

Toehold Strategies, Takeover Laws and Rival Bidders

by

S. Abraham Ravid*

and

Matthew Spiegel**

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* Rutgers University, Faculty of Management and New York University, Stern School of Business.

** University of California at Berkeley, Haas School of Business, S545 Student Services Building #1900, Berkeley, CA 94720-1900. Telephone: 510-642-3421, E-mail: spiegel@haas.berkeley.edu.

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Abstract

Prior to the announcement of a tender offer, the bidding firm is legally allowed to acquire shares in the open market, subject to some limitations. These pre-announcement purchases are known as toeholds. This paper presents a simple model that describes the bidder's optimal toehold acquisition strategy, within an environment that closely parallels the present legal institutions. The model shows that toeholds and bids interact in a complex manner even without the presence of asymmetric information. By examining a simple environment the paper provides a useful alternative hypothesis for tests of other, presumably more complex, models. One of the main implications of our model is that if no competing bidders are expected, no toeholds should be purchased. Indeed, under a wide variety of conditions small toeholds are optimal. The paper also demonstrates that the correct specification of an empirical model can be critical. For example, under some parameter values toehold purchases may exhibit a negative cross-sectional correlation with the pre-announcement run up in the stock price. This occurs even though prices are strictly increasing the size of the toehold. Several implications concerning various aspects of merger legislation are considered. For example, we demonstrate that a rule similar to a "fair price" provision has the desirable property that a second bidder arrives and wins if and only if he places a higher value on the target than the initial bidder.

A great deal of recent theoretical research has focused upon the motivations and consequences of mergers.¹ Several papers have discussed bidding strategies and techniques - notable examples include Fishman (1988) and Hirshleifer and Png (1989) who examine optimal strategies once a tender offer has been declared. However, relatively little attention has been paid to the strategies a potential bidder may use prior to announcing a tender offer. A commonly used method is the open market purchase of shares (toeholds) before the official announcement of the offer. In the present paper we provide a simple model that attempts to accurately capture the primary legal features of the takeover process. We then use the model to characterize the costs and benefits of toehold purchases. The model further explores how synergies and government regulations affect the number of shares purchased and the conditions under which second bidders contest the target.

One contribution of the current analysis is to provide a set of results that are based upon the institutional setting and the basic economic trade-off facing any potential acquirer. By eliminating asymmetric information and agency issues, the model allows one to draw a clear distinction between the empirical regularities that require a richer, and thus more complex model, and those that follow directly from the legal and institutional features of mergers. Further, we show that the latter approach provides a good explanation for some of the more surprising empirical results. Bradley, Desai, and Kim (1988) find that over half the firms in their sample did not acquire any shares prior to making a tender offer. Similarly, Poulsen and Jarrell (1986) report that about 40% of the firms in their sample had no toeholds. Most of the firms in the sample collected by Jennings and Mazzeo (1993) did not purchase any toehold shares either (although Jennings and Mazzeo explicitly excluded firms that had an initial toehold of more than 50%). If bidders are acting rationally, then there must be conditions which preclude open market purchases of the target's shares as an optimal response. The model presented here shows that potential bidders should not attempt open

¹See for example Jensen (1988), Shleifer and Vishny (1988) and Scherer (1988) for reviews and Roll (1986) for a different perspective.

market transactions when rival bidders are sparse.² However, even when a rival is likely other elements of the problem may still induce the use of only modest open market purchases.

The present analysis leads to several additional conclusions. First, we demonstrate that larger toeholds are not unambiguously more effective at discouraging rival bidders. This may explain why many toeholds are small. Secondly, we demonstrate that while toeholds allow the initial bidder to profit should a rival appear, winning is still always better than losing. In contrast, some newspaper articles and legal commentary have indicated that bidders may wish to purchase toeholds in the hope of losing and then selling out. Thirdly, because the legal institutions are part of the model, it is possible to explore the impact of changes in the prevailing laws. An explicit analysis of "fair price" provisions (which require the purchase of un-tendered shares at the highest price paid for any shares) indicates that such laws may provide some welfare benefits. In that sense, the analysis is similar in spirit to Bebchuk (1994), who concludes that the U.S. legal system (without the "fair price" provision) may facilitate inefficient transfers, whereas the Equal Opportunity rule (similar to Fair Price provision) does not enable inefficient transfers to go through. We also discuss the role of corporate charters and laws specifying different number of shares required to complete a merger. Simulations also demonstrate that our simple framework can lead to results consistent with Betton and Eckbo's (1995) counter intuitive finding that empirically, larger toehold purchases are correlated with lower pre-announcement stock values.

While this paper examines the interaction of takeover statutes with the optimal toehold decision, there have been a number of other toehold studies that examine several other important issues. Chowdhry and Jegadeesh(1994) model the toehold selection problem as the solution to a signaling game regarding the bidder's valuation of the target. Freund and Easton (1979) offer an informal but general discussion of the toehold problem. Burkart's (1995) model provides an analysis of strategic bidding given that bidders hold

²This result differentiates our model from Chowdhry and Jegadeesh (1994). In their signaling equilibrium almost every type of bidder will purchase a positive toehold to signal his valuation.

initial stake in the firm. His model predicts that overbidding will occur once a toehold is purchased. However, there is no derivation of an optimal toehold acquisition. Kyle and Vila (1991) suggest that a bidder will generally want to purchase a toehold in order to acquire shares in the open market at a lower cost than they can be obtained at in the subsequent tender offer. However, their paper does not consider multiple bidder contests nor does it explain why many firms never bother to purchase toehold shares. Most other papers, such as Shleifer and Vishny (1986) and Hirshleifer and Titman (1990) take the bidder's initial stake as given and then analyze the resulting game. Similarly, Singh (1995) discusses strategies for block-holders who have already purchased a toehold and the impact of such a situation on takeovers. Dewatripont (1993) discusses some of the trade-offs we consider within a different framework which envisions a contest between an initial raider and a potential white knight, with different private benefits.

The paper is organized as follows. Section 1 describes the legal environment. Section 2 presents the model and derives the conditions under which positive and zero toeholds are optimal. Section 3 contains simulations. Section 4 presents the conclusion.

1 The Legal Environment³

A tender offer goes through several phases, each of which is subject to different legal strictures. The initial phase is an acquisition period during which the bidding firm can employ open market purchases to obtain a toehold in the target. Legally, a firm may acquire up to five percent of another firm before it triggers a reporting requirement. Section 13(d) of the Securities Exchange Act of 1934 stipulates that once someone obtains five percent of a firm's stock, that person has 10 days to file a disclosure form describing his intentions. Importantly, during this ten day period the potential bidder can continue to make open market purchases. Hence, toehold purchases may be considerably larger than 5% of a target firm. Once the report is filed, no additional open market activities are permitted.

³Much of the material in this section can be found in Gilson (1986) and Gilson and Kraakman (1987).

