1-\alpha)p^2 + (t+\alpha p)(1-(p+t)) \right](1-\theta) + t(1-\alpha)\theta,
\end{aligned}
\tag{8}
$$

where, again, the second equality invokes the uniform distribution. The right-hand side of the first equation is the sum of four components. The first three (inside the curly bracket) are, respectively, B1's expected private value, the expected payment for the target, and the expected value from selling the toehold α and receiving t when B2 wins the auction. The fourth term is the expected payoff when no bidder wins. Using Eq. (8), the first-order condition for profit maximization, $\partial E(\Pi))/\partial p = 0$, implies the optimal bid conditional on acceptance in Proposition 1. (To ensure uniqueness, G(v) must be twice continuously differentiable and satisfy the monotonicity condition $\partial(1 - G(v))/\partial g(v) \geq 0$. With the uniform distribution, this condition is satisfied.) If the target rejects negotiations and imposes the resistance cost r, B1's expected profit is

$$
\begin{aligned}
E(\Pi) &= \left\{ (v-r)G(p) - (1-\alpha)\int_0^p v_2 g(v_2)dv_2 + \alpha p[1 - G(p)] \right\}(1-\theta) \\
&= \left[(v-r)p - \frac{1}{2}(1-\alpha)p^2 + \alpha p(1-p) \right](1-\theta),
\end{aligned}
\tag{9}
$$

which leads to the optimal bid conditional on rejection in Proposition 1.

A.2 Proposition 2: Optimal target response

If the target management accepts the invitation to merge, its expected utility is

$$
\begin{aligned}
E(U_{accept}) &= (\beta - t)\theta + \{\int_t^{p^*+t} (v_2 - t)g(v_2)dv_2 + p^*[1 - G(p^* + t)]\}(1 - \theta) \\
&= \beta\theta + [\frac{v + \alpha}{1 + \alpha} - \frac{1}{2}(\frac{v + \alpha}{1 + \alpha})^2](1 - \theta) - t(1 - \frac{1 - \theta}{2}t),
\end{aligned}
\tag{10}
$$

where the second equality invokes the uniform distribution as before. The first term after the second equality is the expected private benefits (retained only when no bidder wins), and the remainder of the expression is the expected auction revenue net of t. If the target rejects,

$$
\begin{aligned}
E(U_{reject}) &= \beta[\theta + (1 - G(p^*))(1 - \theta)] + \{\int_0^{p^*} v_2g(v_2)dv_2 + p^*[1 - G(p^*)]\}(1 - \theta) \\
&= \beta[1 - \frac{v - r + \alpha}{1 + \alpha}(1 - \theta)] + [\frac{v - r + \alpha}{1 + \alpha} - \frac{1}{2}(\frac{v - r + \alpha}{1 + \alpha})^2](1 - \theta),
\end{aligned}
\tag{11}
$$

where β is retained either if $B2$ wins or if no bidder wins. The target accepts negotiations if $E(U_{accept}) > E(U_{reject})$. If $\alpha = 0$, this condition holds for $\beta < \overline{\beta}$. If $\alpha > 0$, this holds for $\beta < \underline{\beta}$. To complete the proof, it is also necessary that $\underline{\beta} < \overline{\beta}$. By inspection of the limits shown in the lemma, this condition always holds.

A.3 Proposition 3: Optimal toehold strategy

Assuming optimal bidding, if the target accepts, B1's expected profits are as follows:

$$
\begin{aligned}
E(\Pi^*) &= \{(v)G(p^* + t) - (1 - \alpha)\int_t^{p^*+t} (v_2 - t)g(v_2)dv_2 + (t + \alpha p^*)[1 - G(p^* + t)]\}(1 - \theta) + t(1 - \alpha)\theta \\
&= \frac{1}{2}[\frac{(v + \alpha)^2}{1 + \alpha} - (1 - \alpha)t^2](1 - \theta) + t(1 - \alpha),
\end{aligned}
\tag{12}
$$

where the second equality invokes the uniform distribution. If the target rejects,

$$
\begin{aligned}
E(\Pi^*) &= \{(v - r)G(p^*) - (1 - \alpha)\int_0^{p^*} v_2g(v_2)dv_2 + \alpha p^*[1 - G(p)]\}(1 - \theta) \\
&= \frac{1}{2}\frac{(v - r + \alpha)^2}{1 + \alpha}(1 - \theta).
\end{aligned}
\tag{13}
$$

Using Eq. (12), in Region I where target management accepts negotiations (Proposition 2), we have $E(\Pi^*_{\alpha>0}|accept) > E(\Pi^*_{\alpha=0}|accept)$, so it is optimal to acquire a toehold in Region I. Similarly, using Eq. (13), in Region III where target management rejects negotiation, $E(\Pi^*_{\alpha>0}|reject) > E(\Pi^*_{\alpha=0}|reject)$ and it is optimal for the bidder to acquire a toehold. Finally, in Region II, target management accepts negotiations if $\alpha = 0$ and rejects if $\alpha > 0$. In this region, B1 is indifferent between bidding with a zero and a positive toehold when $E(\Pi^*_{\alpha=0}|accept) = E(\Pi^*_{\alpha>0}|reject)$. Solving for the toehold that satisfies this condition yields the toehold threshold $\hat{\alpha}$ stated in Proposition 3.

