When do bidders purchase a toehold? Theory and Tests

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Abstract

Most of the theoretical literature on tender oxers has been devoted to illustrating the positive exects of the toehold on the bidder's pro...ts. Empirical research, however, shows that a high proportion of bidders do not trade on the target's shares prior to the tender oxer announcement. This paper presents a model in which the bidder trades in the open market before announcing a tender oxer and the incumbent shareholders form beliefs about the rival's quality given the order size. Market liquidity allows the potential bidder to partially hide her trade, and thus insiders are not able to ascertain whether an increase in volume indicates toehold acquisition. Stock price prior to the announcement date and market perception about the probability of a takeover are therefore contingent on players actions. We show that in some situations no trade will be optimal, and a negative relationship between takeover premium and toehold size arises. Interestingly, stock liquidity and initial stake are positively related. Our results also provide a theoretical basis for the observed pre-bid stock price dynamics. In particular, we show that the ratio between price runup and bid premium is increasing in the toehold size. The model's implications are then tested with a sample including tender oxers in the US and the UK, estimating a bivariate generalization of the tobit model. We ...nd a broad support for the model and signi...cant di erences across countries. We show that toeholds and probability of an acquisition are negatively related, and that companies in which the appropriation of private bene...ts of control is more likely have a higher probability of being taken over.

Keywords: toeholds, takeovers, corporate control, informed trading.

J.E.L. Classi...cation Nos: G34, K22, D82

1 Introduction

Observation of stock price dynamics before tender offer announcements indicates that potential acquirors should be interested in making prior open market purchases of the target shares. Despite the fact that information disclosures (in particular information regarding the stake purchased) are triggered once a threshold percentage is reached¹, it may still be in the bidder s interest to buy a small stake in the target rm, because such an investment may guarantee her a high return. Moreover, there is no such disclosure requirement in some countries (Belgium and, *de facto*, in Italy), so a company can be acquired by secretly dealing in its stock.

Why is it then that only around 15% of bidders² follow the (apparently) optimal strategy of at least acquiring as many shares as possible on the open market (whilst avoiding information disclosures) and then launching a bid immediately afterwards? This question is of great interest especially because most theoretical models on toehold acquisition predict that bidders do prot from acquiring initial stakes (Grossman and Hart (1980), Hirshleifer and Titman (1990), Kyle and Vila (1991), Jegadeesh and Chowdry (1994), Burkhart (1995), Bulow, Huang and Klemperer (1996), Bagnoli and Lipman (1996)), while empirical research shows that a high proportion of acquirors do not purchase a toehold (see Jarrell and Poulsen (1989), Betton and Eckbo (1997), Bradley, Desai and Kim (1988), Jennings and Mazzeo (1993), Asquith and Kieschnick (1996)).

In this paper we try to reconcile the apparent contradiction between theory and empirical research. The objective of our work is twofold. First we provide a theoretical framework that carefully considers the effect of stock trading by potential acquirors prior to takeover announcements. The strategic behaviour of the raider is modeled as a game in two stages. In the rst stage, the bidder decides the toehold size knowing that it will affect the current stock price and produce an information ow, but also aware of the pre-announcement trade s positive effect on ultimate pro ts. In the second stage, the bidder faces a target company with a large number of small shareholders. Target shareholders have an incentive to free ride and keep their shares unless the bid price is high enough. The free rider problem is overcome by means of the pre-announcement stake, which guarantees positive pro ts to the bidder even if she pays her full true valuation in the second stage, and by introducing private bene ts of control that accrue to the bidder if the tender offer succeeds.

Our second objective is to explain theoretically the price runups that occur before tender offer announcements and which have been well documented by the literature (Keown and Pinkerton (1981), Mikkelson and Ruback (1985),

 $^{^{1}}$ In the U.S., Section 13(d) of the Security Exchange Act requires any person acquiring the bene cial ownership of more than 5% of any equity security to le certain information with the SEC, in particular the purpose of the proposed purchase. For a complete description of takeover regulations in the U.S., see Clark (1986).

 $^{^{2}}$ From the data in our sample, only 15% of bidders acquire a toehold less than the limit that would trigger either information disclosures or a mandatory bid

Gupta and Misra (1989), Eysell (1990), Choi (1991), Sanders and Zdanowicz (1992), Barclay and Warner (1993), Schwert (1996)). In the spirit of Easley and O Hara (1987), Kyle (1985) and Kyle and Vila (1991), we postulate a trading game with many uninformed traders and one informed trader (the bidder) who reveals information to the market through her order size. The stock is priced competitively and re ects the market s perceived probability of a bid occurring and succeeding, as well as the market expectations of the potential takeover synergies. Thus, the model illustrates both the cost and bene t of a toehold purchase: in a liquid market, the informed trader will be able to hide her trade only partially, and this initial stage in the game makes the bid price closer to the true synergistic gains. Moreover, as the stock price after the toehold is purchased incorporates only a part of the total stock price reaction that will be ultimately induced by the change in control, the bidder bene ts from the open market trade.

We show the irrelevance of the toehold decision when the market perception regarding the probability of an acquisition is one. In this situation, even before any public announcement, stock prices fully incorporate the expected increase in rm value that will occur after takeover completion; therefore any takeover premium (the difference between bid price and stock price before announcement of the bid) vanishes in such circumstances. Bid price is shown to be independent of the toehold size, in line with Burkhart, Gromb and Panunzi (1995).

When the probability of an acquisition is less than one, we show that the bidder s open market trade depends on stock liquidity (the level of noise trading) and the likelihood of a change in control. Open market trades are protable for a potential acquiror rst because they allow her to buy a portion of the target rm at a cheap price, and second because bid price is shown to be decreasing in the raider s initial stake. However, the cost of the toehold is that the intention to acquire the target is more likely revealed if trading volume increases dramatically. Such a cost is more relevant when the market anticipates the battle for control.

Additionally, this paper shows that, when the synergistic gains from a takeover are overvalued by the market, target rms display declining stock price patterns after takeover completion. Rau and Vermaelen (1998) have shown that glamour bidders (low book to market ratio) underperform in the long run.

Finally, we offer a consistent explanation for the divergent results in Schwert (1996) and Jarrell and Poulsen (1989) concerning the relationship between price runup and takeover markup: our model predicts that price runups and toehold size are positively related, and that informed trade (possibly illegal) drives up the stock price. The relationship between takeover premium and toehold size turns out to be negative and contingent upon variables (e.g. stock liquidity, information disclosures) not previously considered by the literature.

We test the model using a sample of hostile tender offer announcements that took place in the period 1980-1995 in both the US and the UK. Our ndings are broadly consistent with our theoretical results. First it is shown that companies in which the appropriation of private bene ts of control is more likely have a higher probability of being taken over. We also con rm that the ratio of price runup to price markup is increasing in the toehold size i.e. that acquiror trading drives up the pre-announcement stock price. When following the optimal strategy, purchase of a toehold clearly does not make a bid less likely to succeed. Yet paradoxically we nd evidence that toeholds and probability of an acquisition are negatively related. This is resolved by noticing that it is more likely to be optimal to purchase a toehold when the market perceives that the probability of an acquisition is low. By focusing on international deals, the paper shows that regulatory environment, market liquidity, and information disclosures are key issues in determining the outcome of a battle for control. Finally, the econometric implementation deals carefully with causality problems and sample selection biases that might perturb the results. We estimate a bivariate generalization of the Tobit model as formulated by Heckman (1979) combined with GMM estimates of a two equation model for the joint determination of the toehold size and pre-announcement price runup.

Our theoretical model is related to the literature that considers the optimality of the toehold in single bidder contests. In this situation, Hirshleifer and Titman (1990) obtain a negative relationship between bid premium and toehold size. Intuitively, the higher the toehold the lower the proportion of shares that the bidder needs to acquire in the takeover stage, thus the lower the target shareholders bargaining power. In their model, the way in which the toehold is acquired is exogenous, and its strategic role is limited since the probability of failure is one when the toehold is zero. Jegadeesh and Chowdry (1994) formalize a signaling game in which high valuation bidders choose high toeholds. They get two types of equilibria: fully separating and semi-separating equilibrium with a mass of bidders (low valuation) who do not hold shares prior to the tender offer. Thus the takeover premium is positively related to the toehold size. Their model considers the toehold as a device to overcome the free rider problem. However, they do not consider the effect of the toehold on the bid price, which is given in their model by the true value of the synergy, i.e. the bid price is fully revealing.

Bagnoli and Lipman (1996) introduce a new stage in the game. They allow for the bidders to renege on the bid even after the tender offer announcement. In this case it is possible that toeholders are willing to reveal takeover intentions just in order to increase the stock price, dropping the bid afterwards and making pro ts at the expense of minority shareholders. In equilibrium, high types purchase the maximum toehold and bid, low types abstain from bidding and intermediate types mimic the high types but then drop the bid. In practice this kind of manipulation may be prohibited³. Again, bidders always acquire a toehold in equilibrium. Burkhart, Gromb and Panunzi (1995) have explained the shares tendered-bid premium relationship using a model with dilution. They allow for toeholds in the range $[0, \frac{1}{2}]$ and prove the irrelevance of the toehold in the sense that bid price does not depend on the pre-announcement shareholdings (which implies a at toehold-takeover premium relationship). Intuitively, a

³For example, the new EEC Directive on takeovers (art. 13) explicitly prohibits dropping.

higher toehold has two contrarian effects: pro ts from trading in the open market at low prices increase, while pro ts from dilution decrease. The model predicts that bidders will always be willing to increase their initial stakes, since bidder s pro ts are increasing in toehold size.

A different body of models deal with the bargaining advantage of bidders with pre-announcement shareholdings in the target rm. Such models generally consider multiple-bidder situations, where the toeholder is able to increase the bid price enough to beat zero-toehold bidders. Burkhart (1995), for example, nds that bidders with a positive toehold always overbid, while zero-toehold bidders pay their own valuation. However, he nds a positive relationship between toehold and bidder s pro ts, which seems to indicate that the maximum toehold is optimal. Similar results appear in Singh (1993). Bulow, Huang and Klemperer (1996) also obtain positive premia and show the pro tability for the target rm of allowing positive toeholds for potential bidders (to even the contest). However, they always obtain positive toeholds in equilibrium.

Finally, the optimality of not acquiring a toehold is also obtained by Ravid and Spiegel (1993). In their model, the toeholder must announce a rst tier price and the number of shares to be acquired in this tier, plus a second tier price. Intuitively, purchases in the open market drive up stock prices, and the bidder simply ends up paying more for the shares tendered in the second tier. The main implication is that toehold size is positively related to the number of bidders⁴.

The next section of the paper outlines the basic model and presents some preliminary results. The model is presented in two parts, corresponding to the stages that result from the tender offer process. Section 4 is devoted to describing the empirical tests of the theoretical model. The paper concludes with some avenues for further research. All proofs are contained in the Appendix.

2 The model

2.1 Basic Setup

Consider a publicly owned rm with disperse and homogeneous shareholders, whose value at time t = 0 is for simplicity S = 0. The company is targeted by a potential bidder who can manage the rm more efficiently increasing its value up to v. The value v is only observed by the bidder. For the rest of the world, v is a random variable $\tilde{v} \in \{0, \overline{v}, v_h\}$, with $0 < \overline{v} < v_h$, and the probability function of \tilde{v} is $g(\cdot)$ where:

 $^{^4}$ Asquith and Kieschnick (1996) support this prediction empirically. However, Betton and Eckbo (1997) nd that the average toehold is 18.7% with one bidder and 4.8% with a second bidder.

$$g(v) = \begin{cases} p_h & \text{for } v = v_h \\ 1 - p_h - p_l & \text{for } v = \overline{v} \\ p_l & \text{for } v = 0 \end{cases}$$

i.e. the bidder is at least as efficient as the incumbent manager. Only bidders that are potential acquirors of the \mbox{rm} are allowed. Value-decreasing bidders are ruled out because it is assumed at this stage that it is never protable for them to acquire a company. Additionally, if the bid succeeds, private bene ts C accrue to the management of the bidding \mbox{rm} . In this framework private bene ts of control represent synergistic gains from the transaction that are solely rejected in the bidder s balance sheet.