At this point the next phase of the acquisition begins, in which a tender offer is made via a 14D filing. A complete acquisition must offer compensation both for those who voluntarily relinquish their position, and for those who are forced out against their will. As such, a tender offer is necessarily divided into two parts, the second of which "cleans up" any shares not obtained in the first part.⁴ This institutional feature drives many of our results.⁵

There are very few restrictions on the form of the first tier bid. The two primary limitations are that the bid must remain open for at least 20 days and that the tenders must be taken up on a pro rata basis. In other words, the bidder cannot discriminate among the target's shareholders.

The eventual goal of the bid is the dissolution of the target company. Therefore, the acquiring firm must specify a price they will pay for shares not acquired in the first half of the tender offer, if indeed a sufficient number of shares are tendered to force a merger. It is at this point that the legal framework becomes critical. Imagine that the bidder has acquired fifty percent of the target company and that there is no legal protection for the minority shareholders. Then the bidder's optimal strategy is to "sell" the target's assets to the bidder at a price of zero, and dissolve the target firm. Since the bidder has over fifty percent of the stock, approval of the agreement is guaranteed.⁶ Thus, it is clear that any remuneration the remaining target shareholders may hope to receive must be imposed via the legal system or an appropriately structured corporate charter which cannot be revoked (as is the case in some European countries).

⁴While recent "second generation" takeover statutes have affected some of the details involved in an acquisition, the basic two tier structure remains. See Karpoff and Malatesta (1989) for an extensive review and empirical analysis of this legislation.

One should further note that the analysis of this paper deals with cases in which the target is indeed dissolved as a corporate entity as opposed to cases in which the target is managed as a wholly owned subsidiary or is partially liquidated.

⁵Golbe and Schranz (1994) is another example of a model which makes extensive use of this institutional feature in another context.

⁶Clearly, this is an extreme case. Under most circumstances such extreme dilution is not possible according to state and corporate by laws. However, this strong statement highlights the importance of the second tier legislation.

Every state has laws governing the treatment of target shares during the freezeout portion of the merger. Generally, shareholders are entitled to a minimum value which is determined via an appraisal proceeding. The Delaware statute is typical. In section 262 it states:

"... the Court shall appraise the shares, determining their fair value exclusively of any element of value arising from the accomplishment or expectation of the merger..."

While the wording is clear, and appears designed to give the target owners only the pre-merger value of their stock, the courts have taken some liberties with its meaning. (For example, see *Weinberger v. UOP, Inc.*, Supreme Court of Del., 457 A.2d 701 (1983).) In practice, the legal methods used to determine a stock's pre-merger value are ones that most financial academics may not consider appropriate. For example, accounting values are used in addition to the pre-merger stock price. An important feature of this process is that attributes of the bidding firm do not enter the calculations, contrary to some models which implicitly assume such dependence. Only the target's attributes determine the second tier share price.

The procedures used by the courts to value shares that are not taken up in the tender offer are of course a matter of public record. Thus, in the absence of competition, the bidder can in principle formulate a simple strategy. First, he calculates the price the court will allow for the second phase of the tender offer. The initial offer will exceed that amount by a few pennies in order to compensate those who agree to tender early. If necessary, one can also offer to return the submitted shares if the offer fails. It is easy to verify that given this type of bid tendering is at least a weakly dominant strategy, and so the offer should succeed.⁷

The next section analyzes a simple model which adheres closely to the institutional realities described above, and derives several empirical implications.

⁷In practice, the benefit from tendering early is often the ability to receive payment for the shares as quickly as possible. However, as long as there is a positive interest rate, tendering remains at least a weakly dominant strategy.

2 The Model

2.1 Game Tree

Our model describes a target and a set of potential bidders. Initially, one potential bidder becomes the first to discover that his valuation of the target (V_1) justifies a takeover attempt. At this time he may or may not purchase a toehold (t) in the open market. The number of outstanding shares is normalized to one, and thus t represents the fraction of shares purchased by the raider. The acquisition of the toehold occurs within a Kyle or a similar partially revealing market. As a result, toehold purchases increase the stock's price.⁸ Let P denote the market price, and t the toehold purchase. For simplicity, assume that the reduced form price function below describes the stock market, where $k \geq 0$ is a constant.⁹

$$P = P_0 + kt \quad (1)$$

Thus, if $k=0$ the toehold can be purchased without influencing the stock price, while higher values lead to greater price impacts. The model does not derive the price function via a specific microstructure model although it is consistent with many.

After the toehold purchase, the bidder must announce his intentions and make a formal tender offer. To accomplish these tasks, bidders must retain lawyers and sink other resources into designing strategies, arranging financing, and meeting various regulatory requirements. The model captures this set-up by assuming that a raider must pay c_1 dollars in order to begin the bidding process.

Once the tender offer commences, the identity of the participants is revealed and the market can use this information as well as the required disclosure statements in order to learn about the potential value of

⁸Stulz (1988) and Stulz et al. (1990) among others provide a heterogeneous tax bracket justification for an upward sloping equilibrium price curve. Such models are also consistent with the present specification.

⁹Nonlinear price functions produce quantitatively similar results. Thus, we appeal to simplicity for the selection of this particular functional form.

the target to the bidder. Thus, the model assumes that at this stage V_1 becomes common knowledge. The tender offer specifies a first tier price, the number of shares the bidder wishes to acquire in the first tier of the offer ρ_1 , and the second tier price per share b_1 . As required by law, the offer states that shares will be taken up on a pro rata basis.¹⁰

After the public announcement, period two begins. Having observed V_1 , a second firm updates its assessment of the target's value (see Fishman (1988) for a formal analysis focusing on that aspect of the merger game). This value assessment, V_2 , is taken from the density function f .

If V_2 is sufficiently high, the second bidder may decide to enter the contest. In that case, the rival must also pay to a fixed cost, c_2 dollars, to initiate the bidding process and file the relevant documents. Again the model assumes that these documents are sufficiently detailed so that V_2 becomes common knowledge upon their filing. Having paid c_2 to begin bidding, an auction for the target ensues. Of course, if a rival does not appear the first bidder purchases the target at his initial offer price.¹¹

Existing laws do not specify a particular bidding order. Furthermore, the contestants can revise any bids that they make. We thus model the bidding contest as an English Auction. The players submit ever higher bids, until one firm drops out. Note that this implies the first contestant may revise his initial bid in response to a second raider's arrival. For simplicity, we assume that revising a bid is costless, however, changing this assumption will not alter the model's qualitative results. Denote the final bid by the first contestant as B_1 , and that of the second bidder as B_2 .

In general, offers are conditioned on the bidder's ability to obtain financing, and other elements that depend upon both the bidder's actions and those of third parties. The model therefore assumes that a bidder

¹⁰ While two tiered bids of some type must follow from the merger process itself, many models ignore this feature of the bidding mechanism. For example, models patterned after Grossman and Hart (1980) implicitly assume that un-tendered shares retain their share of the target firm's value after the merger. However, since a merger results in the legal dissolution of the target, this scenario is not very realistic.