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Figure 1
The takeover game: attempted merger negotiations followed by auction

The pre-game target share price is normalized to $p = 0$. The payoff to target management is $U \equiv \beta + p$, where β is private benefits of control and p is the price paid by the winner in the auction. The initial bidder B1's private valuation of the target is v and it has a toehold α. B1 approaches the target with an offer to negotiate a merger in which it receives a termination fee t if the target withdraws, and where B1 will remove β. The target's decision whether or not to accept merger negotiations is always followed by a sealed-bid second-price auction, where rival bidder B2 enters without a toehold and bids p_2 while B1 bids p^*. If the target accepts negotiations, B2 will remove β. If the target rejects negotiations, B1 makes a hostile tender offer while B2 is a white knight allowing target management to retain β. In the hostile auction, the target imposes a bidder-specific resistance cost r on B1. If all bids fail, which happens with probability θ, the target stock price falls back to zero.

STAGE 1: | **STAGE 2:**
Merger bid | **Public auction**

Target's decision	Target is acquired (1-θ), or all bids fail (θ)	Who wins the auction?	Retention of private benefits β?	Target management utility U	Initial bidder payoff Π
Accept merger bid	1-θ	Initial bidder wins	no (no resistance)	p_2	$v-(1-\alpha)p_2$
		Rival bidder wins	no (breakup)	p^*	αp^*+t
	θ	No bidder wins	yes	$\beta-t$	$t(1-\alpha)$
Reject merger bid	1-θ	Initial bidder wins	no (target resists)	p_2	$v-r-(1-\alpha)p_2$
		Rival bidder wins	yes (white knight)	$\beta+p^*$	αp^*
	θ	No bidder wins	yes	β	0

Figure 2
Optimal target management response and bidder toehold strategy

The initial bidder decides on a zero or positive toehold α before approaching the target with an invitation to negotiate a merger. Target management's optimal response depends on its private benefits of control β and the bidder's toehold α. The bidder designs an optimal toehold strategy considering the target's optimal response.

1. Target managment's optimal response conditional on the bidder's toehold:

Zero toehold (α=0): ←——————————— Accept ——→ | ← Reject ——→

Positive toehold (α>0): ←—— Accept ——→ | ← Reject ————————————→

| | | | | | Target
| | | | | | management
| **Region I** | $\underline{\beta}$ | **Region II** | $\overline{\beta}$ | **Region III** | private benefits
| | | | | | of control, β
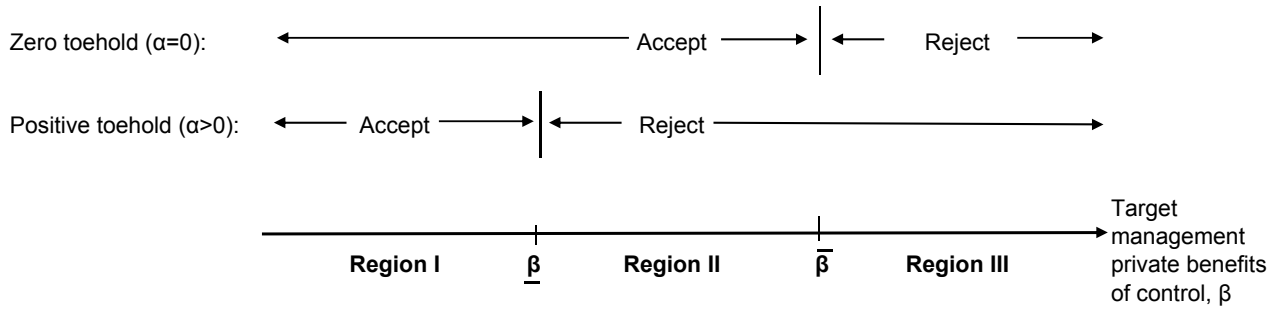
2. Bidder's optimal toehold strategy given the target's optimal response:

Acquire toehold α>0 | Approach with α=0 or acquire α ≥ $\hat{\alpha}$ | Acquire toehold α>0
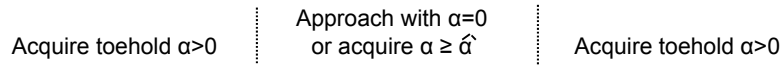
Figure 3
Annual percentage of toehold bidders

Percentage of initial control bidders with positive toehold in the total sample of 3,056 tender offers over the period 1973-2002, and in 7,750 merger bids over the period 1980-2002. Targets are U.S. domiciled and publicly traded.

Figure 4
Frequency distribution of the initial control bidder's toehold size when positive

Panel A uses the total sample of 1,363 initial control bidders with positive toeholds for U.S. public targets, 1973-2002 (with merger bids sampled from 1980-2002). A toehold with a size equal to the boundary between two intervals is included in the lower interval. Panel B is for the subsample of 970 initial control bidders whose toeholds could be classified as long-term and short-term. A long-term toehold is purchased more than six months prior to the announcement of the initial control bid. A short-term toehold is purchased within six months of the initial bid.