At t = 0, the potential bidder, not identi ed by the disperse shareholders, decides whether to bid or not and her optimal strategy. The bidding decision involves:

-The proportion θ of shares that will be acquired on the open market before the tender offer announcement, $0 \le \theta \le 1$.

-The bid price B.

The toehold is priced competitively and efficiently by the market. Shareholdings can be acquired up to a legal limit $\overline{\theta} \leq 1$, above which information disclosures are triggered and the tender offer becomes compulsory.

The decision to acquire a toehold sends information to the market and thus drives the bid price. When the bidder decides not to acquire initial shareholdings, the bid price re ects the information conveyed by the zero-toehold plus the prior information about \tilde{v} . So long as the toehold does not exceed the legal limit, the bidder is able to hide her trade in a liquid market in which uninformed traders place their orders randomly. Intuitively, a high type bidder (v_h) will be willing to purchase a proportion of shares if she is not identi ed as a high-valuation bidder. The low value type ($\tilde{v} = 0$) will balance the pro ts of revealing to the market her own quality with the cost of purchasing an expensive toehold.

At time t = 1 the market maker -who is risk neutral and makes zero pross, as in Kyle (1985)- prices the sum shares after observing the net order ow (the sum of the bidders toehold and traders liquidity demands). The new stock price Q reveals the market makers perceptions regarding the potential rivals for control.

At t = 2, both positive- and zero-toehold bidders announce the tender offer. When bidding for the target company, the rival discloses information about the toehold purchased and the bidding rm quality. We assume that information disclosures affect market perception of \tilde{v} only through θ , i.e. at t = 2 the target shareholders use $E[\tilde{v} | \theta]$ to price the bid. The free rider problem induces the bidder to pay $B \geq E[\tilde{v} | \theta]$, otherwise the bid fails. The tender offer outcome is obtained at t = 3, and players receive their payoffs. The cost of bidding is assumed to be zero⁵.

The timing of the game is sketched in Figure 1.

[INSERT FIGURE 1]

Therefore, the solution to the bidding subgame is contingent upon stock price and beliefs that result from the trading stage.

2.2 Some comments

Single versus continuous trades. Our assumption concerning a single order by the informed trader may seem unrealistic. In fact Kyle (1985) provides a useful framework to split big orders over long time periods. However, Barclay and Warner (1993) have shown that medium size trades (which they de ne as those of 500 to 9900 shares) are responsible for 92.8% of the cumulative price changes before announcement using a sample of 108 tender offers in the period 1981-1984. Those orders represent only 45.7% of total transactions. Additionally, Meulbroek (1992) concludes that direction and frequency of trade and, specially trade size, signal to the market the presence of an informed trader. From a theoretical perspective, Easley and O Hara (1987) formalize the positive correlation between trade size and probability of being an informed trader. Lastly, as will be explained later, our assumptions about the probability of bidding are such that the bidder is always willing to play one-shot game, after which she may be identi ed as a bidder by the market.

The probability of bidding. The level of dilution and private bene ts, C, guarantee that even the low valuation type (v = 0) may be willing to bid with positive probability. Kyle and Vila (1991) and Walkling (1985) have shown the importance of the market perceived probability of success in determining takeover outcomes (toehold size and bid price). Our purpose here is to introduce into the model the possibility for a type to be of extremely low quality while guaranteeing that she is willing to bid for sure (an extreme case). Only by assuming a continuous distribution of types could we have obtained a bidding probability different from zero or one.

Legal issues. It is assumed that the maximum toehold, $\overline{\theta}$, is the level at which a tender offer becomes compulsory⁶. However, we do not consider any motive other than control acquisition for a toehold purchase. Note as well that a tender offer requires a 14d ling in which the offeror must disclose the percentage of shares held. This feature is interesting because in microstructure models à la Kyle in which the market does not know the true value of the asset, the informed trade reveals such a value when the latter s order is known

 $^{^{5}}$ The model is robust to the introduction of a positive bidding cost. As it will be illustrated, the solution for the bidding subgame involves mix strategies when the acquisition is costly independently of its outcome.

⁶See footnote 1

(the optimal informed trade is linear in the true asset value). Thus, unless uninformed trade is bounded and/or asset value has a discrete support, the bidder s valuation becomes common knowledge at the time of the tender offer announcement.

2.3 The pure tender-offer subgame

The decision to purchase a proportion θ of shares prior to announcing a tender offer conveys information to the market regarding the bidder s quality. Thus an imperfect information game is played between bidder and incumbent shareholders in which the rm is priced as an outcome. Denote by $\Phi(v, \theta)$ the market s beliefs about \tilde{v} given θ . Note that $\Phi(v, \theta)$ is not necessarily equal to the prior distribution of \tilde{v} , g(v), stated in the previous section⁷. Indeed, the decision to bid without toehold is itself informative. For the moment, it suffices to express $\Phi(v, \theta) = g(v | \theta)$.

Because of the information asymmetry, bidder and target shareholders will play a signalling game, the decision whether to launch bid (B) or not (\overline{B}) being the strategy followed by the bidder. Shareholders will form their beliefs about \tilde{v} and will decide whether to tender their shares (T) or reject the offer (\overline{T}) . Let $T = \{0, \overline{v}, v_h\}$ denote the set of types and $M = \{B, \overline{B}\}, A = \{T, \overline{T}\}$ the set of possible actions for the rival (b) and shareholders (s) respectively. Let $\sigma(m, t)$ and $\tau(m, a)$ be the mixed strategies for b and s, where

$$\begin{aligned} \sigma(m,t) &: & TxM \longrightarrow \Delta(M) \\ \tau(m,a) &: & MxA \longrightarrow \Delta(A) \end{aligned}$$

where $\Delta(K)$ is the set of probability distributions in $K, K \in \{M, A\}$.

Let $U_j(\sigma, \tau, t)$ be the payoffs for player $j = \{b, s\}$ when type t plays σ and player s plays τ . We will use the concept of Perfect Bayesian Equilibrium (PBE) to solve for the optimal strategies for both players, allowing for mixed strategies. The solution that we obtain is contingent upon the specification of beliefs $\Phi(v)$ and it is stated in the next Proposition.

Proposition 1 Consider the game $\Gamma = \{T, A, M, U_j, j = \{b, s\}\}$. The following values de ne a PBE for Γ .

$$\Phi(v,\theta) = \begin{cases} 1 & \text{for } v = v_m \\ 0 & \text{otherwise} \end{cases}$$

$$\Phi(v,0) = \begin{cases} 0 & \text{for } v = v_m \\ 1 & \text{otherwise} \end{cases} \quad \forall \theta \neq \overline{\theta}$$

⁷For example: if, in equilibrium, only v_m types acquire a toehold $\overline{\theta}$ (following a signalling argument) and we only allow toeholds in the set $\{0, \overline{\theta}\}$, then $\Phi(v, \theta)$ will be:

$$B = E_{\Phi}[v | v \ge (1 - \theta)B - C]$$

$$\sigma^*(B, v) = \begin{cases} 1 & if \ v \ge (1 - \theta)B - C \\ 0 & otherwise \end{cases}$$

$$\tau^*(B, T) = 1$$

$$\mu(v | B) = \Phi(v | v \ge (1 - \theta)B - C)$$

$$\mu(v | \overline{B}) = \Phi(v | v < (1 - \theta)B - C)$$

where $\mu(v \mid \cdot)$ are the shareholders beliefs about \tilde{v} in equilibrium.

In Proposition 1 it is shown how information asymmetry induces the bidder to pay a non negative premium:

$$\pi = E_{\Phi}[\widetilde{v} \mid \widetilde{v} \ge (1 - \theta)B - C] - E_{\Phi}[\widetilde{v}] \ge 0$$

which depends negatively on the bidder s private bene ts of control. Intuitively, when private bene ts are high, the decision to bid does not reveal a potential increase in the rm s value, since a low valuation type may be willing to bid as a means to acquire those private bene ts. The size of the premium depends also on the level of information asymmetry, i.e. on the variance of the distribution of \tilde{v} .

Additionally, our equilibrium results in tender offers that succeed or fail for sure, as in, for instance, Israel (1992). A positive cost of bidding, however, produces an equilibrium in mixed strategies⁸.

The last result gives an insight into why bidders should be interested in acquiring toeholds: the prior shareholdings are disclosed with the offer. Thus, incumbent shareholders information concerning the bidder is more accurate when a toehold was acquired. Formally, $Var(v | \theta) < Var(v)$, which induces a reduction in the takeover premium. This intuition is illustrated in the next result:

Corollary 2 Bid price is decreasing in the initial toehold. **Proof.** Direct from the denition of B in Proposition 1

A toehold is protable for a potential acquiror, because she is able to acquire a portion of the target run at a low price. Therefore the population of bidders

$$U_b(\sigma_B, \tau_T, \widetilde{v}) = \tau_T \sigma_B(\widetilde{v} - (1 - \theta)B - \theta Q + C - k) + \sigma_B(1 - \tau_T)(-k - \theta Q)$$

⁸Suppose we introduce a positive cost of bidding k. Then

assuming that the bidding cost is paid by the bidder even when the tender offer fails. In this case, the optimal strategies will be mix.

for which a takeover is bene tial increases as the initial stake gets higher, from the uninformed shareholders perspective. Therefore the bid price, that re ects the market s expectation regarding a bid occuring and succeeding, reduces.

In the next section the former result is taken for granted and we solve for the optimal trading decision prior to the tender offer announcement.

3 Toehold acquisition

We assume now that the potential bidder has decided whether to acquire an initial shareholding prior to the hostile bid or not, and its size. Let us analyze the way in which this initial shareholding is priced, the determinants of its size, and its effect on the takeover outcome.

Suppose the bidder, who knows the realization of \tilde{v} , trades an amount θ . Uninformed investors in the market (and the incumbent shareholders among them) have only a prior g(v) about the potential value of the rm. Note that at this point the rival has not revealed her stake in the company and thus the only information available to the market is g(v). Uninformed traders place a random order u which is a proportion with respect to the outstanding number of shares, and is distributed uniformly $u \sim U[-\sigma, +\sigma]$, where σ can be interpreted as the size of the noise trade or the level or market liquidity. Let s assume that σ is sufficiently high⁹ to ensure $\sigma > \frac{\overline{\theta}}{2}$, and $\sigma \leq 1$.

The price for the company is set by a risk neutral market maker who only observes the net order w = 0 where w = 0 with the neutral market market maker owns a stock of shares, and she is able to match supply and demand. An equilibrium is defined (as in Kyle and Vila (1991)) as an order size θ^* and a pricing rule $Q(\theta + u)$ such that the following two conditions are satisfied:

(1) Prot maximization: $\theta^* \in \arg \max_{\theta} \Pi_v(\theta, u)$, where Π_v are the prots for the bidder with quality v.

(2) Market efficiency. The market price equals the expected value of the rm given the observed trade, i.e.:

$$Q(\theta + u) = E[\tilde{v} | \theta + u, \text{, Tender Offer occurs}] + 0 \cdot \Pr[\text{Tender Offer does not occur} | \theta + u]$$

Before stating the basic result, it should be noted, rst, that for any type, the expected pro ts from bidding will be:

$$\Pi_{v}(v) = E \left[v - \theta^{*} Q(\theta^{*} + u) - (1 - \theta^{*}) B + C | v \right]$$
(2)

 $^{^{9}}$ This assumption guarantees that there will exist situations in which the market maker cannot identify the trader s nature, i.e. whether informed or uninformed (Rochet and Vila (1994))

Unlike Kyle (1985), expression (2) is not linear in the total order ow $\theta^* + u$. From expression (1) bid price depends on $Q(\theta^* + u)$, which makes it difficult to pin down the informed trader s order size in equilibrium. For simplicity, we restrict ourselves to toeholds in the interval $(0, \overline{\theta})$ and consider only pure strategies equilibria.