¹¹In the real world this corresponds to the passage of twenty days pass from the date of the initial tender offer without the appearance of another bidder.

cannot obtain financing for bids beyond his valuation. An alternative view of this assumption is that bidders are complex organizations and structures. If, for example, a financier believes that a firm is worth much more than its current market value she will provide appropriate financing. In this case the financier will essentially be the bidder (with perhaps another corporation preparing the actual documentation for the bid) and the value in our setting will equal the financier's valuation. If after winning the auction a bidder cannot obtain financing, then shareholders can tender to the second highest bidder at that bidder's last offer. If the shares are not tendered, the target remains independent.¹²

The minimum bid price for any shares that are not purchased in the first tier of the bid and are left for the freezeout merger is determined by the courts only through attributes of the target, the first tier bid and the market price of shares prior to the initial toehold purchase.¹³ Following the legal institutions, one therefore requires a function b such that $\partial b/\partial P \geq 0$ and $\partial b/\partial B_w \geq 0$, where B_w represents the winning first tier

¹²This assumption eliminates certain incredible bids. Consider a simple single period auction model where the seller places a zero value on the object. If the seller knows the buyer's reservation value, the seller can bid the buyer's reservation value minus a small amount. The buyer is then "forced" to bid his full value in order to receive the object. However, it is not really credible for the seller to "buy" the object since he actually places a zero value on it. In a dynamic game one would expect the seller, if he won, to immediately re-auction the object. Since everybody knows this, nobody will take the seller's bid seriously. By assuming that firms cannot obtain financing for bids above their valuation we eliminate this type of dynamic inconsistency.

¹³If the courts follow Delaware's statute to the letter, then clearly the second tier price is exogenous to any parameter in the model. Thus, we allow for institutions in which b is a constant. However, since the courts often refuse to rigidly follow their state laws the model is designed to handle other institutional settings. For example, in the Delaware Supreme Court's decision regarding *Smith v. Van Gorkom* (1985. 488 A.2d 858), the court states that the stock price is at most a lower bound on which to base the firm's value. This implies that the courts will require bidders to pay an amount (say 10 percent) above the stock's price prior to the tender offer for the shares in the freeze out merger. Along a similar line the Delaware Court in *Weinberger v. UOP, Inc. Del. Supr.*, 457 A.2d 701 (1983), discusses the "Delaware block" method for determining a firm's value in an appraisal proceeding. In this method,

the elements of value, ie., assets, market price, earnings, etc., [are] assigned a particular weight and the resulting amounts added to determine the value per share. This procedure has been in use for decades.

Importantly, for the present model, these cases indicate that the stock price is not included in the court's calculation of the firm's value.

bid. For simplicity, the model assumes that the courts set the second tier price to either a weighted average of the pre-merger price and the winning bid or the pre-merger price, whichever is higher:

$$b = \max\{[1-n]P + nB_w, P\} \quad (2)$$

where n is a nonnegative constant.¹⁴ This functional form can be used to capture a wide range of legal behavior. Setting n equal to zero, implies that the court interprets literally statutes that compel winning bidders to take up shares in the clean up offer at the pre-merger value.¹⁵ At the other extreme, one can set n equal to 1, in which case bidders must pay the same amount for shares purchased in the back end of the offer as they do for those initially tendered. Thus, setting n equal to one replicates the conditions faced by a bidder operating under “fair price” provisions similar to those enacted by several legislative bodies.

While in principle each bid has three components, the game's structure implies that only B_1 requires much analysis. First, setting b_1 above the court mandated minimum level is sub-optimal since a raider only purchases the residual shares after he has already obtained control. Second, since b_1 never exceeds B_1 , an optimal strategy must minimize the number of shares purchased at the higher first tier price.¹⁶ Thus, each firm sets ρ_1 to the lowest value sufficient to obtain control of the firm. Since the number of shares required to complete a takeover varies by state, assume that the bidder can only complete the acquisition if he controls at least a fraction α of the firm's shares. Thus, in equilibrium each bidder will set ρ_1 to its smallest possible value which will equal α for the new bidder, and $\alpha-t$ for the first bidder.

¹⁴For most of the paper's results, one can show that more general specifications which will produce qualitatively similar results.

¹⁵One can also add a third term to equation (2) that allows the courts to use P_0 in addition to P and B_w without changing the model's qualitative features.

¹⁶Prior to the late 1980's, no state required second tier bids to even equal first tier bids (i.e. $b_1 < B_1$). Since then several states have added the requirement, (via "fair price" regulations) that the second tier bid not fall below the first tier bid. In this case the raider's cost minimizing strategy requires him to set $B_1 = b_1$. Later on we explicitly analyze the impact of fair price provisions.

Faced with bids from both raiders, shareholders must decide to whom they will tender. In a rational expectations model, there exist equilibria in which $B_i > B_j$ and yet firm i does not receive any shares. This can happen if i 's offer is conditional upon winning, and shareholders believe i will lose. In this case each stockholder correctly thinks that if he tenders to j , he will receive B_j in the offer's first tier and b_j in the second tier. Conversely, tendering to i results in the return of the owner's shares, which are then taken up in j 's (lower) second tier for b_j dollars. As a result, all shareholders tender to j . Not only does this equilibrium seem implausible, but several equilibrium refinements can be used to eliminate it.¹⁷ We therefore assume that if $B_i > B_j$ (firm i offers a higher initial bid than firm j) firm i receives at least ρ_i shares. This structure simplifies the decision problem of shareholders to tender shares to the highest first tier bidder.

The following outline summarizes the game's structure:

Period 0: A firm (labeled 1) privately discovers that its valuation of the target (V_1) is large enough to warrant a takeover attempt.

Firm 1 may purchase a toehold in the open market.

Period 1: Firm 1 pays c_1 , and then submits a tender offer for the target shares, specifying how much it will pay for the target. Firm 1's value V_1 becomes common knowledge.

Period 2: Upon seeing the first bidder's actions a second bidder draws a valuation (V_2) from the density function f .

The game can now branch off in one of two directions A, or B.

Period 3A: V_2 is low enough that the rival bidder does not contest the target. Firm 1 completes the acquisition at the initial bid. The game now ends.

Period 3B: V_2 is large enough and a bidding contest ensues. Firm 2 pays a cost c_2 to enter the contest. Both firms then submit simultaneous bids, an auction ensues where bids can be revised. The bids B_2 and B_1 respectively are determined.

Period 4B: Shareholders tender to the bidder with the highest credible bid. Absent a credible bid, the target remains independent.

Period 5B: The winning bidder completes the purchase and dissolves the target as a legal entity. The game ends.

¹⁷For a discussion regarding refinements that rule out these outcomes see Grossman and Hart (1987).

In order to draw out the factors that influence the bidder's strategy the paper considers two special cases prior to analyzing the full model. Section 2.2 examines the bidder's problem when a rival never appears. This case is of particular interest when the bidder-target match involves synergies unique to the pair. Its conclusions also correspond to much of the empirical evidence. Section 2.3.2 then examines the model under the assumption that the toehold purchase does not influence the probability a rival will appear. In this case, the toehold acts simply to force up the rivals equilibrium bid and not to discourage competition. Finally, section 2.3.3 considers the full model.