A: Frequency distribution of the total toehold size
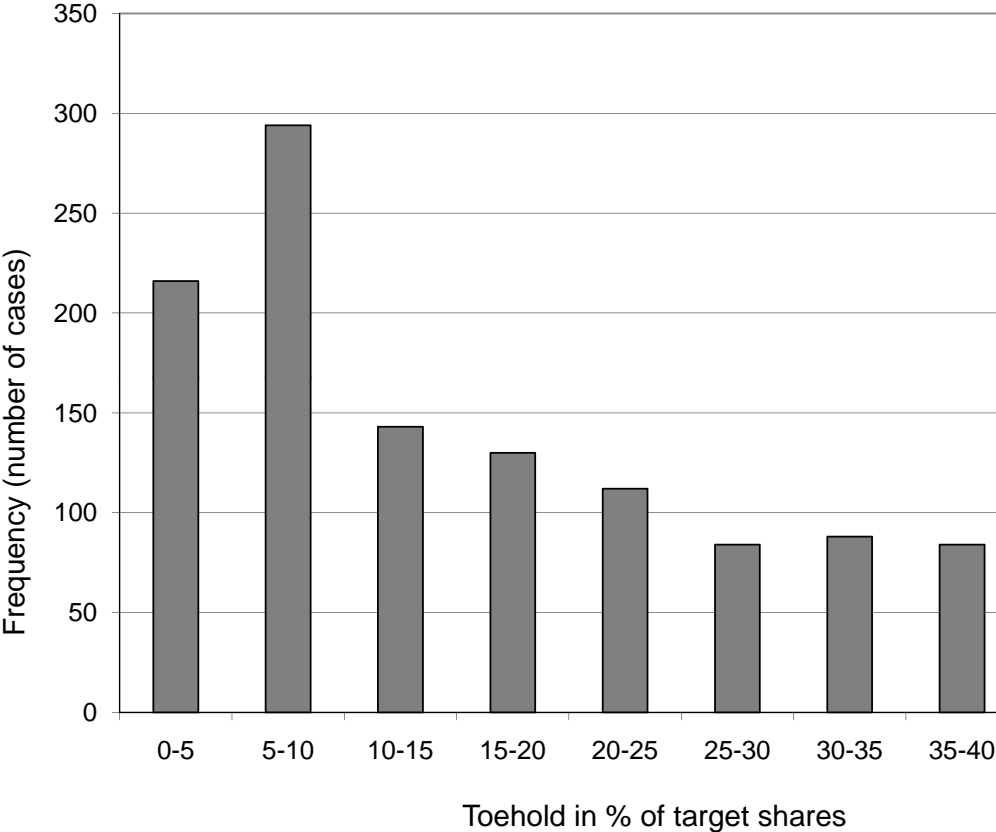
B: Frequency distribution of long-term and short-term toehold size
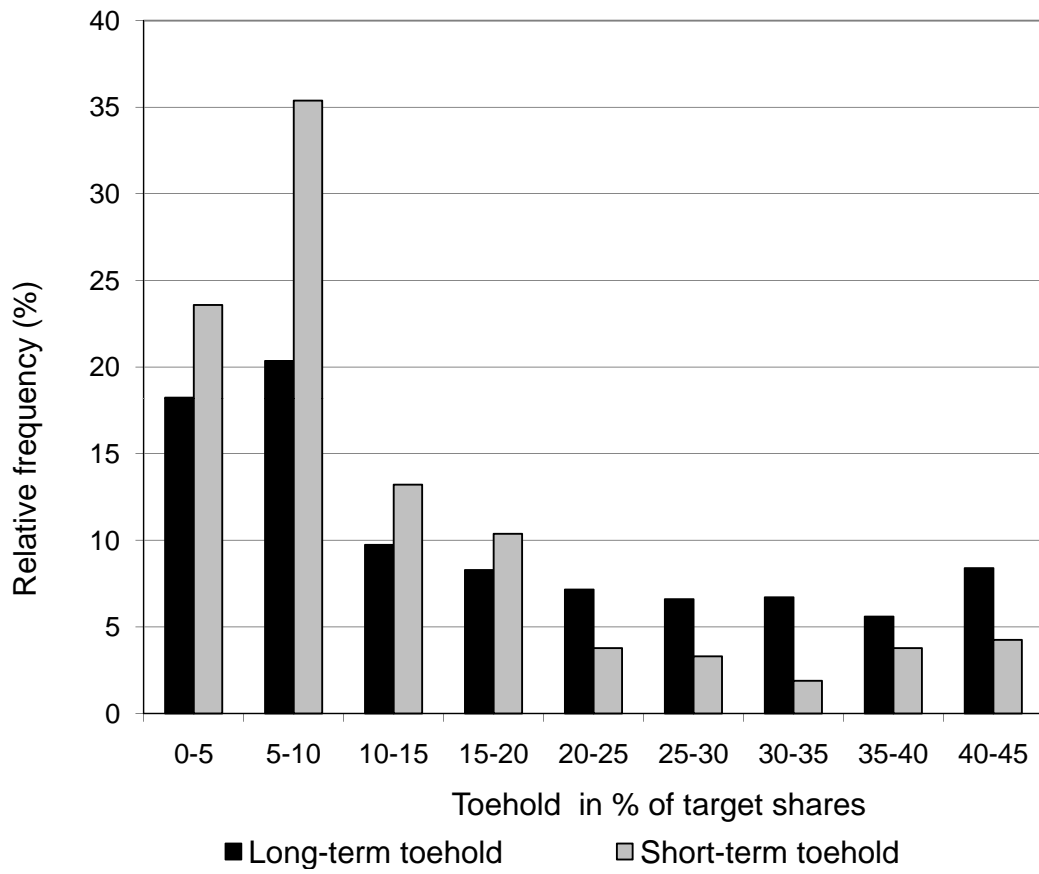
Figure 5

Toehold threshold frequency distribution for 6,155 initial bidders, 1973-2002.