Second, the probability of bidding is exogenous in our model and it depends essentially on the pro-tability of the combination of a toehold acquisition plus a tender offer. In general, for any type v and any toehold size θ , positiveness of the bidder s expected pro-ts as in expression (2) will depend essentially on the magnitude of private bene ts of control C. As a benchmark, consider the case in which the low type is willing to bid with probability one. This assumption requires conditions on C to ensure¹⁰:

$$\Pi_0(v) = E\left[0 - \theta^* Q(\theta^* + u) - (1 - \theta^*)B + C | v = 0\right] \ge 0$$

In a second stage, assume that the low type is left out of the market for corporate control. This may happen because of two reasons: if private bene ts are sufficiently low it is possible that for any possible bid price, low type s pro ts are negative; additionally, if the market s perception regarding the probability of a takeover is re-ected in the stock price prior to the offer, then it is likely that the price jumps so as to make the bid not pro-table for the low type. The last situation is illustrated by Schwert (1996), who describes cases in which takeover rumors and consequent price runups disincentive possible battles for control.

Under this approach, we facilitate the comparison of situations in which probabilities of control contest are different, and will be able to draw conclusions concerning the effect of those different probabilities on the takeover outcome.

3.1 The benchmark: when the low type is a potential bidder

Assume $C \ge E[\tilde{v}]$. When this is the case, the bid is protable for the low type and the equilibrium strategies involve the complete initial set of types.

A rigorous characterization of all equilibria is presented in detail in Proposition 2. To set aside technical difficulties, let us clarify rst such a solution. Toehold acquisition is protable for a potential bidder because she will be able to acquire a portion of the target rm at a cheap price (that is, lower than the price to be paid to complete the transaction). But the downside is that, if by disclosing her pre-announcement trade, she reveals to the market the value of the target rm under her control, then toehold trading will also be costly, especially for high-valuation bidders. This is because target shareholders will not accept a bid below the expected value of the rm if the takeover succeeds. Therefore high valuation bidders are not willing to signal their types to the market with the toeholds they acquire, because this makes the bid price higher.

¹⁰ The protes for the zero-type of doing nothing (not trading and not bidding) are obviously zero.

Since the toehold provides no new information to the market, in equilibrium, market beliefs about the bidder s quality are not updated after the toehold is acquired (and stock price is observed). The bid price is therefore independent from the toehold size. The only effect of the toehold is an increase in the stock price prior to the tender offer (run-up), which makes bid premium lower.

Hence, Proposition 2 shows that when a takeover is sure to happen, bidders are indifferent regarding their initial stakes in the target rm.

Proposition 3 If $C > E[\tilde{v}]$ then there exist an in nite number of Nashequilibria $\theta^* = \theta, \ \theta \in (0, \overline{\theta})$, and such that

$$B^* = Q^*(\theta^* + u) = E\left[\widetilde{v}\right]$$

where

$$\mu(v | \theta) = \begin{cases} p_h & \text{for } v = v_h \\ 1 - p_h - p_l & \text{for } v = \overline{v} \\ p_l & \text{for } v = 0 \end{cases} \quad \forall \theta \in (0, \overline{\theta})$$

are shareholders beliefs in equilibrium.

Extant literature on toeholds motivates the fact that most bidders do not trade prior to the tender offer using signalling arguments, considerations regarding the number of bidders or characteristics of the bid itself. We show here that when stock price reaction incorporates all the available information about the probability and outcome of a future acquisition, bidders pre-announcement strategy is irrelevant since they are indifferent between making open market purchases and allowing target shareholders to tender their shares. Moreover, toehold size is unrelated to market characteristics and, in particular, to the volume of noise trading. Note here a subtlety: it is crucial for this result the assumption that the potential bidder is bidding with probability one.

Figures 2 and 3 illustrate the price effects of the toehold decision for the intermediate type only. Toehold does not affect bid price when the probability of a tender offer is one and the result sheds some light on the divergent results in empirical research by Walkling (1995), Betton and Eckbo (1997), Bradley, Desai and Kim (1988), Mikkelson and Ruback (1985) and Asquith and Kieschnik (1996)¹¹. The at relationship takeover premium-toehold size is as well consistent with the theoretical results by Burkhart, Gromb and Panunzi (1995).

¹¹Walkling (1985) nds that the toehold increases the probability of takeover success and thus the premium. Betton and Eckbo (1994) nd that toeholds, after controlling for the number of bids and target management response, lowers he initial offer premium. Bradlei, Desai and Kim (1988) conclude that the relation between takeover premium and toehold is positive. The study by Mikkelson and Ruback (1985) obtains the some result. Asquit and Kieschnik (1996) obtain a positive correlation toehold-takeover premium only signi cant at the 93% level.

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[INSERT FIGURE 2]
[INSERT FIGURE 3]
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Finally, we show that overvalued bidders (those that increase target rm s value to a level lower than the one expected by the market) display declining stock price patterns after takeover completion. Rau and Vermaelen (1996) have shown that glamour bidders underperform with respect to the market in the long run. Our results are in line with such an evidence. On the other hand, undervalued bidders bene t from the market misperception about their quality, making pro ts $v - E[\tilde{v}] + C$.

3.2 Non-bidder informed trader

Suppose now that C is sufficiently low to ensure that a low type bidder will never be willing to bid for the target company. This assumption is equivalent to considering an informed insider who knows with certainty that no bid is going to take place and is not willing to trade in the rm s shares because market expectations will induce an arti cial price runup at t = 1. This is a situation à la Bagnoli and Lipman (1996), with the particular feature that the informed trader is not incumbent shareholder. Alternatively, this section applies to cases in which the market anticipates a battle for control only with a positive probability due to takeover rumors, mismanagement or intense activity in the market for corporate control. The latter represents the most common general situation in our framework.

Under the assumption¹² that $C < E[\tilde{v}]$ market maker perceives that, when trading takes place, the probability of a tender offer occuring at t = 2 is $1 - p_l$. Now the bidder s average quality is $\frac{E[\tilde{v}]}{1-p_l} > E[\tilde{v}]$ and, at the trading stage, market maker is taking into consideration the non-bidder trader strategy. In this setup \overline{v} is always lower than the market s expected type, and the optimum bid price may make a \overline{v} -type bidder pay for the target company more than her true valuation. Thus we must have additional constraints on C to ensure the pro tability of the bid for the \overline{v} -type.

In Proposition 3 it turns out that the solution for the bidding subgame is a pooling equilibrium, being the optimal toehold size dependent on the volume of noise trade, and the probability that bidding is pro-table.

Proposition 4 If C, private bene ts of control, satisfy

then the op

$$\overline{C} \leq C < E[\tilde{v}]$$
timal toehold is $\theta^* = \frac{1+p_l(2\sigma-1)}{(1+p_l)\overline{\theta}}$, for $v = v_h$, \overline{v} , where
$$(3)$$

 $^{^{12}}$ Given that the zero-type will be willing to bid as long as her pro ts are non-negative, ranges for C in which both bidding and abstaining from trading are possible must be ruled out. We further assume that, being C common knowledge ex ante, it is as well common knowledge that this party will never trade in the company s stock.

$$\overline{C} = (1 - \theta^*) \frac{E[\widetilde{v}]}{1 - p_l} + \theta^* \frac{(2\sigma - \theta^*)E[\widetilde{v}] + \frac{E[v]}{1 - p_l}\theta^*}{2\sigma} - \overline{v}$$

Additionally, the equilibrium stock price is:

$$Q(y) = \begin{cases} 0 & -\sigma \le \theta + u < -\sigma + \theta^* \\ E[\widetilde{v}] & -\sigma + \theta^* \le \theta + u < \sigma \\ \frac{E[\widetilde{v}]}{1 - p_l} & \sigma \le \theta + u < \sigma + \theta^* \end{cases}$$

and the nal bid price:

$$B = \frac{E[\widetilde{v}]}{1 - p_l}$$

Therefore, there exist a range of values for C such that the bidder will purchase a positive toehold. The intuition is as follows: now private bene ts of control are not so high, so informed traders bene t from trading at t = 1 although they reveal their willingness to bid. Bidders pay for the company s stock a lower price ($E[\tilde{v}]$) than market s expectations ($\frac{E[\tilde{v}]}{1-p_l}$).

Market reaction to informed trade is, not surprisingly, the same as in the previous situation with three potential types. However, a probability of takeovers less than one makes bid price and stock price different. The nal price effect can be decomposed into two components:

$$R = Q^*(y)$$

that represents the price runup prior to the tender offer, and where $y = \theta + u$. Moreover:

$$M = \frac{E[\tilde{v}]}{1 - p_l} - Q^*(y)$$

markup price that isolates the effect of the bid announcement on the stock price.

Both components depend on the probability of a takeover to happen, the market noise parameter and the bidder s quality. Those effects are illustrated in the next Corollary.

Corollary 5 The expected price runup is decreasing in σ Price markup is increasing in σ The intuition for this result is the same as in Kyle (1985) and Kyle and Vila (1991): the effect of informed trading on prices is lower as the amount of noise trade increases. Bidders are able to hide bid orders in a liquid market. In the other hand, the effect of $1 - p_l$ (probability of takeover) on price is twofold: a higher probability of acquisition directly increases pre-announcement stock price, thus making the bid more expensive. But, and following the same intuition as in Proposition 2, a higher probability of a battle for control reduces the costs associated with toehold acquisition. That is so because when the market perceives that the tender offer is imminent, stock price will adjust so as to equal the expected rm value once the company is acquired. In the limit, as we have seen, bidders are indifferent with respect to the toeholds they acquire. However, our model setup is such that $1 - p_l$ also determines the average bidder quality. Therefore, even if the toehold size increases with $1 - p_l$, we need to disentangle the effect of an increase in the bidder s quality and the direct increase in the likelihook of a contest for control.

Corollary 6 The toehold is higher the lower the probability of a takeover.

Why could that be? Because as the takeover becomes imminent, any abnormal increase in trading volume is identified by the market as takeover oriented, and thus it is very difficult for potential acquirors to hide open market trades, even when the market is liquid enough. Therefore the relationship between toehold size and probability of an acquisition is negative.

Price effects arising from the equilibrium in Proposition 3 are represented in Figure 4, both under low and high noise trade, and assuming $\overline{v} > E[\tilde{v}]$ (this assumption is not relevant for our purposes). To hold trading is pro-table and drives up the stock price.

[INSERT FIGURE 4]

The model accounts for the empirically observed price runups during the tender offer process. We showed that, when the event of a takeover is sure to happen, there is not markup pricing and correlation between runup and takeover premium is one. In the present situation, we nd that the bid price is given and independent of the bidder s strategy. Markup and runup are substitutes depending on σ and p_l . Jarrell and Poulsen (1989) offer empirical evidence of the former; Schwert (1996) nds support for the latter.

Finally, when the probability of a tender offer is not one, we obtain a negative relationship takeover premium-toehold size. As initial trade increases, price runup and nal bid price remain unchanged. The only effect of the toehold is to reduce the gap between bid price and stock price prior to announcement. Toehold trading is bene cial for potential acquirors because of the possibility of the bidder to conceal her purchases of stock due to the existence of noise traders in the market. Since there is a positive probability that the target company is not acquired, stock is cheaper at the trading stage than it is when the bid is launched. The ability of potential acquirors to deal secretly in the target s stock increases with the level of noise in the market. The next result illustrates such intuition.

Corollary 7 Bidder s pro ts increase as noise trading increases.

Therefore, as long as regulation prevents potential acquirors to accumulate shares bought open market, target shareholders are better off. The latter result predicts that more liquid stocks (markets) should display more severe limitations to block acquisitions.