2.2 Equilibrium When a Rival Never Appears

Absent a rival the first bidder will earn

$$\pi_w^1 = V_1 - [\alpha-t]B_1 - [1-\alpha]b - tP - c_1, \quad (3)$$

where π_w^1 signifies the profits received by firm 1 given it has won the target. The bidder receives V_1 but must pay a total of $[\alpha-t]B_1$ for the shares purchased in the first tier, and $[1-\alpha]b$ for those shares purchased when the target is dissolved as a corporate entity.

If the initial bidder has no competition, he will set a price equal to (or marginally higher than) the court mandated second tier price. Denote by $b_0 = b(P, b_0)$, the lowest possible second tier bid given that a rival does not appear. Based upon equation (2) one can find a closed form solution by setting both B_1 and b equal to b_0 and then solving for b_0 . This calculation and equation (3) prove the following proposition:

Proposition 1: If a rival is not expected to appear then the initial bidder will not purchase a toehold, and the equilibrium strategy does not depend on the number of shares required to complete the acquisition (α).

Thus, absent agency problems and asymmetric information, no toehold will be purchased unless competition is expected. The intuition is that a firm secure in the notion that it is the only bidder, does not derive any benefit from a toehold position. Worse, to the degree that a toehold drives up the stock price, and

thereby increases the target's value in the eyes of the court system, a toehold purchase may actually hurt the bidding firm. While this conclusion is easy to reach within the model it has great empirical importance. Since most bids go uncontested, the model predicts a preponderance of zero toeholds. Indeed, empirical studies find that many firms never bother with the purchase of a toehold in the open market. Furthermore, the results regarding the equilibrium bids are consistent with papers such as Schwert (1996) and Comment and Schwert (1995) who find that a much higher premium is paid to target shareholders in contested bids than in single bidder takeovers.

2.3 Toehold Strategies when a Rival May Appear

2.3.1 Equilibrium Bidding Strategies

When a rival may appear, the potential profits that the initial bidder can obtain by either winning or losing the auction take on primary importance. Equation (3) provides the profits obtained when firm 1 wins with a bid of B_1 . However, management must also consider the value that can be obtained from losing the auction and selling out the toehold. In this case firm 1 receives

$$\pi_L^1 = [(1-\alpha)b + \alpha B_2]t - tP - c_1. \quad (4)$$

Should the first bidder lose the auction, he earns B_2 on a fraction α of the toehold shares (t) in the first tier of the offer, and b on a fraction $1-\alpha$ of the toehold. The final two terms arise from the fact that the toehold cost firm 1 tP in the open market, and that the firm spent c_1 dollars to initiate the takeover bid. Thus, π_L^1 represents the profits firm 1 expects to earn for losing the auction.

In equilibrium, firm 1 should stop bidding when its profits from losing just equal its profits from winning.¹⁸ Below this level, the first raider can slightly increase his bid and earn a strictly greater profit. Bids above this point are simply not credible since the first bidder will back out of the offer in order to sell

¹⁸One can easily show that π_W^1 is declining in B_1 and that π_L^1 is increasing in B_2 . Thus, there will be a unique point at which firm 1 no longer wishes to outbid firm 2.

out to the second bidder. Setting $\pi_W^1 = \pi_L^1$, and $B_1 = B_2$ and then solving for B_2 shows that the rival firm can win the auction at a bid of

$$B_2^* = \frac{V_1 - (1-\alpha)(1-n)(1+t)P}{1-(1-\alpha)(1-n)(1+t)} \quad (5)$$

where the “*” indicates the value of B_2 at which firm 2 wins the auction. Notice that B_2^* does not depend upon V_2 . Firm 2 only needs to bid enough so that firm 1 finds it unprofitable to win the target.¹⁹

Having worked out the equilibrium bids, one can now determine when rival bidders will try to bid for the target firm. Upon the realization of V_2 , there is no uncertainty remaining in the game. Thus, for each value of V_2 both raiders can determine the winner if an auction takes place. Since bidding is costly, the second raider does not enter if he knows that he will lose. Thus there exists a value V_2^* such that if the realized value of V_2 is higher the second raider enters and wins.²⁰

An offer is worthwhile if B_2^* , the lowest bid that enables the second bidder to win, provides a positive profit:

$$V_2 - \alpha B_2^* - (1-\alpha)b - c_2 \geq 0. \quad (6)$$

Using equation (2) to eliminate b , and then solving for V_2 shows that a rival bidder can profitably enter if

¹⁹As noted earlier, the courts cannot observe V_2 so they cannot use its value in their calculation of b . These two features of the problem imply that the amount firm 2 must bid to win the auction can only depend upon firm 1's valuation, and the transaction prices observable by the court.

²⁰This does not mean that we will not observe much interest in a target that is "in play". However, in the model, as is the case in many real life situations, you are not going to spend a large amount of money on constructing a bid if there is not much of a chance of winning.

$$V_2 \geq \frac{[1-(1-\alpha)(1-n)]V_1 - t(1-\alpha)(1-n)P}{1-(1-\alpha)(1-n)(1+t)} + c_2. \quad (7)$$

Let V_2^* represent the value of V_2 for which equation (7) holds with equality. Then for any $V_2 \geq V_2^*$ the rival bidder will enter the contest.

Equation (7) demonstrates that larger toeholds do not unambiguously discourage rival bidders. An increase in t , decreases both the numerator and the denominator. The denominator reflects the fact that larger toeholds allow the initial bidder to concentrate his funds on a smaller number of shares in a bidding contest. However, the numerator reflects the firm's incentive to profit by losing the auction and selling the toehold to the second bidder. For some parameter values, the second influence can dominate the first with larger toeholds leading to an increased probability of entry.

Equations (5) and (7) also demonstrate that the institutional parameters α and n have identical influences on the takeover process since they always appear in the combination $(1-\alpha)(1-n)$. This implies that increasing the minimum number of shares that must be purchased in the first stage of the offer (α) has approximately the same impact as an increase in the weight assigned to the first tier bid in calculating the clean-up price. Actually, the weighting scheme offers considerably more flexibility. Logically, α cannot be set below .5, while n can take on any value between 0 and 1. Thus, within this model, one can leave the equilibrium unchanged by replacing any supermajority rule with a simple majority rule and then adjusting n to keep $(1-\alpha)(1-n)$ constant.

Having solved for the second raider's entry condition, and the equilibrium bids with and without the rival bidder, it now becomes possible to calculate the first raider's optimal toehold strategy. The table below summarizes the paper's findings which are detailed in the following sections.