Frequency distribution of the toehold threshold $\hat{\alpha} = -k_1 + \sqrt{k_1^2 + k_2}$, where $k_1 = v - r - \frac{1}{2}(v^2 - t^2) - \frac{t}{1-\theta}$ and $k_2 = r(2v - r) + t(\frac{2}{1-\theta} - t)$. The estimation uses the initial offer premium as a proxy for bidder private valuations v and assumes $v \sim U[0, 1]$. The termination fee t is the average fee for control bids in the same industry and year. The probability θ that no bidder wins is the predicted value from Model II in Table 4. The resistance cost r is replaced by $\bar{r} = -(1-v) + \sqrt{(1-v)^2 + 2t/(1-\theta) - t^2}$. A threshold with a size equal to the boundary between two intervals is included in the lower interval.
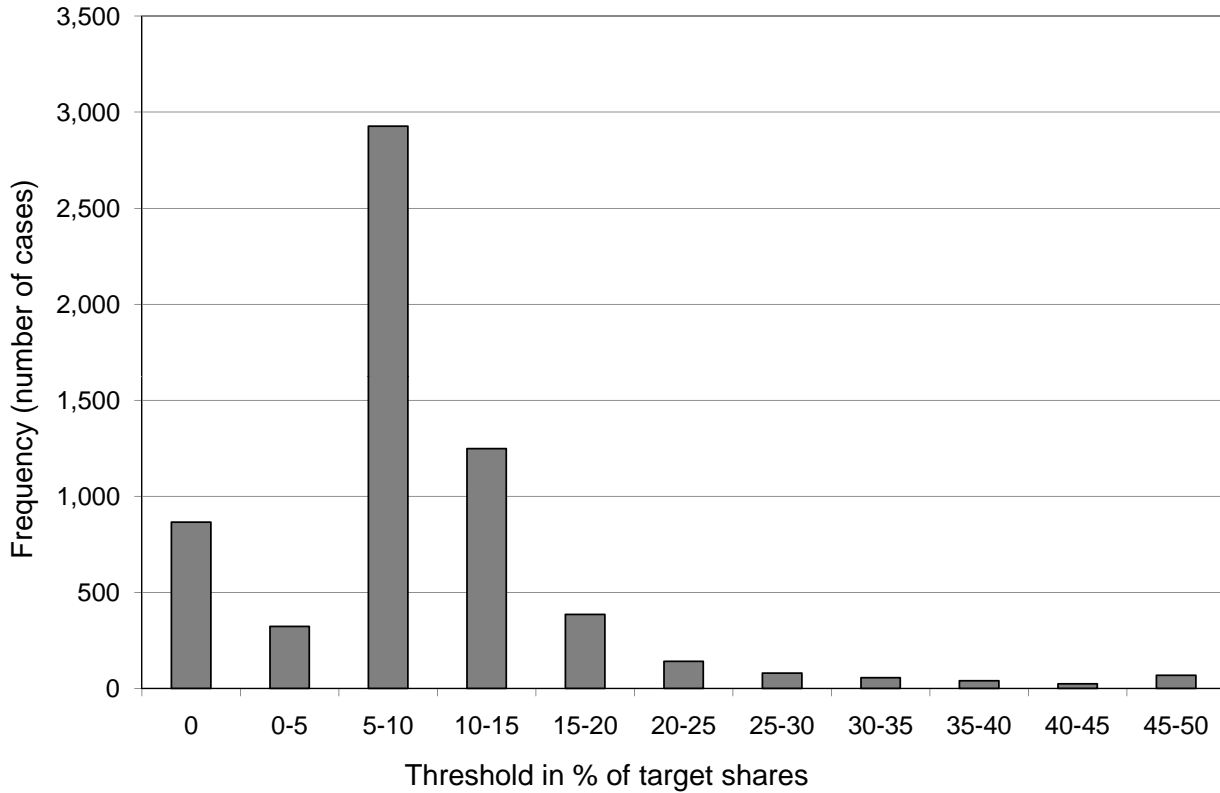
Table 1

The total sample of 10,806 control contests for public U.S. targets, 1973-2002.

The contest sample is constructed as follows: Between 1/1980 and 12/2002, the SDC Merger & Acquisitions data base contains 13,896 control bids for U.S. publicly traded firms with transaction form "M" (merger) or "AM" (acquisition of majority interest). A control bid is defined as the bidder owning less than 50% of the target shares prior to the bid and seeking to own at least 50% of the target shares. Successive control bids for the same target are then grouped into a control contest. A "contest" can have a single control bid, multiple bids by a single bidder, or multiple bidders. A given control bid initiates the contest if there are no other public control bids for the same target over the preceding six months. All subsequent control bids within six months of a previous bid belong to the same contest, and the contest ends when there are no additional control bids for the same target over the following six-month period. We also include 1,106 tender offers for control identified by Betton and Eckbo (2000) that are not found in SDC, and we update another 610 SDC records with information from that paper. In addition, we search the WSJ for tender offers, which produces 200 control bids also not in SDC. Reading the WSJ and the SDC history, we include any additional information on tender offer announcement dates, rival bids, and toeholds. This leaves a total of 15,197 bids for control. With our contest definition, these bids take place in a total of 12,721 takeover contests. When we also require the target to be listed on CRSP, the total sample becomes 10,806 control contests. The deal value is available for 8,271 contests and the final contest outcome is classified for 10,619 contests. The initial offer premium is $p_{ini}/p_{-41} - 1$, where p_{ini} is the first offer price, p_{-41} is the target stock price on day -41 adjusted for splits and dividends, and 0 is the day of the initial control bid. The final offer premium is $p_{fin}/p_{-41} - 1$, where p_{fin} is the last offer price in the contest. We have data on offer premiums for a total of 6,886 contests from SDC, WSJ and Betton and Eckbo (2000).