4 The evidence

4.1 Introduction

In this section we empirically analyze the main implications of our model. Propositions 2 and 3 show that the market perception concerning a raider s quality explains the observed cross-sectional differences in toehold acquisition. Additionally, the theoretical model predicts that stock price prior to announcement will rise not only as a consequence of informed trading, but also as the tender offer becomes more likely. In this setup, the toehold decision is not information-revealing, and we will not observe any positive correlation toehold size-bidder quality.

To be more exhaustive, the empirical implications that result from previous sections include:

1. The probability of being a takeover target is increasing in the potential private bene ts that accrue to the acquiror when the target is under her control. For values of C lower than \overline{C} , only for the v_h valuation bidder will the acquisition be protable. When $\overline{C} \leq C < E[\tilde{v}]$, probability of being a takeover target increases up to $1 - p_l$ and in fact the tender offer is consummated. Finally, in Proposition 2 we show that a bid will occur for sure when the bene ts of control $C \geq E[v]$.

2. Bidder s pro ts decrease as market expectations regarding the quality of potential acquirors increase. In our model, the toehold is costly because it increases the pre-announcement stock price, and then it pays more for the lowest types to hold it.

3. Toehold size and probability of being taken over are negatively related. Proposition 3 shows that, as the offer becomes more likely, potential acquirors will tend to reduce their open market purchases. In the limit, when stock price prior to the acquisition announcement fully incorporates the increase in rm s value, acquirors will be indifferent between buying a toehold or not.

4. Toehold size and market liquidity (noise) are positively related, the reason being that as the noise trading increases, it is more difficult for the market maker to ascertain whether a battle for control is taking place, and the observation of large volumes will be perceived as indication of uninformed trading.

Thus, the existence of a large blockholder or managerial ownership in the target rm prevents potential bidders from purchasing toeholds. Stulz (1988) obtains the same result using different arguments. In his model, the higher the managerial stake in the rm, the higher the takeover premium, since the higher is the proportion of outstanding shares to be acquired in order to gain control. Consequently, the lower is the probability of takeover. In our framework, the higher the managerial ownership, the *lower* the uninformed trade and hence the more difficult is for the bidder to hide her intentions.

5. There is a positive relationship between the ratio markup-runup and toehold size, as shown in Figure 3. Price dynamics prior to the tender offer are determined by factors such as market liquidity, perceived probability of takeover and regulation. However, cross-sectionally the relationship runup-markup is not monotone.

6. Negative relationship takeover premium-toehold size, where the premium is measured as the difference between the bid price and stock price right before the offer announcement. Intuitively, the bidder will always pay for the target rm the market s inference about her efficiency gain, so a higher toehold, which drives pre-announcement stock price up, only reduces the gap between the nal price and the stock price-at-announcement.

4.2 Related literature

We provide an explanation for the empirical observation that bidders sometimes prefer not to trade in the target $\,$ rm s stock. Jarrell and Poulsen show that 40%of the bidders in their sample (172 tender offers in the period 1981-1984) had no stake in the target rm prior to a tender offer. Betton and Eckbo (1997) (who use 14d lings from January 1971 to December 1990) report that 641 rms out of 1353 (47%) had zero toehold, while 864 rms (64%) had stakes between zero and 10%. The results in Bradley, Desai and Kim (1988) are more conclusive. In their sample of successful tender offer contests from the period 1963-1984 they report that, out of the 236 acquiring rms, 155 (65.57%) held no target shares prior to the offer. In the paper by Jennings and Mazzeo (1993), both consummated and non consummated acquisition proposals are studied (68% consummated, 32% cancelled). In 84.38% of the cases (with a sample of 647 observations) no ownership in the target was reported prior to the offer. Finally, in a recent paper by Asquith and Kieschnick (1996) it is shown that 28.85% of the companies bid for the target without prior stake (their sample consists of 609 tender offers led on 14d forms in 1980-1986).

The price effect of the toehold, in particular the price runup prior to the tender offer announcement, has not been considered by the theoretical literature. Nevertheless, price dynamics during takeover contests display an initial increase that incorporates the market information regarding the bidder s quality as well as the impact of informed block trades. When designing her optimal strategy, the bidder takes into account the nal price that will result after all open market purchases are realized. This is the price that determines the bid premium and

thus the optimal size of the toehold. Barclay and Warner (1993) show that about half of the total stock price runup associated with a takeover occurs before the announcement. This percentage is 26% in Gupta and Misra (1989) (18% when there is no news about the target), 56.8% in Schwert (1996), and 43.3% in Keown and Pinkerton (1981). These studies consider the cumulative effect of uninformed and informed trading, insider trading and toehold acquisition and the effect of rumours on the stock price. Choi (1991) tries to isolate the effect of toehold trading using a sample of 13d lings in the period 1982-1985, accounting for a positive valuation effect. Eysell (1990) quanti es it calculating abnormal returns on the day of 13d ling¹³ announcement, nding a signi cant 4.79% excess return. With a different sample, Mikkelson and Ruback (1985) nd a 3.40% abnormal return.

Meulbroek (1992) has used illegal insider trading detected by the SEC to measure the informed trade effect (different from toehold acquisition) on excess returns. She concludes that 43% of the runup occurs on insider trading days. This result seems to indicate that bidder activity is only part of the cause of the price behaviour on the days prior to a tender offer. However, as Jarrell and Poulsen (1989) showed in their study, several other factors affect pre-bid runups. Among those (legal) factors are insider trading prosecution, toehold size (not necessarily observable ex ante), whether the bid is hostile or friendly, and street talk rumours. They measure the toehold size using 14d lings and they consider that the toehold is an indicator of observable acquisitions, thus disregarding purchases below 5% of a company stock (in the U.S.). They nd a negative relationship between toehold and takeover premium and conclude that after controlling for observable variables, insider trading has no explanatory power. Additionally, both authors report a substitution effect between price runup and bid markup (the difference between the bid price and the stock price at the announcement day). Some other papers either support this evidence (Gupta and Misra (1989)) or nd that insider trading is indeed relevant (Pound and Zeckhauser (1990), Eysell and Arshadi (1993), although the latter eliminate from the sample an important source of block trading such as 13d lings).

4.3 Sample Description

Our initial sample is obtained from Security Data Corporation (SDC) and consists of all the hostile tender offer announcements that took place in the U.S. and the UK in the period January 1980-December 1995. Friendly deals are excluded because in those deals the strategic role of the toehold is minimal. We consider U.S. and UK offers because regulation is an important determinant of our model outcome. The initial sample size is 434; out of 434 offers, 63 deals are eliminated from the sample since they referred to competing bids after some initial attempt. For econometric analysis, another 44 deals were dropped when accounting data or key deal characteristics were not available.

 $^{^{-13}}$ Note that this implies that trades under 5% are not considered even if they are not to ehold acquisitions.

Although SDC provides most of the bid parameters, we completed the sample with information from the Wall Street Journal and the Financial Times. Additionally, all accounting variables were obtained from Compustat for U.S. rms, Amadeus and Datastream for UK rms. Security returns, volume data and market indexes are from the Center for Research in Security Prices (CRSP) for U.S. rms, and Datastream for UK rms. Where necessary, all variables were calculated in U.S. dollars using exchange rates provided by Datastream.

The nal sample contains 327 hostile tender offers, and US deals account for 70.45% of the sample.

[INSERT TABLE I]

Table I reports the main characteristics of our sample in terms of outcome and structure of the deal, for those tender offers in which that information was available. Multiple bidders situations occur in 33.21% of the cases, while only 8.58% of the offers are launched in two tiers. In 81% of the cases the bidder is aiming to acquire 100% of the target s stock. Around 49.26% of the offers are successful, and in only 27.24% of the hostile attempts does the target remain independent.

In Table II we analyze the toehold acquisition strategy for bidders in both countries. The results are similar to those in Jarrell and Poulsen (1989), Betton and Eckbo (1997) and Asquith and Kieshchnik (1996). In our sample, 32.1% of bidders do not trade prior to announcement, and toehold size is between 0 and 5% in 48.9% of the cases. In only 3% of the deals is the bidder s toehold higher than 50%. By country, median toehold size is the smallest in the U.S. (4.10%) and well under the legal limit except for the U.K., where the 5% limit triggers disclosure but the median toehold is 10%). Table 2 also highlights the importance of timing in stock purchases. In fact only 50 bidders purchase stock in the last six months prior to the public announcement. The increase in the median in this period is 0% for the overall sample, 0.7% for the U.S. offers, and 5% in the U.K. deals.

[INSERT TABLE II]

4.4 Measures of price dynamics

The empirical literature on takeovers has not come up with a generally accepted solution on how to measure movements in stock prices before and after takeover announcements, and in particular on the denitions of price runup, markup and takeover premium. Betton and Eckbo (1997) dene the premium as the increase in the bid price with respect to the stock price 60 days prior to announcement. Schwert (1996) calculates price runup as the cumulative abnormal return from t = -42 to t = -1 and price markup as the cumulative abnormal return from t = 0 to t = +126 or the delisting date, whichever comes rst. The total premium is then the sum of both components. The problem with the mentioned

papers lies with the difficulties of estimating real premia¹⁴, that is, the difference between bid price and stock price right before announcement. To address this issue, we measure the takeover premium as the percentage increase in the bid price with respect to the share price one day prior to the announcement date, and:

$$Runup_i = \sum_{t=-120}^{-1} \epsilon_{it}$$
$$Markup_i = \sum_{t=-1}^{+1} \epsilon_{it}$$

where ϵ_{it} are the residuals from the market model regressions in the estimation window t = -420, t = -120. We choose t = -120 as the starting date for the runup calculations because it corresponds roughly to the period of six months (20 trading days per month), for which we know how much bidders trade in the targets stock. As a complementary measure, we calculate as well the cumulative abnormal return from t = +1 to t = +100.

Market model regressions are performed in the following way:

$$R_{ijt} = \alpha_i + \beta_i R_{mjt} + \epsilon_{it} \qquad t = -420, \dots, -120$$

where R_{ijt} refers to the stock return for target rm *i* in country *j*, and R_{mjt} is the market return¹⁵ in country *j*.

[INSERT FIGURE 5]

Figure 5 illustrates the results for the total sample of rms and by country. The highest price reaction occurs in the U.S., and in general there is no signi cant abnormal return in the period t = -120, ..., -60. On average, price runup is 10.03%, and the stock price abnormally increases 7.18% at announcement date. In table III, we split the sample into successful offers, unsuccessful offers, and offers in which the target is sold to a third party (another bidder or a white knight). Price runup is higher for unsuccessful than successful offers (the difference is 9.80% and signi cant), supporting the intuition in Schwert (1996) that some deals fail because rumours or insider trading drive the stock price up and make the offer very expensive for the bidder. Table III also illustrates an interesting difference in our sample between the U.S. and the U.K.: a higher price runup and a lower abnormal return at announcement date in the former compared to the latter indicates that information leakage is more likely in the U.S. than in the U.K. In the U.K., tender offer announcements are more surprising and the stock price does not react in the days before announcement.

 $^{^{14}}$ Wall Street Journal and Financial Times articles refer to *premium* as the difference between bid price and stock price several days (one week in general) before announcement.

¹⁵The continuously compounded return to the CRSP value-weighted portfolio of NYSEand AMEX-listed stock is used for U.S. rms. For the U.K. targets, we use FTSE 100 index.

[INSERT TABLE III] [INSERT FIGURES 6.1 AND 6.2]

Figures 6.1 and 6.2 depict the results in Table III. First, we analyze market reaction to toehold acquisition that is disclosed to the market. To do that, we compare for every deal the toehold size with either the domestic legal limit that triggers information disclosure (e.g. a 13d ling in the U.S.). In 50.16% of the cases, the threshold is surpassed. Interestingly, the price runup difference is 2.89%, but not signi cantly different from zero (t-statistic equals 0.752) with respect to the group in which the limit is not reached. The result is similar for U.S. deals only, with a 3.25% difference (t-statistic 0.672). It turns out to be clear evidence that toehold announcements do not reveal the bidder s quality, but merely an increase in the probability of a tender offer. We nd evidence to support this hypothesis by looking at the market reaction to share purchases by the toeholder. Cumulative abnormal returns for U.S. deals when the bidder trades in the target s stock are signically different from those deals in which she does not (5% difference with a t-statistic 2.941). The result reveals that even in situations in which informed trade is small (i.e. the threshold is not surpassed) the market (maker) reckons relevant trades as takeover-oriented. The reason why a bidder should not be interested in purchasing *cheap* stock before announcing a battle for control is that it may drive the stock price up, making the bid more expensive (Schwert 1996) or reducing the takeover premium (as our model predicts) thus demotivating insiders to tender their shares.