Results Summary	
Market Condition	Conclusion
Assumption 1: No Competition (Proposition 1)	
A Rival Never Appears	No Toehold
Assumption 2: Toehold Does not Affect the Rival's Entry Decision (Proposition 2)	
Lower Stock Price Liquidity (increased value of k)	Smaller Toehold
Reduced Bidder Valuation (smaller V_1)	Smaller Toehold
Reduced Probability of a Rival's Appearance (increased value of F)	Smaller Toehold
Assumption 3: Toehold Does Affect the Rival's Entry Decision	
Proposition 3: Reduced Sensitivity of Rival Entry to the Toehold Purchased (reduction in f at the minimal value needed for entry)	Smaller Toehold
Proposition 4: Increase in the Probability that a Rival Appears (reduction in F)	Lower Initial Bidder Profits
Proposition 5: Minimum Number of Shares the Bidder Must Own to Force Acceptance of the Second Tier Offer (increase in α)	Lower Initial Bidder Profits
Proposition 6: Imposition of a Fair Price Provision	Bidder with the Highest Valuation Wins the Contest.
Simulation Results	
Parameters Are Such That the Optimal Toehold is Not Very Sensitive to the Market Liquidity Parameter (k). This implies that the initial bidder knows the likely valuation of a potential rival.	Toeholds May Appear to be Negatively Correlated with Stock Prices in Empirical Data
When Larger Rival Entry Probabilities (low F) or Larger Initial Bidder Valuations (low V_1) are Associated with Lower Levels of Market Liquidity (High k).	Toeholds May Appear to be Negatively Correlated with Stock Prices in Empirical Data

2.3.2 Equilibrium Implications When the Toehold Does Not Affect the Rival's Entry Decision

We first consider the case where the probability of the rival's entry is independent of the toehold decision, i.e. F is independent of t . This simplifies the analysis and allows us to separate out the toehold's use as a strategic device to discourage competition from its use as "insurance" in case a rival appears.

After some minor algebra, the expected profits firm 1 earns by beginning a takeover (π) can be written as

$$\pi = [V_1 - c_1 - P]F + \left[\frac{[1 - (1 - \alpha)(1 - n)](V_1 - P)}{1 - (1 - \alpha)(1 - n)(1 + t)} t - c_1 \right] (1 - F). \quad (8)$$

The first term on the right hand side of (8) represents the first raider's profit if a rival never appears, while the second term is the value obtained if one does appear.

Differentiating (8) with respect to t , produces the first order equation

$$\frac{\partial \pi}{\partial t} = -kF + \left[\frac{(V_1 - P)[1 - (1 - \alpha)(1 - n)]^2}{[1 - (1 - \alpha)(1 - n)(1 + t)]^2} - \frac{kt[1 - (1 - \alpha)(1 - n)]}{1 - (1 - \alpha)(1 - n)(1 + t)} \right] (1 - F). \quad (9)$$

To determine whether or not the optimal toehold involves an interior solution one can examine the second order condition

$$\frac{\partial^2 \pi}{\partial t^2} = \frac{2[1 - (1 - \alpha)(1 - n)]^2 [(V_1 - P_0)(1 - \alpha)(1 - n) - k[1 - (1 - \alpha)(1 - n)]]}{[(1 - \alpha)(1 - n)(1 + t) - 1]^3} (1 - F). \quad (10)$$

Since t cannot exceed α , and n lies between 0 and 1, the denominator of (10) must be negative. Notice that this implies that the sign of (10) depends only upon the second term in the numerator, and this term does not depend upon t . Thus, the optimal toehold will only lie in the interior if (10)'s value is less than zero for all

relevant t .

Equations (9) and (10) combine to produce the following characterization of how the optimal toehold responds to changes in the model's parameters. From the perspective of the data, the results indicate the rather broad conditions under which either no toehold or a very small toehold will be purchased by the initial bidder.

Proposition 2: (A) Increasing k reduces the optimal toehold. If $k=0$, then the optimal strategy for the bidder is to purchase a toehold sufficient to control the firm, $t=\alpha$. (B) The higher the initial bidder's valuation (V_1) the greater the toehold. (C) Assume that for a given value of F , the first bidder's optimal strategy is to attempt a takeover, and purchase a toehold. Then decreasing F , increases the optimal value of t .

Proof: (i) Equation (9) shows that the bidder's first order condition will be strictly negative at $t=0$. If the first condition in A holds and it will be strictly positive if the inequality is reversed. The sign of the second order condition (equation (10)) will be negative when the second condition in A holds and positive when the inequality is reversed. The conditions leading to A, B and C then follow from basic optimization principles. (B) Use the first order condition on t , equation (9) to prove the proposition. (C) Since the first term in (8) is strictly decreasing in t , the optimal toehold must set the derivative of the second term to a strictly positive value. Decreasing F will initially produce a positive first derivative. To restore optimization, we must increase t . QED

The proposition shows that in markets that are either relatively illiquid (high k), or when the initial bidder's valuation is close to the current market price (low V_1), or when the probability that a rival should appear is small (large F) toeholds will be small. Part (B) of the Proposition may seem counterintuitive. One might conjecture that if V_1 is small, the first bidder's best profit opportunity will come from purchasing a toehold and losing the auction. There is some truth to this. However, this intuition fails for a sufficiently low value of V_1 , since a low V_1 makes it impossible for the first bidder to drive up the winning bid. Rather, the auction stalls out at a relatively low price, since the second bidder knows the target is not worth very much to the first

bidder. Thus, when V_1 is small, purchasing a toehold acts mainly as a device to drive up the price of the target which then makes the clean up offer more expensive.

The general conclusion to be drawn from Proposition 2 is that under reasonable market conditions toeholds should be small, a conclusion that is supported by a number of empirical studies briefly mentioned earlier. Jennings and Mazzeo (1993) find small and infrequent toeholds - the average toehold in their data was only 3% and 546 firms out of their sample of 647 purchased no toehold at all. As noted earlier, Bradley, Desai, and Kim (1988) found that over half the firms in their sample had not acquired any shares prior to making a tender offer. Somewhat less direct evidence can be found in Stultz, et al. (1990) who find that toeholds average 10% (median of 2.3%) in their sample. However, it is difficult to relate their results directly to our model since their definition of a successful tender offer includes bidders who purchased some shares (but did not necessarily take over the target). Similarly, Poulsen and Jarrell (1986) report that about 40% of the firms in their sample had no toeholds.

Part (C) of Proposition 2 shows how the economic environment can induce some rather odd correlations between toehold purchases and other elements within the data. Intuitively, since toeholds act to discourage rival bidders, one might suppose that larger toeholds should characterize single bidder contests. However, exactly the opposite is true. Betton and Eckbo (1995) find that zero toeholds were held by 44.2% of the firms involved in single bidder contests but only by 27.3% of those engaged in multiple bidder contests. Asquith (1990) finds that zero toehold bids are less likely to be contested than bids with positive toeholds. Jennings and Mazzeo (1993) also find that the probability of a competing offer is somewhat lower in the sub-sample without prior ownership (13% vs. 16%). Part (C) of Proposition 2 is consistent with these results. When bidders do not believe a rival will appear, they should not engage in toehold share purchases. Consequently, when bids are uncontested we should observe small or zero toeholds. Indeed, Betton and Eckbo (1995) find that out of 1353 takeover attempts they investigate, 1055 did not draw a rival bidder. Conversely, part (C) of Proposition 2 also implies when rivals are likely (smaller values of F) the initial

bidders will purchase larger toeholds, thus inducing a positive correlation between the purchase of a toehold and the appearance of a rival bidder. As one can see, one has to be careful when interpreting the data. The model demonstrates that, even though toeholds discourage rivals from entering the bidding contest, the solution to the initial bidder's optimization may induce a positive correlation between toeholds and multiple bidder contests.