Sample	Number of cases	Deal value ($ million)		% of contests where the winner is:			Average offer premium (%)	
		Mean	Median	Initial bidder	Rival	No bidder wins	Initial bid	Final bid
All contests	10,806	715	89	66.6	3.7	29.7	44.5	46.1
1973-1989	3,730	312	60	58.7	5.2	36.1	45.0	48.5
1990-2002	7,076	903	108	70.7	3.0	26.4	44.2	45.0
Merger bid	7,750	827	92	63.5	3.3	33.2	43.6	44.5
Tender offer	3,056	433	78	74.8	4.8	20.4	46.5	50.2
Acquirer public	6,726	902	112	75.6	3.2	21.3	46.1	47.5
Acquirer private	4,080	285	52	51.7	4.6	43.7	40.1	42.6
Single bidder	9,944	693	88	70.5	0.0	29.5	44.8	45.4
Multiple bidders	862	989	101	20.6	47.8	31.7	41.1	53.2
Target friendly	10,295	688	85	68.0	3.2	28.8	44.1	45.1
Target hostile	511	1,204	183	34.4	16.3	49.2	49.0	60.9
All cash	4,185	320	66	69.1	4.0	27.0	44.1	46.6
Stock/mixed	6,621	1,048	119	65.0	3.6	31.4	44.7	45.8

Table 2

Table 2

Characteristics of the initial control bidder's toehold, 1973–2002

The table shows the toehold of the initial control bidder in 10,806 contests for U.S. targets listed on CRSP. A toehold consists of target shares held by the acquirer prior to the announcement of the initial control bid. The toehold information is from SDC, the WSJ, and Betton and Eckbo (2000). A long-term toehold is purchased more than six months prior to the bid. A short-term toehold is purchased within the six months leading up to the bid. For 393 tender offers, toeholds could not be classified as long- or short-term. The toehold size reported in the table is conditional on a positive toehold.

	Initial bidders with toehold		% of toehold bidders with[b]		Average toehold size in % of target shares		
Sample	Number of cases	% of all bidders[a]	Long-term toehold	Short-term toehold	Total toehold	Long-term toehold	Short-term toehold
All contests	1,363	12.6	91.1	21.6	20.0	20.2	12.6
1973-1989	832	22.3	88.2	25.4	18.7	18.2	11.2
1990-2002	531	7.5	93.7	18.4	22.0	21.9	14.2
Merger bid	558	7.2	89.1	26.0	19.0	18.9	11.1
Tender offer	805	26.3	93.9	15.8	20.6	21.8	15.8
Acquirer public	714	10.6	91.8	17.7	19.5	20.4	14.2
Acquirer private	649	15.9	90.6	24.9	20.4	20.1	11.6
Single bidder	1,211	12.2	90.9	21.6	20.9	21.2	12.8
Multiple bidders	152	17.6	92.9	22.3	12.8	13.0	11.1
Target friendly	1,106	10.7	92.0	20.4	21.9	21.6	13.1
Target hostile	257	50.3	85.1	30.6	11.5	10.0	10.1
Initial bidder wins	866	12.2	88.3	24.3	22.7	23.0	14.8
Rival wins	79	20.0	94.0	16.0	10.9	12.1	5.8
No bidder wins	354	11.2	97.6	15.0	16.4	16.6	6.7

[a]The percent of the total number of initial bidders (with or without toehold) in the category specified by the row.
[b]The percent of the total number of initial toehold bidders in the category specified by the row.

<div align="center">

Table 3

Summary of variables used in the cross-sectional analysis

</div>

Variable	Definition and estimation

A. Toehold bidding

Toehold size — Fraction target shares owned by the initial control bidder prior to announcing the bid.

Positive toehold — The acquirer has a positive toehold.

Threshold — The minimum % toehold threshold $\hat{\alpha}$ required for the bidder to optimally acquire a toehold (Proposition 1): $\hat{\alpha} = -k_1 + \sqrt{k_1^2 + k_2}$, where $k_1 = v - r - \frac{1}{2}(v^2 - t^2) - \frac{t}{1-\theta}$ and $k_2 = r(2v - r) + t(\frac{2}{1-\theta} - t)$ (Proposition 3). The estimation uses the initial offer premium as a proxy for bidder private valuations v and assume $v \sim U[0, 1]$. The termination fee t is the average fee for control bids in the same industry and year. The probability θ that no bidder wins is the predicted value from Table 4. The resistance cost r is replaced by $\bar{r} = -(1 - v) + \sqrt{(1 - v)^2 + 2t/(1 - \theta) - t^2}$, the minimum r for Region II to exist (Eq. (6)).