4.5 Econometric model

Our model s implications regarding price dynamics and toehold decisions involve several econometric problems that have to be addressed. First, although the model predicts that the causality toehold acquisition-price runup is onedirectional (i.e. toehold trade reveals informed trade and thus the price increases), a bad speci cation may produce spurious results. In particular, this may happen in a reduced-form regression of toehold size on stock price runup.

Second, in our model the probability of a takeover is the probability that the bidder s expected protes are positive. Empirically, estimating such a probability is an arduous task, since our sample contains only probability-one events. We deal with this difficulty by constructing a sample of matching rms that are not takeover targets, and estimating the takeover probability as a function of individual characteristics.

Third, a speci cation error arises from the sample selection. Note that we do not observe the actual strategy of potential entrants that – nally do not become takeover bidders. Additionally, the probability of becoming a target is, to the light of our theoretical results, an important determinant of toehold size and stock price reaction prior to a tender offer announcement. This paper follows the estimation method – rst formulated by Heckman (1979), a bivariate generalization of a tobit model. Such model allows us to estimate a behavioural function for toehold size and pre-announcement stock price that is free of selection bias. To obtain consistent estimations, we specify a selection equation in which the endogenous variable is the probability of a rm becoming a takeover target.

Let I_i , i = 1, ..., N be an indicator function that takes value 1 when rm i is a takeover target, zero otherwise. Without a loss of generality, we assume $I_i = 1$ for $i = 1, ..., N_1$, where $N_1 < N$. Let us de ne u_{Ti} as the utility for the rival management derived from taking over rm i. Factors such as private bene ts or prestige affect positively u_{Ti} . In a similar way, let u_{Ni} be the utility derived from avoiding any battle for control. If the rival management is also stakeholder, the reduction in the value of the stake affects negatively u_{Ni} . Let s assume in general that:

$$u_{Ti} = Y_i \beta_T + e_{Ti}$$

$$u_{Ni} = Y_i \beta_N + e_{Ni}$$
(4)

where e_{Ti} , e_{Ni} are normally distributed random disturbances, with zero mean, respective variances σ_T^2 , σ_N^2 , and covariance σ_{NT}^2 . Y_i is a vector of rm *i* characteristics and β_T , β_N are vectors of parameters. Hence the probability that rm *i* is taken over is, from (4):

$$\begin{aligned} \Pr_{i}[Takeover] &= & \Pr[u_{Ti} > u_{Ni}] = \\ &= & \Pr[Y_{i}\beta_{T} + e_{Ti} > Y_{i}\beta_{N} + e_{Ni}] = \\ &= & \Pr[e_{Ni} - e_{Ti} < Y_{i}(\beta_{T} - \beta_{N})] = \\ &= & \Pr\left[\frac{e_{Ni} - e_{Ti}}{\sqrt{\sigma_{T}^{2} + \sigma_{N}^{2} - 2\sigma_{NT}^{2}}} < \frac{Y_{i}(\beta_{T} - \beta_{N})}{\sqrt{\sigma_{T}^{2} + \sigma_{N}^{2} - 2\sigma_{NT}^{2}}}\right] = \\ &= & \Phi\left[\frac{Y_{i}(\beta_{T} - \beta_{N})}{\sqrt{\sigma_{T}^{2} + \sigma_{N}^{2} - 2\sigma_{NT}^{2}}}\right]\end{aligned}$$

where $\Phi(.)$ is the distribution function of a standard normal. Rede ning $\frac{\beta_T - \beta_N}{\sqrt{\sigma_T^2 + \sigma_N^2 - 2\sigma_{NT}^2}} = \beta$, yields:

$$\Pr_i[Takeover] = \Phi[Y_i\beta] \qquad \qquad \forall i = 1, ..., N$$

Therefore,

$$I_i = \Phi \left[Y_i \beta \right] + \pi_i \qquad \qquad \forall i = 1, ..., N \tag{5}$$

where $\pi_i, \forall i = 1, ..., N$, is a random error. Under the assumption $Var(\pi_i | Y_i) = Y_i\beta(1 - Y_i\beta) = \sigma_{\pi}$, the model in (5) can be estimated with a probit regression.

The determinants of toehold size and price runup are modelled as follows:

$$W_i = \Pi' X_i + \epsilon_i \qquad \forall i = 1, ..., N \tag{6}$$

where

$$\begin{split} W_i &= \begin{bmatrix} Toehold_i \\ Runup_i \end{bmatrix}, \\ X'_i &= \begin{bmatrix} 1 & Toehold_i & Runup_i & Liquidity_i & Rumors_i \end{bmatrix} \\ \Pi &= \begin{bmatrix} \alpha & \gamma \\ 0 & \delta_1 \\ \beta_1 & 0 \\ \beta_2 & \delta_2 \\ 0 & \delta_3 \end{bmatrix}, \quad \epsilon_i = \begin{bmatrix} \varepsilon_i \\ \nu_i \end{bmatrix} \end{split}$$

 $\forall i = 1, ..., N$, where $\Sigma = Var[\varepsilon \ \nu]$, and $\sigma_{\pi\varepsilon} = Cov[\pi_i, \varepsilon_i], \ \sigma_{\pi\nu} = Cov[\pi_i, \nu_i].$

The causality problem is explicitly taken into account: we expect β_1 to be insigni cantly different from zero, and δ_1 to be signi cantly positive. The hypothesis that market liquidity increases toehold size is explicitly tested. Finally, Rumors is a control variable to test the effect of press news and rumored acquisitions on initial stock price increases prior to tender offer announcements.

One estimation problem stems from the fact that we only observe N_1 rms. From Heckman (1979), (6) is equivalent to estimating:

$$W_{i} = \Pi' X_{i} + \lambda_{i} + w_{i} \qquad \forall i = 1, ..., N_{1} \qquad (7)$$
$$= \begin{pmatrix} \frac{\sigma_{\pi \varepsilon}}{\sigma_{\pi}} \\ \frac{\sigma_{\pi \nu}}{\sigma_{\pi \nu}} \end{pmatrix}, \lambda_{i} = \frac{\phi \begin{bmatrix} Y_{i\beta} \\ \sigma_{\pi} \end{bmatrix}}{\Phi \begin{bmatrix} Y_{i\beta} \end{bmatrix}}$$

being ϕ the standard normal density. The term λ_i will be referred to as hazard rate, and equals the inverse of the Mills ratio. However, since λ_i is unknown, we can obtain consistent estimates for Π and in (7) by estimating the parameters of the probability that $I_i > 0$ (i.e., $\frac{\beta}{\sigma_{\pi}}$). From this estimator, λ_i can be consistently estimated as well, and we can use $\hat{\lambda}_i$ as a regressor in equation (7) instead of λ_i .

The econometric model is completed with the following assumptions:

$$E[Z_i w_i] = 0 \tag{8}$$

 $\forall i = 1, ..., N_1$, where

where

$$Z_i = \{Liquidity_i, Rumors, \widehat{\lambda}_i\}$$

is the set of instruments.

The model in (6), (7) and (8) could easily be estimated using 3SLS were the random vectors ε_i , ν_i homoskedastic. However, by using hazard rates as explanatory variables in (7), and because of the use of cross-sectional data from different countries, residuals become heteroskedastic (see Heckman (1979). Therefore we will calculate the GMM estimator for Π and , where the orthogonality conditions are:

$$E[\Psi_i(X_i, W_i, \Pi, \)] = E[Z_i \ w_i] = 0 \tag{9}$$

where denotes Kronecker product. GMM estimators solve:

$$\left(\widehat{\Pi},\widehat{}\right) \in \arg\min_{c,p} \left(\sum_{i=1}^{N_1} \frac{1}{N_1} \Psi_i(X_i, W_i, c, p)\right)' A_N\left(\sum_{i=1}^{N_1} \frac{1}{N_1} \Psi_i(X_i, W_i, c, p)\right)$$

where:

$$A_N = \left(\frac{1}{N_1} \sum_{i=1}^{N_1} Z_i' \widehat{\Sigma} Z_i\right)^{-1}$$

and $\widehat{\Sigma} = \frac{1}{N_1} \sum_{i=1}^{N_1} \widehat{w}'_i \widehat{w}_i$

The initial $\widehat{\Sigma}$ matrix is the variance-covariance matrix of the estimated residuals from a two-stages least squares regression applied to (6) and (7):

$$\widehat{w}_i = W_i - \widehat{\Pi}'_{2SLS} X_i - \widehat{\ }'_{2SLS} \widehat{\lambda}_i$$

The GMM estimators are consistent using this procedure.

4.6 Results

4.6.1 The probability of takeover.

The main implication of the theoretical section related to the probability of a takeover states that, ceteris paribus, the more likely a company is to be taken over the higher the potential bene ts of control that accrue to the successful bidder. To test this hypothesis a sample of matching rms have been constructed. For every rm in the basic sample, we selected another rm when the following criteria were satis ed: (i) the nation in which the matching rm primary business or division is located at the time of the transaction is the same as the original rm, (ii) both rms have the same SIC code, (iii) the matching rm was not a takeover target in the period 1980-1995. When a matching company could not be selected within the same four SIC-code digits, only three digits were considered. Matching rms were identi ed from Compustat for US targets., Amadeus and Datastream for UK targets.

The total sample contains 638 rms, half of them takeover targets, that is, N = 638 and $N_1 = 319$. For all the rms we proxy private bene ts of control by the dollar value of total intangible assets. Intangible assets comprise the value of a trademark, the value of patents, or the value of customer recognition. They have no physical existence but can be very valuable. We assume that a rm with a high proportion of intangible assets is more likely to have management appropriating private bene ts (Rajan and Zingales (1995) also point out the positive relationship between the fraction of a rm s intangible assets and the risk of lenders suffering agency costs of debt).

Note that country differences, industry characteristics or size considerations are controlled for in our arti cial sample of target-non target rms^{16} . Therefore, in equation (5), the set Y_i contains a proxy for bene ts of control, industry, country and size characteristics of rm i. Because of the way in which the articial sample has been constructed, only private bene ts of control will explain the probability of takeover in the model.

[INSERT TABLE IV]

Table IV displays the results of the estimation. As predicted, intangible assets (as a proportion of total assets) positively affect the probability of a takeover. The results are also signi cant in the U.S. and U.K as separate sub-sample, as well as for different size quartiles.

The variable λ_i , which is used as an instrument in the econometric model in (7) and (8) is estimated nally as:

$$\widehat{\lambda_i} = \frac{\phi\left[\left(\widehat{\frac{\beta}{\sigma_{\pi}}}\right)Y_i\right]}{\Phi\left[\left(\widehat{\frac{\beta}{\sigma_{\pi}}}\right)Y_i\right]}$$

4.6.2 Joint determination of toehold size and price runup.

Table V presents the results from the estimation of the general model. For the overall sample, it is important to note that the sample selection bias affects the estimates of the toehold size and stock price runup equation to a great extent. In particular, the table shows a negative relationship between toehold size and probability of being acquired. This implies that a higher perceived probability of becoming a target makes potential bidders reduce their open market purchases, the rationale for it being that as probability of takeover increases, prosts from toehold acquisition diminish because of a greater price reaction due to informed

¹⁶Cosslett (1981) and Manski and McFadden (1981) have shown that, under choice-based sampling, the standard Maximum Likelihood estimator in a Probit regression may be inefficient. In particular, Cosslett (1981) prove that the choice-based sampling maximum likelihood estimator (CBMLE) is consistent and asymptotically normal. This is the estimator we use in this paper. Manski and Lerman (1977) propose a more efficient estimator that assigns every term in the likelihood function with a weight that depends on the probability of the event in the whole population (Weighted Exogenous Sampling MLE or WESML). When applied the WESML to our sample, it turns out that the coefficients become insigni cant, the reason being that the true probability of a takeover happening (calculated as the average number of hostile takeovers per year divided by the total number of rms in the Compustat les for US rms and in Datastream for UK rms) is 0.008066 for the US and 0.006012 for the UK. Amemiya (1985) states that choice-based sampling is useful in a situation where random sampling would nd only a very small number of people choosing a particular alternative (sic).

trade. Additionally, none of the coefficients in the econometric model is significant. The reason, as it will become clearer below, is the difference in toehold acquisition between US and UK bidders.