2.3.3 Equilibrium Implications When the Toehold Impacts the Rival's Entry Decision

The previous section of the paper took the probability of a rival's entry to be independent of the toehold decision. However, toeholds change the cutoff value for V_2 at which profitable entry can occur, and therefore will in general influence the probability that a rival appears. This section of the paper takes the ex-ante distribution of V_2 as given, hence, the larger the required value of V_2 , the less likely it is a rival will appear.

Allowing the probability of entry to depend upon the initial bidder's toehold, V_2^* changes the toehold decision through the first order condition. Let π'_F represent the first order condition holding the probability of a rival's entry ($1-F$) fixed (equation (9)). Then the first order conditions when F depends upon V_2^* can be written as

$$\frac{\partial \pi}{\partial t} = \pi'_F + \frac{[\alpha - t + n(1 - \alpha)](V_1 - P)f}{1 - (1 - \alpha)(1 - n)(1 + t)} \frac{\partial V_2^*}{\partial t} \quad (11)$$

where

$$\frac{\partial V_2^*}{\partial t} = \frac{(1 - \alpha)(1 - n)[(V_1 - P)[1 - (1 - \alpha)(1 - n)] - kt[1 - (1 - \alpha)(1 - n)(1 + t)]}{[1 - (1 - \alpha)(1 - n)(1 + t)]^2}, \quad (12)$$

which derives from equation (7). From equations (11) and (12) one can show that allowing entry to depend upon V_2^* increases the optimal toehold.

Proposition 3: Making entry by the rival more sensitive to V_2^* increases the optimal toehold. Formally, an increase in f at V_2^* increases the optimal toehold.

Proof: To prove the proposition one needs to show that the term multiplying f in (11) is positive. From equation (8) $V_1 - P > 0$, or the first bidder will earn an expected loss. Since the first bidder can always stay out of the contest expected losses cannot occur. Thus, the term multiplying $\partial V_2^*/\partial t$ must be positive. To complete the proof one now needs to show that $\partial V_2^*/\partial t$ is also positive. The expression in (12) will be positive if the term $(V_1 - P)[1 - (1 - \alpha)(1 - n)] - kt[1 - (1 - \alpha)(1 - n)(1 + t)]$ from the numerator is positive. Call this term x . Then one can write the first order conditions as

$$\frac{\partial \pi}{\partial t} = -kF + \frac{x[1 - (1 - \alpha)(1 - n)(1 + t)][1 - F]}{[1 - (1 - \alpha)(1 - n)(1 + t)]^2} + \frac{x(1 - \alpha)^2(1 - n)^2 f}{[1 - (1 - \alpha)(1 - n)(1 + t)]^4} \quad (13)$$

Since all of the terms multiplying x are positive, if $x < 0$ then t cannot satisfy the first order condition (unless $t = 0$). Therefore $x > 0$. If $x > 0$ then so is $\partial V_2^*/\partial t$. Q.E.D.

Proposition 3 has the following intuitive interpretation: if the first bidder knows that a small change in the toehold will cause a large decrease in the probability of rivals entering the picture, he will purchase a large toehold to keep potential rivals away.

The foregoing analysis seems to be consistent with media contentions asserting that toeholds are a good strategy against bidding contests. Either you complete the acquisition at a considerable gain, or else you are amply compensated by a better rival. This is particularly relevant given how infrequently two rivals appear let alone three or more.²¹ We demonstrate below, however, that while toeholds do provide insurance, it is incomplete, and bidders still prefer winning to losing.

²¹Recall that the Betton and Eckbo (1995) find that only 22% of their sample involves multiple bidders.

Proposition 4: Increasing the probability a rival arrives reduces the initial bidder's expected profits.

Formally, $\partial\pi/\partial F > 0$.

Proof: Differentiate (8) with respect to F to yield

$$\frac{\partial\pi}{\partial F} = \left[1 - \frac{[1-(1-\alpha)(1-n)]t}{1-(1-\alpha)(1-n)(1+t)} \right] (V_1 - P) \quad (14)$$

From earlier arguments $V_1 - P > 0$. An examination of the second term in the square brackets shows that it is less than one. Thus, $\partial\pi/\partial F > 0$. Q.E.D.

Proposition 4 implies that single bidder contests should be more profitable to acquirers. This is broadly supported by empirical studies. One of the better known examples is Bradley Desai and Kim (1988) who demonstrate that in each sub-period of their sample single bidder takeovers yielded higher returns to successful acquirers than multiple bidder contests. These are also the findings of Comment and Schwert (1995) and Schwert (1996).

Another view of Proposition 4 can be found in the derivation of Proposition 3. Proposition 3's proof shows that at the optimal toehold level, the derivative of V_2^* with respect to t is positive. Thus, it never pays to increase the toehold past a point where rivals are encouraged to enter. Basically, all else equal, the first bidder prefers to see the rival stay out which is precisely what Proposition 4 shows.

At this point one can also inquire how various policy changes may impact the welfare of the game's participants. The model contains two parameters representing constraints imposed by the legal system: α which represents the minimum acquisition required to proceed with the clean up offer, and n which determines the minimum payment allowed by the courts for any shares taken up in the clean up offer. The next proposition shows that the welfare of the first bidder declines in α .

Proposition 5: If there is a positive probability that a rival firm should appear, then an increase in α decreases the initial bidder's expected profit, and thus increases the minimum value of V_1 needed to begin the acquisition process.

Proof: Differentiate (8) with respect to α . Some minor algebra shows that $\partial\pi/\partial\alpha$ has the opposite sign as V_1-P . From our earlier arguments $V_1-P>0$, so $\partial\pi/\partial\alpha<0$. Q.E.D.

Proposition 5 implies that supermajority takeover laws act to thwart profitable takeovers when the initial bidder finds it optimal to purchase a toehold. While such rules may occasionally produce higher bids for the target shareholders, they will have an overall negative impact by discouraging profitable bids. Also note that the optimal toehold equals zero when the first bidder knows he will not face any competition. Thus, increasing α discourages takeovers when one might expect them to provide the greatest economic benefit.