B. Target characteristics

Target size — Natural logarithm of the target market capitalization in $ million on day -41 relative to the announcement day of the initial bid (day 0).

Target runup — Target average cumulative abnormal return over the period [-41,-2] using a value-weighted market model estimated over [-291, end] with a dummy for the runup window. The contest ends on the earlier of target delisting and 126 trading days after the last control bid in the contest.

Penny stock — $p_{-41} < 1$, where p_{-41} is the target share price on day -41.

Turnover — Average daily trading volume as a fraction of target shares over the period [-166, -42].

NYSE/Amex — The target is listed on NYSE or Amex.

Poison pill — The target has a shareholder rights plan.

Industry — Vector of industry dummies for financial, manufacturing, trade, and service industries.

C. Bidder characteristics

Horizontal — Bidder and target has the same four-digit primary SIC code.

Acquirer public — The bidder is publicly traded.

D. Contest characteristics

Tender offer — Bid for at least 50% of the target shares (i) with SDC transaction form AM, (ii) with SDC transaction form M and flagged as a tender offer, or (iii) identified by the WSJ or Betton and Eckbo (2000) as a tender offer.

Cash — Payment method is cash only.

1973-1989 — The contest is announced in the period 1973-1989 (versus 1990-2002).

Hostile — Target management's response is recorded as hostile, as opposed to friendly/neutral or response not recorded.

Multiple bidders — A rival bidder enters the contest.

No bidder wins — Indicates the no-bidder-win contest outcome.

Table 4
Determinants of the probability θ of the no-bidder-wins outcome

The table shows logit estimates of the coefficients for variables determining the probability θ that no bidder wins the contest. The estimations use initial control bids for targets listed in CRSP, 1973-2002. Variables are defined in Table 3. All regressions control for industry fixed effects (using the vector $Industry$). p-values are in parentheses.

Variable	Sample period 1973-1989		Sample period 1990-2002	
	Model I	Model II	Model I	Model II
Constant	0.847	0.911	0.495	0.445
	(0.009)	(0.006)	(0.062)	(0.097)
Target characteristics				
Target size	-0.015	-0.016	0.020	0.022
	(0.550)	(0.504)	(0.274)	(0.242)
Penny stock	-0.728	-0.615	0.473	0.483
	(0.074)	(0.135)	(0.001)	(0.001)
Turnover	0.024	0.025	0.003	0.003
	(0.163)	(0.138)	(0.506)	(0.423)
NYSE/Amex	-0.247	-0.367	-0.223	-0.253
	(0.029)	(0.002)	(0.015)	(0.006)
Poison pill	1.058	0.645	1.951	1.117
	(0.000)	(0.036)	(0.000)	(0.010)
Bidder characteristics				
Acquirer public	-0.567	-0.545	-1.693	-1.708
	(0.000)	(0.000)	(0.000)	(0.000)
Horizontal	0.024	-0.036	-0.279	-0.287
	(0.827)	(0.752)	(0.001)	(0.001)
Contest characteristics				
Tender offer	-0.574	-0.766	-0.942	-0.927
	(0.000)	(0.000)	(0.000)	(0.000)
Cash	-0.337	-0.364	-0.821	-0.887
	(0.000)	(0.000)	(0.000)	(0.000)
Hostile		1.070		1.831
		(0.000)		(0.000)
Multiple bidders		-0.299		-0.032
		(0.019)		(0.814)
Number of cases	2,344	2,344	5,285	5,285
Nagelkerke R^2	0.087	0.117	0.208	0.226
χ^2	156.7	212.7	803.1	876.7
	(0.000)	(0.000)	(0.000)	(0.000)

Table 5
Determinants of the probability of toehold bidding and the toehold size.

The table shows coefficient estimates in logit regressions for the probability that the initial control bidder has a toehold, and OLS regressions for the percent toehold size. Sample of initial control bids for targets listed in CRSP, 1973-2002. *Threshold I* and *Threshold II* are computed using the predicted value of θ using models I and II in Table 4, respectively. Variables are defined in Table 3. All regressions control for industry fixed effects (*Industry*). p-values are in parentheses.

Variable	Probability of toehold (logit)		% toehold size (OLS)	
Constant	-0.970	-1.175	3.377	3.723
	(0.001)	(0.000)	(0.000)	(0.000)
Toehold bidding				
Threshold I	-0.025			
	(0.000)			
*Threshold I * Positive toehold*			1.004	
			(0.000)	
Threshold II		-0.017		
		(0.005)		
*Threshold II * Positive toehold*				0.842
				(0.000)
Target characteristics				
Target size	-0.031	-0.034	-0.029	-0.033
	(0.148)	(0.125)	(0.571)	(0.517)
Penny stock	-0.434	-0.408	-1.782	-1.765
	(0.182)	(0.215)	(0.005)	(0.006)
Turnover	-0.032	-0.025	-0.047	-0.052
	(0.001)	(0.012)	(0.002)	(0.001)
Nyse/Amex	0.670	0.512	0.653	0.786
	(0.000)	(0.000)	(0.003)	(0.000)
Poison pill	1.654	0.897	-4.379	-2.456
	(0.000)	(0.002)	(0.000)	(0.008)
Bidder characteristics				
Acquirer public	-1.098	-0.985	-0.982	-1.114
	(0.000)	(0.000)	(0.000)	(0.000)
Horizontal	-0.069	-0.170	-0.227	-0.186
	(0.469)	(0.089)	(0.285)	(0.391)
Contest characteristics				
Tender offer	1.146	1.050	2.916	3.193
	(0.000)	(0.000)	(0.000)	(0.000)
Cash	0.324	0.395	-0.477	-0.370
	(0.000)	(0.000)	(0.030)	(0.099)
Hostile		1.621		-2.089
		(0.000)		(0.000)
Multiple bidders		0.174		-0.874
		(0.186)		(0.014)
Number of cases	5,828	5,828	5,859	5,859
Nagelkerke/Adjusted R^2	0.194	0.235	0.292	0.262
χ^2/F-value	668.3	821.2	173.5	130.9
	(0.000)	(0.000)	(0.000)	(0.000)