The estimates for the US corroborate the initial hypothesis that a higher toehold directly causes a higher stock price runup, but not the oppossite. As predicted by the model, prices react less when stock is liquid enough, in line with Kyle (1985). The coefficient for the Toehold Size in the Stock Price Runup equation is 1.947 (p-value 0.01%). As potential rivals are able to hide their trades better in a more liquid stock, the market maker more likely recognizes big trades as informed. Corollary 5 is thus supported by the data. By size and focusing just on US deals, the sample selection bias is important for big rms, and it turns out that the relationship between probability of an acquisition and toehold size is negative. Therefore, bidders will tend to accumulate initial stake when the market perceives that the probability of an acquisition is low. Takeover Rumors are relevant for bigger rms, and they have a positive and signi cant effect on stock prices prior to the public announcement. In general the low power of the tests derives from the small number of observations when rms are classi ed by size.

For deals in the UK, we nd that the causality toehold size-stock price runup is bidirectional and that UK bidders tend to acquire toeholds when market price rises. The mandatory bid rule (that states that when a potential bidder acquires shares carrying 30 percent or more of the voting rights of a company, she must make a cash offer, or a share offer with a cash alternative, to all other shareholders at the highest price paid in the previous twelve months¹⁷) induces UK acquirors to accumulate shares even when they become expensive. Stock price reaction is also higher for more liquid stocks, possibly because those are the ones subject to a more intense bidder trading.

[INSERT TABLE V]

With respect to hazard rate coefficients, the estimation for $\frac{\sigma_{\pi \varepsilon}}{\sigma_{\pi}}$ is signi-cantly negative for the smallest targets in the UK subsample (quartiles 1 and 2).

4.6.3 The determinants of the premium

The next step consists of reconsidering the determinants of the takeover premium taking into account the model s premisses. we estimate a GLS regression of the takeover premium (the difference between the bid price and the stock price one day prior to announcement date) on toehold size and control variables. Takeover premium was only available for 216 rms in the sample. Control variables include stock liquidity and the hazard rate. Hazard rate is introduced here to avoid sample selection biases.

[INSERT TABLE VI]

¹⁷City Code, Rule 9.

The results are in Table VI, and are only signi cant for the U.S. The toehold size, as predicted, decreases signi cantly the nal premium. Stock liquidity increases the premium. Intuitively, there are two effects with opposite sign. On one hand, the higher the stock liquidity and the information leakage, the lower the pre-bid runup and thus the higher the premium. On the other hand, the higher the market reaction to announcement will be and thus the more difficult to convince insiders to tender. The former effect dominates in light of the estimates. Finally, the probability of being a target positively affects the premium, because of its positive effect on price markup.

4.6.4 The determinants of stock price dynamics.

Table VII displays a direct test of the theoretical results in subsection 3.2, where we asserted that markup pricing is decreasing in the toehold size because the bid price remains unchanged as toehold increases (or at least does not increase as toehold increases). The ratio runup/markup (note that we invert the relationship here) is regressed against toehold size, being the coefficient signi cantly positive. Schwert (1996) has found little evidence for a *substitution effect* between markup and runup. The argument made in this paper is, to the light of the last result, that for tender offers in which pre-announcement trade is considerable, such a substitution is more relevant¹⁸.

[INSERT TABLE VII]

5 Conclusion

This paper explores the reasons a potential bidder has to abstain from acquiring target rm s shares in the open market (toehold) before launching a bid. Following the empirical observation that toeholds are on average very low, our analysis suggests that, in some situations, toehold acquisition may drive up the target s stock price without affecting the nal bid price, thus making the tender offer unattractive for target shareholders. The decision of whether to acquire a toehold, and the effect of the toehold on stock price dynamics, are contingent upon shareholders beliefs concerning the bidder s quality and the level of noise trading in the market.

In the theoretical model two possible scenarios are considered. First, a potential bidder starts trading in the open market and has the intention of bidding for the whole company with probability one. In this case, market price prior to the bid announcement captures the whole effect of the takeover thread, and the toehold decision is irrelevant. Second, when the market perceives that a bid will happen with probability less than one, stock price will react only partially

¹⁸In fact, when Schwert (1996) accounts for (illegal) insider trading the estimates in the regression of premium against runup supports such a substitution effect. Although I do not assimilate toehold acquisition to illegal insider trading, the latter is a closer measure of informed trade.

according to incumbents expectations, and open market purchases will be low so as to allow acquirors to hide the level of their synergies. Stock price reaction depends on market characteristics and the regulatory environment.

The model has been tested from several perspectives after addressing some econometric issues. We employ a methodology broadly used in the economics eld to solve the selection bias that results from using nonrandomly selected samples. This is a common problem in empirical studies, and in particular in takeovers, where there is self selection by the individuals in the sample. The methodology in Heckman (1979) allows us to estimate a behavioural function for toehold size and pre-announcement stock price that is free of selection bias. To obtain consistent estimations, we specify a selection equation in which the endogenous variable is the probability of a rm becoming a takeover target. By so doing, we show the effect of the probability of an acquisition on price runup prior to tender offer announcements and on bidder s toehold.

The empirical implications of the model are confronted with the data. In particular, we show that toehold size is negatively related to the probability of becoming a target; that stock price run-up depends directly on the size of the acquiror s toehold; and that bid premium and toehold size are negatively related. Additionally, we furnish some evidence showing that price runup and market liquidity (noise) are negatively related.

The general conclusion is a broad support for the model and signi cant differences across countries. This raises the question of how market conditions, information disclosures and other domestic regulation affect the market for corporate control. Although it is beyond the scope of this paper, an analysis of those conditions would complement the one presented here.

The approach we take, unlike previous papers on this topic, has not focused on the bidding game after the offer announcement and does not consider the possibility of multiple bidders. Potential extensions include multiple informed traders, managerial ownership in the target rm and the role of information disclosures contained in the Williams Act. A dynamic analysis of the toehold acquisition strategy, and in particular, the process of information acquisition that follows stake purchases would complement the results presented here. Those are features that can be incorporated into the analysis and will be the object of our future research.

A Appendix

PROOF OF PROPOSITION 1

Let $\sigma_B \equiv \sigma(B, \tilde{v})$ and $\tau_T \equiv \tau(B, T)$ de ne the mixed strategies for b and s. Then, for $\sigma_B = 1$

$$U_b(B,\tau_T,\widetilde{v}) = \tau_T(\widetilde{v} - \theta Q - (1-\theta)B + C) + (1-\tau_T)(-\theta Q)$$
(10)

and, for $\sigma_B = 0$

$$U_b(\overline{B}, \tau_T, \widetilde{v}) = -\theta Q \tag{11}$$

(no take over) On the other hand, for $\tau_T=1$

$$U_s(\sigma_B, T) = \sigma_B \left[(1 - \theta) B \right]$$

and, for $\tau_T = 0$

$$U_s(\sigma_B, \overline{T}, \widetilde{v}) = \sigma_B \left[(1 - \theta) \, \widetilde{v} \right]$$

Note that the last expression results because the free rider expects to get the postbid rm value if she does not tender while the others do. Therefore, from (10) and (11):

$$U_b(\sigma_B, \tau_T, \widetilde{v}) = \sigma_B \left[\tau_T(\widetilde{v} - \theta Q - (1 - \theta)B + C) + (1 - \tau_T)(-\theta Q) \right] \\ + (1 - \sigma_B)(-\theta Q) \\ = \sigma_B \left[\tau_T \widetilde{v} - \theta Q - \tau_T (1 - \theta)B + \tau_T C \right] - (1 - \sigma_B)\theta Q \\ = \sigma_B \tau_T \left[\widetilde{v} - (1 - \theta)B + C \right] - \theta Q$$

and maximizing the last expression with respect to σ_B gives us:

$$\sigma_B^* = \begin{cases} 1 & \text{when } \widetilde{v} - (1-\theta)B + C \ge 0\\ 0 & \text{otherwise} \end{cases}$$

Then:

$$E[U_s(\sigma_B, \tau_T, \widetilde{v})] = \tau_T \sigma_B [(1-\theta) B] + (1-\tau_T) \sigma_B [(1-\theta) E_{\Phi}[\widetilde{v} | \widetilde{v} \ge (1-\theta) B - C]]$$

and shareholders pro ts maximization implies:

$$\tau_T = \begin{cases} 1 & \text{when } B \ge E_{\Phi}[\widetilde{v} | \widetilde{v} \ge (1-\theta)B - C] \\ 0 & \text{otherwise} \end{cases}$$
(12)

Bidder s prost s are maximized when (12) holds with equality

PROOF OF PROPOSITION 2

Let us de ne $\rho\overline{\theta}$, $\delta\overline{\theta}$, and $\tau\overline{\theta}$, $(\rho, \delta, \tau \in (0, 1))$ as the toehold size for 0, \overline{v} , and v_h synergy level bidders, respectively. Let us show rst that there does not exist a Nash-equilibrium in which $\rho \neq \tau$.

Profits for v_h -type from playing τ are:

$$v_h - \tau \overline{\theta} Q_\tau - (1 - \tau \overline{\theta}) v_h$$

where Q_{τ} is the stock price when an informed order of size τ is submitted, and where a bid price $B = v_h$ results because the toehold is a perfect signal of the bidder s quality. Equilibrium pro ts are always lower than pro ts from imitating the lowest type, $v_h - \delta \overline{\theta} Q_{\delta} - (1 - \delta \overline{\theta}) 0$, since $Q_{\tau} \leq v_h$.