Another important case arises when b is set by the courts very close to the winning bid. Offers in which B is set much larger than b are considered coercive by the judicial system, leaving the bidder vulnerable if a lawsuit is filed. Evidence of this phenomena can be found in the Unocal Corporation v. Mesa Petroleum Co., Del.Supr., 493 A.2d 946 (1985) decision. This case involved a large difference between B and b , which the court then used to legitimize extreme actions taken by the target management to block the acquisition.²² The judicial requirement that $B=b$ is often known as a "fair price" provision. To duplicate this requirement simply set $n=1$ in the model. Under these conditions, equation (5) reduces to $B_2^*=V_1$. In other words, a second bidder will enter if his synergies are larger than those of the first bidder. Thus, we have proven the following proposition.

²² While this judicial viewpoint is crucial in the case of two bidders, it is relatively unimportant when there is only one acquirer. A single bidder can simply set B a small amount over the minimum value of b and proceed. However, when there are two bidders each firm wants to set the first tier bid far above the second tier bid. In this case the constraint that B remain close to b (known as a "fair price" rule) becomes significant. It is also important to recognize that even when courts set the dollar value of B equal to b this still acts like a two tier offer and breaks the free rider problem. The reason is that those who tender early will receive their payment sooner. So long as the interest rate is positive, tendering remains a dominant strategy, and no free rider problem exists.

Proposition 6: Fair price provisions ensure that rivals enter the bidding contest and win whenever their valuation of the target exceeds that of the first bidder.²³

Proposition 6 implies that fair price provisions may be socially efficient, not because of any "fairness" features, but because of efficiency considerations.²⁴

3 Model Simulations

The model generates a number of empirical predictions that correspond to those found in Betton and Eckbo (1995) and other related studies. This section goes beyond what one can say with simple analytics and shows via simulations how the model can be used to explain some of the more anomalous elements found within Betton and Eckbo's (1995) study.

The first example examines the optimal toehold and resulting stock price within a set of situations similar in all respects except for the stock price reaction to open market purchases parameter (k). While an increase in k discourages toehold purchases, by increasing the stock price for a given purchase, it also raises the observed price for any particular toehold. Thus, while a larger k may reduce the optimal toehold, it may still result in a higher pre-tender offer price increase. If firm 1 believes that the rival's valuation of the target falls in a relatively narrow range, then the optimal toehold purchase will be relatively insensitive to k since there will exist one particular toehold that stops most entry. Under these conditions the empirical data may appear to show that larger toehold purchases suppress the stock price prior to the takeover announcement even though open market stock purchases actually drive stock prices up.

²³ If we were to re-introduce costly bidding, the proposition would read "whenever their valuation + the cost of bidding exceed the valuation of the first bidder. Since in that case bidding does involve real social costs, our conclusions, concerning ex-post efficiency are not affected.

²⁴ Bebchuk (1994) concludes that Equal Opportunity Rule, akin in spirit to the "fair price" provisions, does not enable inefficient transfers of control to go through (however, in his framework, efficient transfers may be blocked in an EOR environment). Bebchuk (1994) uses private benefits as a wedge between total value and security value. However, the policy implications are similar.

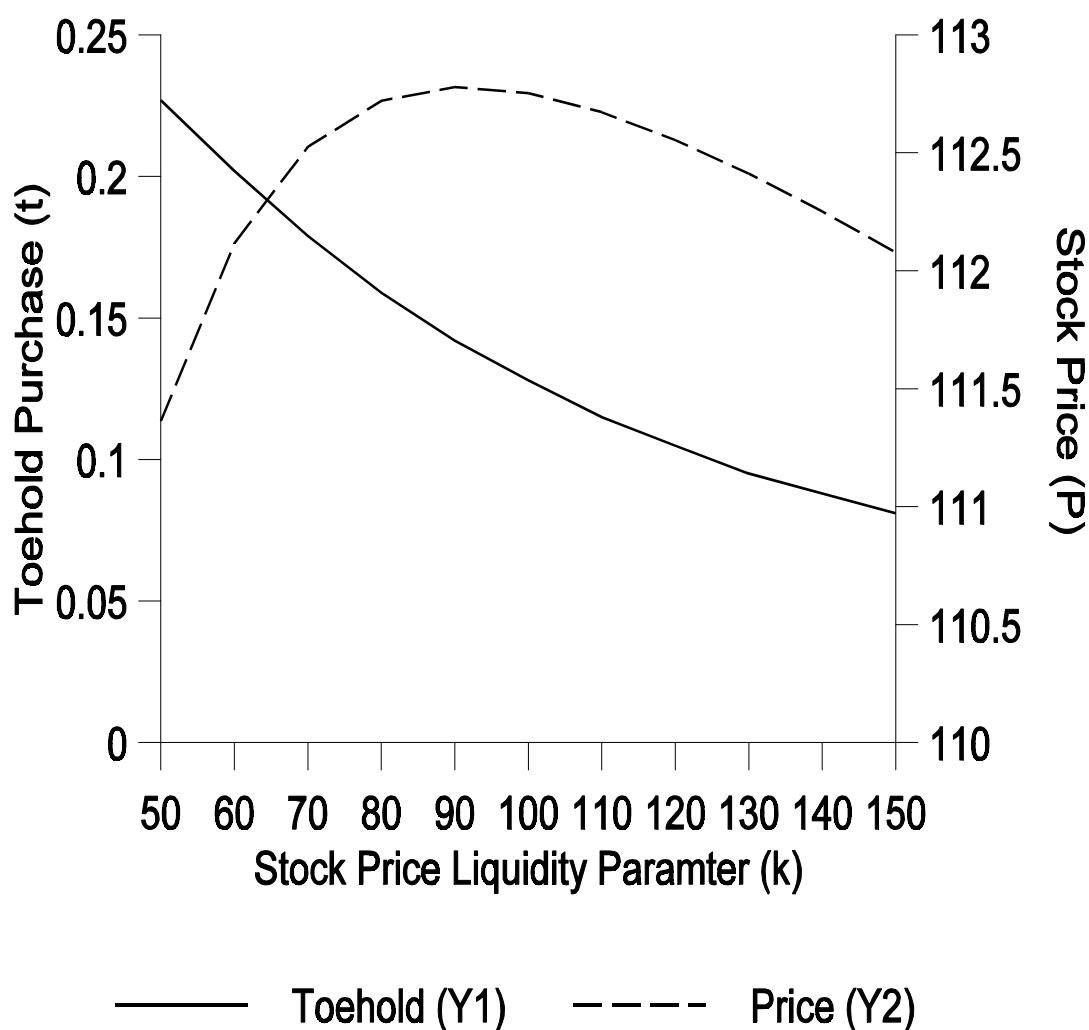


Figure 1: V_2 - normally distributed with a mean of 145 and variance of 1, $c = 4$, $P_0 = 100$, $(1-n)(1-\alpha) = .2$.