Table 6
Average abnormal returns to bidders and targets sorted on toehold bidding

The sample is 9,418 control contests for U.S. targets with return data on CRSP, 1973-2002. The average daily abnormal stock return for firm j over event window k is estimated directly as the event parameter AR_{jk} in the value-weighted market model

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=1}^{3} AR_{jk} d_{kt} + \epsilon_{jt}, \quad t = day(-291), ..., day(contest\ ends),$$

where r_{jt} is the return to firm j over day t, r_{mt} is the value-weighted market return, and d_{kt} is a dummy variable that takes a value of one if day t is in the k'th event window and zero otherwise. Day 0 is the day of the initial control bid and the ending date is the earlier of the target delisting date and the day of the last bid in the contest plus 126 trading days. The three event windows are [-41, -2] (the runup period), [-1, 1] (the announcement period), and [2, end] (the post-announcement period). The estimation uses ordinary least squares with White's heteroskedastic-consistent covariance matrix. The cumulative abnormal return to firm j over event period k is $CAR_{jk} = \omega_k AR_{jk}$, where ω_k is the number of trading days in the event window. In a sample of N firms, the average cumulative abnormal return is $ACAR_k = (1/N) \sum_j CAR_{jk}$. The z-values are in parentheses, where $z = (1/\sqrt{N}) \sum_j AR_{jk}/\sigma_{AR_{jk}}$ and $\sigma_{AR_{jk}}$ is the estimated standard error of AR_{jk}. Under the null of ACAR=0, $z \sim N(0,1)$ for large N.

Sample	Bidder ACAR (%)				Target ACAR (%)			
	No of cases	Runup [-41, -2]	Announcement [-1, 1]	Total [-41, end]	No of cases	Runup [-41, -2]	Announcement [-1, 1]	Total [-41, end]
Panel A: All contests								
All	5,297	0.36 (0.20)	-1.24 (-18.40)	-10.19 (-12.71)	9,418	6.84 (25.61)	13.43 (105.20)	17.17 (37.45)
Zero toehold	4,731	0.48 (0.55)	-1.38 (-18.22)	-10.92 (-12.76)	8,146	6.83 (22.80)	13.39 (95.88)	16.98 (34.00)
Positive toehold	566	-0.68 (-1.00)	0.00 (-3.61)	-4.05 (-1.97)	1,272	6.90 (11.99)	13.69 (43.62)	18.39 (15.85)
Panel B: Contests where the target is ultimately acquired								
All	4,190	0.63 (0.82)	-1.24 (-17.06)	-7.96 (-9.90)	6,520	8.47 (25.15)	14.93 (90.65)	26.90 (44.47)
Zero toehold	3,757	0.78 (1.11)	-1.39 (-17.10)	-8.54 (-10.11)	5,639	8.61 (23.01)	15.07 (83.52)	27.91 (41.76)
Positive toehold	433	-0.75 (-0.71)	0.00 (-2.70)	-2.88 (-1.00)	881	7.57 (10.21)	14.05 (35.33)	20.39 (15.34)
Panel C: Contests where no bidder wins								
All	1,107	-0.66 (-1.17)	-1.21 (-7.05)	-18.64 (-8.55)	2,898	3.18 (8.45)	10.06 (53.67)	-4.71 (0.80)
Zero toehold	974	-0.69 (-0.96)	-1.36 (-6.56)	-20.11 (-8.28)	2,507	2.83 (6.59)	9.62 (47.57)	-7.60 (-1.34)
Positive toehold	133	-0.46 (-0.78)	-0.15 (-2.58)	-7.83 (-2.27)	391	5.40 (6.30)	12.88 (25.64)	13.90 (5.56)

Table 7

Table 7

Determinants of bidder abnormal returns, initial and final offer premiums, and the probability π that the initial bidder wins the contest.

Sample of initial control bids for U.S. public targets with stock return data on CRSP, 1973-2002. The table reports WLS estimates of bidder cumulative abnormal returns (CAR) over the runup and announcement period [-42, 1] and over the entire contest [-41, end], respectively, using σ_{AR} as weights. Columns 3 and 4 report OLS estimates of log of the initial and final offer premium, $ln(p_{ini}/p-41)$ and $ln(p_{fin}/p-41)$, respectively, where p_{ini} is the initial offer price, p_{fin} is the final offer price in the contest, and p_{-41} is the target stock price on day -41 adjusted for splits and dividends. The last column shows a logit estimation of the probability π that the initial control bidder wins the contest. Variables are defined in Table 3. All regressions control for industry fixed effects. p-values are in parentheses.