Therefore we can limit ourselves to the following classes of equilibria:

1. $\delta > \tau = \rho$

In this case:

$$f(y) = \begin{cases} 0 & -\sigma \le y < -\sigma + \tau \overline{\theta} \\ \frac{p_h + p_l}{2\sigma} & -\sigma + \tau \overline{\theta} \le y < -\sigma + \delta \overline{\theta} \\ \frac{1}{2\sigma} & -\sigma + \delta \overline{\theta} \le y < \sigma + \tau \overline{\theta} \\ \frac{1 - p_h - p_l}{2\sigma} & \sigma + \tau \overline{\theta} \le y < \sigma + \delta \overline{\theta} \end{cases}$$
(13)

where $y = \theta + u$ Hence,

$$f(y|v=v_h) = f(y|v=0) = \begin{cases} 0 & -\sigma \le y < -\sigma + \tau\overline{\theta} \\ \frac{1}{2\sigma} & -\sigma + \tau\overline{\theta} \le y < -\sigma + \delta\overline{\theta} \\ \frac{1}{2\sigma} & -\sigma + \delta\overline{\theta} \le y < \sigma + \tau\overline{\theta} \\ 0 & \sigma + \tau\overline{\theta} \le y < \sigma + \delta\overline{\theta} \end{cases}$$

and

$$f(y | v = \overline{v}) = \begin{cases} 0 & -\sigma \le y < -\sigma + \tau \theta \\ 0 & -\sigma + \tau \overline{\theta} \le y < -\sigma + \delta \overline{\theta} \\ \frac{1}{2\sigma} & -\sigma + \delta \overline{\theta} \le y < \sigma + \tau \overline{\theta} \\ \frac{1}{2\sigma} & \sigma + \tau \overline{\theta} \le y < \sigma + \delta \overline{\theta} \end{cases}$$

and, using Bayes rule:

$$f(\overline{v}|y) = \begin{cases} 0 & -\sigma \leq y < -\sigma + \tau\overline{\theta} \\ 0 & -\sigma + \tau\overline{\theta} \leq y < -\sigma + \delta\overline{\theta} \\ 1 - p_h - p_l & -\sigma + \delta\overline{\theta} \leq y < \sigma + \tau\overline{\theta} \\ 1 & \sigma + \tau\overline{\theta} \leq y < \sigma + \delta\overline{\theta} \end{cases}$$

and analogous expressions are obtained for $v = v_h$ and v = 0. Finally, making Q(y) = E[v/y], results in:

$$Q^{*}(y) = \begin{cases} 0 & -\sigma \leq y < -\sigma + \tau \overline{\theta} \\ \overline{v} & -\sigma + \tau \overline{\theta} \leq y < -\sigma + \delta \overline{\theta} \\ E[\widetilde{v}] & -\sigma + \delta \overline{\theta} \leq y < \sigma + \tau \overline{\theta} \\ \frac{p_{h}v_{h}}{p_{h} + p_{l}} & \sigma + \tau \overline{\theta} \leq y < \sigma + \delta \overline{\theta} \end{cases}$$

Expected protes for the \overline{v} type will be $\overline{v} - \delta E[Q^*(y)|\delta] - (1 - \delta\overline{\theta})\overline{v}$, where:

$$E\left[Q^*(y)\,|\delta\right] = \frac{(\tau-\delta)\overline{\theta}\overline{v} + (2\sigma+\delta\overline{\theta}-\tau\overline{\theta})E[\widetilde{v}]}{2\sigma}$$

Similarly, profits for the v_h type are $v_h - \tau \overline{\theta} E[Q^*(y) | \tau] - (1 - \tau \overline{\theta})v_h$, where

$$E\left[Q^*(y)\,|\tau\right] = \frac{(\tau-\delta)\overline{\theta}\overline{v} + (2\sigma+\delta\overline{\theta}-\tau\overline{\theta})\frac{p_hv_h}{p_h+p_l}}{2\sigma}$$

However, note that given the previous expressions, if $\overline{v} < E[\tilde{v}] \Leftrightarrow \overline{v} < \frac{p_h v_h}{p_h + p_l}$, v_h will mimick \overline{v} , since then $\overline{v} < E[Q^*(y) | \delta] < E[\tilde{v}] < E[Q^*(y) | \tau] < v_h$ Therefore, it must be $\overline{v} > E[\tilde{v}]$. And maximizing pro ts for v_h and \overline{v} with

Therefore, it must be $\overline{v} > E[\widetilde{v}]$. And maximizing pro ts for v_h and \overline{v} with respect to τ and δ , respectively, yields:

$$\begin{split} \delta^* &= \quad \frac{E[\widetilde{v}]}{E[\widetilde{v}] - \overline{v}} - \sigma - \frac{\overline{v}}{2\left(E[\widetilde{v}] - \overline{v}\right)} \tau^* \\ \tau^* &= \quad \sigma + \frac{1}{2} \delta^* \end{split}$$

However, it is easy to show that then $\tau^* \leq 1 \Rightarrow \delta^* < 0$, which is absurd.

2. $\delta < \tau = \rho$. Analogous to case 1.

3. $\delta = \tau = \rho$ In this case:

$$Q^*(y) = \begin{cases} 0 & -\sigma \le y < -\sigma + \tau \overline{\theta} \\ E[\widetilde{v}] & -\sigma + \tau \overline{\theta} \le y < \sigma + \tau \overline{\theta} \end{cases}$$

And then $E[Q^*(y)|\tau] = E[\tilde{v}] = B$, being bidder protector $v - E[\tilde{v}] + C$, $v = 0, \overline{v}, v_h$. The condition $C > E[\tilde{v}]$ ensures that the lowest type prefers to bid. Equilibrium beliefs that guarantee no deviation are:

$$\mu(v | \theta) = g(v) \qquad \forall \theta \in (0, \overline{\theta})$$

PROOF OF PROPOSITION 3

The proof will proceed in three steps:

1. Let us rst show that there does not exist an equilibrium in pure strategies in which types play either $\theta = 0$ or $\theta = \overline{\theta}$.

Suppose type v_h chooses $\theta = 0$ and type \overline{v} plays $\theta = \overline{\theta}$. Hence:

$$E\left[Q^*(\theta+u) | \theta=0\right] = \frac{\overline{\theta} \frac{p_h v_h}{p_h + p_l} + (2\sigma - \overline{\theta}) E[\widetilde{v}]}{2\sigma}$$

And

$$E\left[Q^*(\theta+u)\left|\theta=\overline{\theta}\right.\right] = \frac{\overline{\theta}\overline{v} + (2\sigma-\overline{\theta})E[\widetilde{v}]}{2\sigma}$$

Since the toehold becomes a perfect signal of the bidder s type, $B_{\theta=\overline{\theta}} = \overline{v}$ and $B_{\theta=0} = v_h$.

Under the proposed strategies, $v_h - type$ will deviate if:

$$v_h - v_h + C < v_h - \overline{\theta} E \left[Q^*(\theta + u) \left| \theta = \overline{\theta} \right] - (1 - \overline{\theta}) \overline{v} + C \right]$$

that is, always since $E\left[Q^*(\theta + u) | \theta = \overline{\theta}\right] < v_h$. Suppose type v_h chooses $\theta = \overline{\theta}$ and type \overline{v} plays $\theta = 0$. Hence:

$$E\left[Q^*(\theta+u) | \theta=0\right] = \frac{\overline{\theta}\overline{v}(1-p_h-p_l)}{1-p_h} + (2\sigma - \overline{\theta})E[\widetilde{v}]}{2\sigma}$$

And

$$E\left[Q^*(\theta+u)\left|\theta=\overline{\theta}\right.\right] = \frac{\overline{\theta}v_h + (2\sigma - \overline{\theta})E[\widetilde{v}]}{2\sigma}$$

Since the toehold becomes a perfect signal of the bidder s type, $B_{\theta=\overline{\theta}} = v_h$ and $B_{\theta=0} = \overline{v}$.

Under the proposed strategies, $v_h - type$ will deviate if:

$$v_h - (1 - \overline{\theta})v_h - \overline{\theta}E\left[Q^*(\theta + u) \left| \theta = \overline{\theta}\right.\right] + C < v_h - \overline{v} + C$$

that is, always since $\overline{v} < E\left[Q^*(\theta + u) \left| \theta = \overline{\theta}\right] < v_h$.

2. Let us show now that there does not exist an equilibrium in which $v_h - type$ plays $\theta^* = \tau \overline{\theta}, \overline{v} - type$ plays $\theta^* = \delta \overline{\theta}, 0 < \delta < 1, 0 < \tau < 1$ and $\delta \neq \tau$. Suppose rst that $\delta < \tau$. Hence:

$$Q^*(\theta + u) = \begin{cases} 0 & -\sigma \le \theta + u < -\sigma + \delta \overline{\theta} \\ \frac{\overline{v}(1 - p_l - p_h)}{1 - p_h} & -\sigma + \delta \overline{\theta} \le \theta + u < -\sigma + \tau \overline{\theta} \\ E\left[\widetilde{v}\right] & -\sigma + \tau \overline{\theta} \le \theta + u < \sigma \\ \frac{E\left[\widetilde{v}\right]}{1 - p_l} & \sigma \le \theta + u < \sigma + \delta \overline{\theta} \\ v_h & \sigma + \delta \overline{\theta} \le \theta + u \le \sigma + \tau \overline{\theta} \end{cases}$$

Therefore:

$$E\left[Q^*(\theta+u)\left|\theta=\delta\overline{\theta}\right] = \frac{(\tau-\delta)\overline{\theta}\overline{v}(1-p_l-p_h)}{1-p_h} + (2\sigma-\tau\overline{\theta})E\left[\widetilde{v}\right] + \delta\overline{\theta}\frac{E[v]}{1-p_l}}{2\sigma}$$

~

r~1

And $B_{\theta=\delta} = \overline{v}$. Similarly:

$$E\left[Q^*(\theta+u) \left| \theta = \tau \overline{\theta}\right] = \frac{(\tau-\delta)\overline{\theta}v_h + (2\sigma-\tau\overline{\theta})E\left[\widetilde{v}\right] + \delta\overline{\theta}\frac{E[v]}{1-p_l}}{2\sigma}$$

And note that playing $\theta = \tau \overline{\theta}$ is a dominated strategy for $v_h - type$, since by mimicking the $\overline{v} - type$ both stock price and bid price get lower. Therefore this is not an equilibrium

Suppose instead that $\delta > \tau$. In a similar fashion as in the previous case:

$$Q^*(\theta + u) = \begin{cases} 0 & -\sigma \le \theta + u < -\sigma + \delta \overline{\theta} \\ \frac{p_h v_h}{p_h + p_l} & -\sigma + \tau \overline{\theta} \le \theta + u < -\sigma + \delta \overline{\theta} \\ E\left[\widetilde{v} \right] & -\sigma + \delta \overline{\theta} \le \theta + u < \sigma \\ \frac{E\left[\widetilde{v} \right]}{1 - p_l} & \sigma \le \theta + u < \sigma + \tau \overline{\theta} \\ \overline{v} & \sigma + \tau \overline{\theta} \le \theta + u \le \sigma + \delta \overline{\theta} \end{cases}$$

The optimal values for δ and τ are such that:

$$\delta^* \in \arg\max_{\delta} \left[\overline{v} - (1 - \delta\overline{\theta})\overline{v} - \delta\overline{\theta}E\left[Q^*(\theta + u) \left| \theta = \delta\overline{\theta} \right] \right]$$

$$\tau^* \in \arg\max_{\tau} \left[v_h - (1 - \tau\overline{\theta})v_h - \tau\overline{\theta}E\left[Q^*(\theta + u) \left| \theta = \tau\overline{\theta}\right] \right]$$

First order conditions imply:

$$\delta^{*} = \frac{\sigma(E\left[\widetilde{v}\right] - \overline{v})}{E\left[\widetilde{v}\right]} + \frac{\frac{E\left[\widetilde{v}\right]}{1 - p_{l}} - \overline{v}}{2E\left[\widetilde{v}\right]} \tau^{*}$$

and:

$$\tau^* = \frac{\sigma\left(v_h - E\left[\widetilde{v}\right]\right)}{\frac{E\left[\widetilde{v}\right]}{1 - p_l} - \frac{v_h p_h}{p_h + p_l}} + \frac{\left(1 - p_l - p_h\right)\left(E\left[\widetilde{v}\right] - v_h\right)}{2\left(v_h p_h - \frac{p_h + p_l}{1 - p_l}E\left[\widetilde{v}\right]\right)}\delta^*$$

And de ning $M = \frac{\sigma(E\left[\widetilde{v}\right] - \overline{v})}{E\left[\widetilde{v}\right]}, N = \frac{\frac{E\left[\widetilde{v}\right]}{1 - p_l} - \overline{v}}{2E\left[\widetilde{v}\right]}, D = \frac{\sigma(v_h - E\left[\widetilde{v}\right])}{\frac{E\left[\widetilde{v}\right]}{1 - p_l} - \frac{v_h p_h}{p_h + p_l}}, R = \frac{(1 - p_l - p_h)\left(E\left[\widetilde{v}\right] - v_h\right)}{2\left(v_h p_h - \frac{p_h + p_l}{1 - p_l}E\left[\widetilde{v}\right]\right)}$

results:

$$\delta^* = M + N\tau^*$$

$$\tau^* = D + R\delta^*$$

However, it is easy to show that the proposed equilibrium is such that $\tau^* < 0$, since $\tau^* < 0 \Rightarrow D + R\delta^* < 0 \Rightarrow D < -R\delta^*$, where $\delta^* = \frac{M+ND}{1-NR}$. Hence, $\tau^* < 0 \Rightarrow D < -RM$, and from the de nitions above,

$$\frac{\sigma\left(v_{h}-E\left[\widetilde{v}\right]\right)}{\frac{E\left[\widetilde{v}\right]}{1-p_{l}}-\frac{v_{h}p_{h}}{p_{h}+p_{l}}} < -\frac{\left(1-p_{l}-p_{h}\right)\left(E\left[\widetilde{v}\right]-v_{h}\right)}{2\left(v_{h}p_{h}-\frac{p_{h}+p_{l}}{1-p_{l}}E\left[\widetilde{v}\right]\right)}\frac{\sigma(E\left[\widetilde{v}\right]-\overline{v})}{E\left[\widetilde{v}\right]}$$

which implies:

$$\frac{(1-p_l-p_h)\left(E\left[\widetilde{v}\right]-\overline{v}\right)}{2} < (v_h - E\left[\widetilde{v}\right])\left(p_h + p_l\right)$$

condition that always holds for $p_h + p_l < 1$.