The results displayed in **Figure 1** may help explain why Betton and Eckbo (1995) find that larger toeholds are associated with smaller returns during the period prior to the takeover announcement. This seems surprising since larger purchases by the bidding firm, even if done secretly, should drive up the stock price. Depending upon the liquidity parameter, the toehold may display a negative or a positive correlation with the stock price. To obtain some intuition as to what k 's value may be in practice, note that when $k=50$ a 10% toehold will raise the price by 5%. At $k=100$ a 10% toehold raises the stock price by 10%. As one can see

from the figure if the liquidity parameter lies between 0 and 90 larger toeholds will be associated with lower prices. This results from the way the liquidity parameter influences both the optimal toehold purchase and the resulting stock price. When liquidity is high (low k) the optimal toehold becomes very large, but has only a minor impact on the stock price. As the market becomes less liquid, the optimal toehold shrinks, but what is purchased causes an ever greater impact on the stock's final price.

Even when the initial bidder has very little information about potential rivals, the toehold may still display a negative correlation with the pre-offer price run up. Recall from the propositions in Section 2.3.2 that under these scenarios, smaller values of F , and larger values of V_1 , should lead to larger toehold purchases. Thus, if either small values of F or large values of V_1 are associated with large values of k , it is a simple matter to produce examples where large toehold purchases appear to “cause” low abnormal returns in the period prior to the takeover. An example of this correlation is displayed in **Figure 2**.

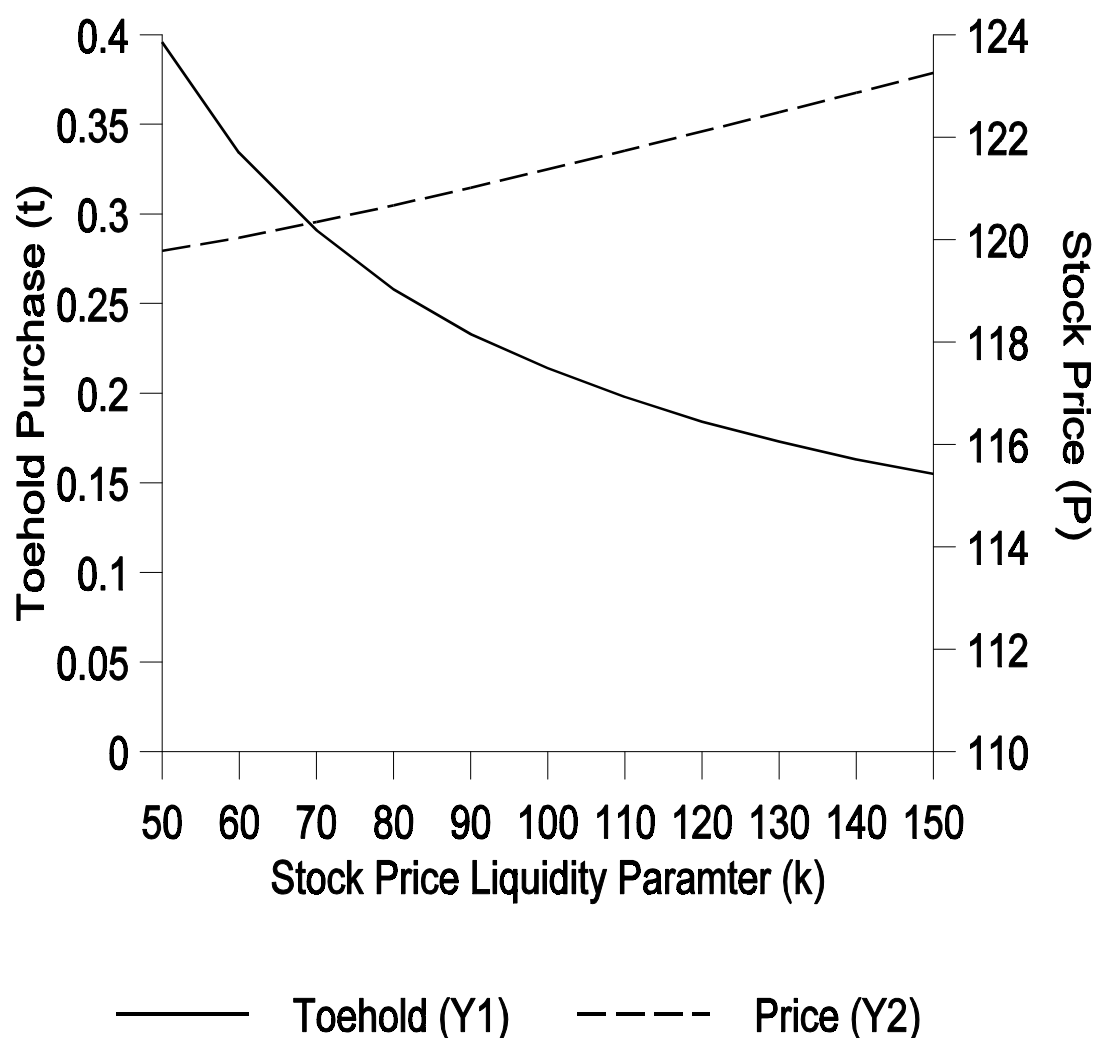


Figure 2: Probability of no rival (F) set to .3, $c = 4$, $P_0 = 100$, $(1-n)(1-\alpha) = .2$, $V_1 = 130 + .5k$.

Figure 2 creates a correlation between V_1 and k by simply assuming that $V_1 = 130 + .5k$. In contrast to the results in **Figure 1**, the price appears to decrease in the toehold for all values of the liquidity parameter k . This can happen over a wider range of values for k because the larger values of V_1 encourage larger toehold purchases thereby offsetting k 's retarding influence. The example in **Figure 2** necessarily leads to the question of whether high values of V_1 will generally correspond to high values for k . It seems reasonable to suppose that this may be the case. High bidder valuations should be associated with conditions where the

market suspects a takeover is likely. If the market is “suspicious” then the equilibrium price function should be relatively steep, thus creating a correlation between high V 's and high k 's. The resulting data will then produce correlation coefficients that indicate that open market toehold purchases actually drive down the stock price, when in fact the very opposite is true.

4 Conclusion

This paper shows that a classical model based upon the legal institutions confronting a profit maximizing firm with no asymmetric information can yield many of the major patterns found in analyses of the currently available toehold data. In particular, we analyze toeholds in an environment where rival bidders can attempt to purchase the same target. If no rival bidders are expected, no toehold will be purchased. This is a commonly observed in real life. Otherwise, toeholds provide two separate benefits for the initial bidder. First, even if a toehold cannot discourage rival bidders, it does at least provide some insurance should entry occur. In addition, up to a point, the larger the toehold the more the second bidder will be forced to pay for the target. Somewhat surprisingly, however, sometimes too large a toehold can *reduce* the amount a rival must pay for the target. The model also reaches two important conclusions regarding welfare. First, super-majority rules discourage firms from embarking on a takeover process, but only if a rival firm might contest the offer. However, these are exactly the cases when one may want to encourage takeovers, since they are likely to generate the greatest economic gains. Second, fair price provisions ensure that rival bidders who place a higher value on the target (net of their transactions costs) than the initial bidder will enter the contest. This at least offers a possibility of a social welfare improvement. One can conclude then, that from the perspective of this model, super-majority clauses are unambiguously poor policy, while fair price provisions may not be.

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