Variable	Bidder CAR [-41, 1]	Bidder CAR [-41, end]	Initial offer premium	Final offer premium	Probability π that initial bidder wins
Constant	-0.032	-0.173	0.168	0.156	-0.217
	(0.169)	(0.009)	(0.000)	(0.000)	(0.290)
Toehold bidding					
Toehold size	-0.001	0.014	-0.105	-0.106	1.863
	(0.978)	(0.914)	(0.024)	(0.033)	(0.000)
Target characteristics					
Target size	0.000	-0.001	0.000	0.001	-0.018
	(0.893)	(0.859)	(0.809)	(0.575)	(0.213)
Target runup	0.150	0.144	0.740	0.754	0.806
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Penny stock	0.091	0.214	-0.111	-0.136	-0.506
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Turnover	-0.002	-0.008	-0.001	-0.001	0.002
	(0.000)	(0.000)	(0.082)	(0.101)	(0.704)
NYSE/Amex	0.010	0.098	0.021	0.026	0.211
	(0.104)	(0.000)	(0.020)	(0.005)	(0.002)
Poison pill	0.018	0.038	-0.001	0.018	-1.694
	(0.562)	(0.676)	(0.986)	(0.649)	(0.000)
Bidder characteristics					
Acquirer public			0.026	0.021	1.197
			(0.015)	(0.059)	(0.000)
Horizontal	0.017	0.013	-0.005	0.003	0.121
	(0.008)	(0.457)	(0.539)	(0.779)	(0.060)
Contest characteristics					
Tender offer	0.000	0.004	-0.036	-0.032	0.704
	(0.988)	(0.868)	(0.000)	(0.002)	(0.000)
Cash	0.009	0.075	0.039	0.049	0.450
	(0.252)	(0.000)	(0.000)	(0.000)	(0.000)
1973-1989	-0.003	0.052	0.014	0.016	-0.783
	(0.739)	(0.018)	(0.115)	(0.108)	(0.000)
Hostile		0.048		0.062	
		(0.260)		(0.000)	
Multiple bidders		-0.045		0.059	
		(0.198)		(0.000)	
No bidder wins		-0.113			
		(0.000)			
Number of cases	4,417	4,417	5,825	5,926	7,470
Nagelkerke/Adjusted R^2	0.050	0.048	0.286	0.271	0.197
χ^2/F-value	16.5	13.4	147.0	123.6	1,139.6
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 8
Determinants of target abnormal returns when no bidder wins.

The table shows WLS estimates of the target total cumulative abnormal return $CAR[-41, end]$, using σ_{AR} as weights, and OLS estimates of the target total raw return $ln(p_{end}/p_{-41})$, where p_{end} is the target stock price 126 days after the last control bid in the contest and p_{-41} is the closing price 41 days prior to the initial control bid, adjusted for splits and dividends. The sample is control contests for targets listed in CRSP 1973-2002 where no bidder wins. The explanatory variables are defined in Table 3. All regressions control for industry fixed effects. p-values are in parentheses.

Variable	Target total CAR [-41, end]		Target raw return $ln(p_{end}/p_{-41})$	
Constant	-0.349	-0.353	5.342	5.309
	(0.005)	(0.005)	(0.000)	(0.000)
Toehold bidding				
Toehold size	0.917		0.450	
	(0.001)		(0.505)	
Positive toehold		0.233		0.255
		(0.000)		(0.084)
Target characteristics				
Target size	-0.011	-0.011	-0.486	-0.485
	(0.244)	(0.246)	(0.000)	(0.000)
Target runup	1.305	1.302	0.275	-0.271
	(0.000)	(0.000)	(0.126)	(0.132)
Penny stock	0.066	0.067	-3.007	-3.003
	(0.192)	(0.181)	(0.000)	(0.000)
Turnover	-0.010	-0.010	-0.011	-0.011
	(0.000)	(0.000)	(0.072)	(0.075)
Nyse/Amex	0.195	0.188	0.600	0.594
	(0.000)	(0.000)	(0.000)	(0.000)
Poison pill	0.172	0.165	0.552	0.538
	(0.237)	(0.256)	(0.078)	(0.086)
Bidder characteristics				
Acquirer public	-0.062	-0.058	-0.189	-0.181
	(0.147)	(0.177)	(0.117)	(0.135)
Horizontal	0.146	0.150	0.118	0.123
	(0.002)	(0.002)	(0.348)	(0.325)
Contest characteristics				
Tender offer	-0.007	-0.015	-0.596	-0.612
	(0.873)	(0.740)	(0.000)	(0.000)
Cash	0.216	0.213	-0.244	-0.262
	(0.000)	(0.000)	(0.017)	(0.011)
1973-1989	0.020	0.013	0.188	0.181
	(0.627)	(0.750)	(0.055)	(0.065)
Hostile	0.138	0.097	0.663	0.616
	(0.071)	(0.209)	(0.000)	(0.001)
Multiple bidders	-0.119	-0.123	-0.013	-0.019
	(0.048)	(0.041)	(0.932)	(0.906)
Number of cases	2,292	2,292	2,026	2,026
Adjusted R^2	0.391	0.392	0.233	0.234
F-value	82.59	82.93	35.12	35.31
	(0.000)	(0.000)	(0.000)	(0.000)