3. Finally, suppose both types play $\theta = \pi \overline{\theta}$. The stock price becomes:

$$Q^*(\theta + u) = \begin{cases} 0 & -\sigma \le \theta + u < -\sigma + \pi \overline{\theta} \\ E\left[\widetilde{v}\right] & -\sigma + \pi \overline{\theta} \le \theta + u < \sigma \\ \frac{E\left[\widetilde{v}\right]}{1 - p_l} & \sigma \le \theta + u < \sigma + \pi \overline{\theta} \end{cases}$$

And then:

$$E\left[Q^*(\theta+u)\left|\theta=\pi\overline{\theta}\right.\right] = \frac{(2\sigma-\pi\overline{\theta})E\left[\widetilde{v}\right] + \frac{E\left[\widetilde{v}\right]}{1-p_l}\pi\overline{\theta}}{2\sigma}$$
(14)

where the bid price becomes $B_{\theta=\pi\overline{\theta}} = \frac{E[\widetilde{v}]}{1-p_l}$ and:

$$\pi^* \in \arg\max_{\pi} \left[v - \pi \overline{\theta} E\left[Q^*(\theta + u) \left| \theta = \pi \overline{\theta} \right] - (1 - \pi \overline{\theta}) \frac{E\left[\widetilde{v}\right]}{1 - p_l} \right], \qquad \forall v = v_h, \overline{v}$$
(15)

And after some easy calculations:

$$\pi^* = \frac{1 + p_l(2\sigma - 1)}{(1 + p_l)} \tag{16}$$

Note that $0 < \pi^* \leq 1$

Second order conditions for maximum are satis ed since pro ts are concave in π . The condition for C ensures that the $\overline{v} - type$ is making positive pro ts. For $C > E[\widetilde{v}]$, the 0 - type is also willing to bid and the proposed equilibrium breaks down.

PROOF OF COROLLARY 2

From (14):

$$\frac{\partial E\left[Q^*(\theta+u)\left|\theta=\pi\overline{\theta}\right]\right]}{\partial\sigma} = \left(\frac{E[\widetilde{v}]}{1-p_l} - E[\widetilde{v}]\right)\left[p_l - \frac{1}{2}\frac{1+p_l\left(2\sigma-1\right)}{\sigma}\right]\right]$$
$$= \left(\frac{E[\widetilde{v}]}{1-p_l} - E[\widetilde{v}]\right)\frac{p_l - 1}{2\sigma} < 0$$

PROOF OF COROLLARY 3

As the probability of an acquisition increases, the probability that $-\sigma \leq \theta + u < -\sigma + \pi \overline{\theta}$ is lower in equilibrium. Therefore $E\left[Q^*(\theta + u) | \theta = \pi \overline{\theta}\right]$ increases and the optimal toehold decreases.

PROOF OF COROLLARY 4

From (15) and (14):

$$E\left[\Pi_{v}(\theta,\sigma)\left|\theta=\pi^{*}\overline{\theta}\right] = v+C-\pi^{*}\overline{\theta}\left[\frac{(2\sigma-\pi^{*}\overline{\theta})E\left[\widetilde{v}\right]+\frac{E\left[\widetilde{v}\right]}{1-p_{l}}\pi^{*}\overline{\theta}}{2\sigma}\right] -(1-\pi^{*}\overline{\theta})\frac{E\left[\widetilde{v}\right]}{1-p_{l}} \quad \forall v=\overline{v}, v_{h}$$

And, using Corollary 6 and (16):

$$\frac{\partial E\left[\Pi_{v}(\theta,\sigma) \mid \theta = \pi^{*}\overline{\theta}\right]}{\partial \sigma}$$

$$= -\pi^{*}\overline{\theta}\frac{\partial E\left[Q^{*}(\theta+u) \mid \theta = \pi^{*}\overline{\theta}\right]}{\partial \sigma} + \overline{\theta}\frac{E[\widetilde{v}]}{1-p_{l}} - \overline{\theta}\left[\frac{(2\sigma - \pi^{*}\overline{\theta})E\left[\widetilde{v}\right] + \frac{E[\widetilde{v}]}{1-p_{l}}\pi^{*}\overline{\theta}}{2\sigma}\right]$$

$$> 0 \qquad \forall v = \overline{v}, v_{h}$$

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Figure 1. Timing of the game. At t=0 the bidder firm decides whether to purchase a toehold θ and its size. Trading takes place at t=1 and the stock is priced competitively depending on the total order flow θ +u. At t=2, after disclosing shareholdings in the target firm, the bidder announces a tender offer with bid price B. At t=3, target shareholders accept or reject the bid.



Figure 2. Price dynamics for v=v when E[v] < v



Figure 3. Price dynamics for v=v when E[v]>v



Figure 4. Price dynamics when probability of takeover is not one, for v=v



Figure 5. Cumulative Abnormal Returns around Tender Offer Announcements for US and UK firms

The plot shows Cumulative Abnormal Returns (CARs) before (from day t=-120) and after (to day t=+100) tender offer announcement, for all US and UK targets in the sample. Abnormal Returns are calculated using estimated coefficients from the market model in the period t=-420 days to t=-120 days relative to the tender offer announcements. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.



Figure 6.1. Cumulative Abnormal Returns around Tender Offer Announcements for US firms

The plot shows Cumulative Abnormal Returns (CARs) before and after tender offer announcement, for all US targets in the sample, for which the bidder acquire target shares in the last six months preceeding the tender offer announcement, and tender offers in which the bidder does not trade in the target's stock in the last six months preceeding the takeover announcement (first graph) and targets for wich the bidder has acquired a toehold that is either below or above the legal limit that triggers information disclosures (second graph). Abnormal Returns are calculated using estimated coefficients from the market model in the period t=-420 days to t=-120 days relative to the tender offer announcements. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.



Bidder's Toehold over Legal Limit

Bidder's Toehold below Legal Limit



No Stock Purchases in last Six Months

Figure 6.2. Cumulative Abnormal Returns around Tender Offer Announcements for UK firms

The plot shows Cumulative Abnormal Returns (CARs) before and after tender offer announcement, for all UK targets in the sample, for which the bidder acquire target shares in the last six months preceeding the tender offer announcement, and tender offers in which the bidder does not trade in the target's stock in the last six months preceeding the takeover announcement (first graph) and targets for wich the bidder has acquired a toehold that is either below or above the legal limit that triggers information disclosures (second graph). Abnormal Returns are calculated using estimated coefficients from the market model in the period t=-420 days to t=-120 days relative to the tender offer announcements. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

		Р	ANEL I: T	OTAL SAM	PLE			
			СНАЦИ		TENDE		TWO	
	055500		OFFER		IENDE		055500	
	OFFERS	% OVER TOTAL	OFFERS	% OVER ALL	OFFERS	% OVER ALL	OFFERS	% OVER ALL
Consummated	21	7.84%	1	4.76%	16	78.95%	21	100.00%
Independent Target	73	27.24%	11	15.07%	61	75.68%	70	95.89%
Sold to Other Bidder	17	6.34%	15	88.24%	14	85.71%	15	88.23%
Sold to the Raider	111	41.42%	28	25.23%	102	91.86%	101	90.99%
Sold to White Knight	45	16.79%	34	75.56%	24	47.88%	38	84.44%
Non Reported	1	0.37%						
Total	268		89	33.21%	217	81.03%	245	91.42%
		Р	ANEL II: U	JS FIRMS				
		ALL	CHALLI	ENGING BID	TENDE	R / MERGER	тwо-	TIER OFFER
	OFFERS	% OVER TOTAL	OFFERS	% OVER ALL	OFFERS	% OVER ALL	OFFERS	% OVER ALL
Consummated	19	9.64%	1	5.26%	15	78.95%	19	100.00%
Independent Target	37	18.78%	8	21.62%	28	75.68%	34	91.89%
Sold to Other Bidder	14	7.11%	13	92.86%	12	85.71%	12	85.71%
Sold to the Raider	86	43.65%	28	32.56%	79	91.86%	76	88.37%
Sold to White Knight	40	20.30%	30	75.00%	19	47.88%	33	82.50%
Non Reported	1	0.51%						
Total	197		80	40.61%	153	77.74%	174	88.32%
		Р	ANEL III:	UK FIRMS				
		ALL	CHALL	ENGING BID	TENDE	R / MERGER	тwо-	TIER OFFER
	OFFERS	% OVER TOTAL	OFFERS	% OVER ALL	OFFERS	% OVER ALL	OFFERS	% OVER ALL
Consummated	2	2.82%	0	0.00%	1	50.00%	2	100.00%
Independent Target	36	50.70%	3	8.33%	33	91.67%	36	100.00%
Sold to Other Bidder	3	4.23%	2	66.67%	2	66.67%	3	100.00%
Sold to the Raider	25	35.21%	0	0.00%	23	92.00%	25	100.00%
Sold to White Knight Non Reported	5	7.04%	4	80.00%	5	100.00%	5	100.00%

Table I. Sample Description

Total

71

Tender Offer characteristics for Total Sample, US targets and UK targets. Independent Target means that the target successfully blocks a hostile offer or the acquiror withdraws the bid. Sold to Other Bidder means that the target was acquired by a third party bidder. Sold to the Raider means that the target was sold to a hostile bidder. Sold to a White Knight means that the target agrees to a friendly transaction with a third party bidder to thwart a hostile offer. A Challenging Bid indicates that a third party launched an offer for the target while this bid was pending. Two-Tier Offer indicates whether an acquiror is offering different consideration for a portion of the firm's shares. Tender/Merger indicates whether a tender offer is launched to acquire control of the company, and the offer is followed by a merger agreement in which the acquiring firm agrees to purchase the remaining shares not tendered under the offer. Sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

12.67%

9

90.14%

64

71 100.00%

			PANEL I. TO	DEHOLD /	AT ANNOL	JNCEME	NT DATE				
		Median	Standard			F	ercentage	e of Targe	ts for whic	h Toehold is	5:
	N	Toehold	Dev.	Min	Max	0%	0%-5%	5%-10%	10%-20%	20%-50%	>50%
ALL DEALS	327	4.10	13.76	0	69.5	32.1	16.8	19.9	14.4	13.8	3.1
US TARGETS	230	4.35	12.42	0	69.5	33.9	20.9	23.0	13.0	6.1	3.0
UK TARGETS	97	10.00	15.36	0	62.1	27.8	7.2	12.4	17.5	32.0	3.1
			PANEL II. T	OEHOLD	SIX MON ⁻	THS BEFO	ORE ANN	OUNCEM	ENT		
		Median	Standard			P	ercentage	e of Targe	ts for whic	h Toehold is	5:
	N	Toehold	Dev.	Min	Max	0.0	0%-5%	5%-10%	10%-20%	20%-50%	>50%
ALL DEALS	327	4.10	12.59	0	69.5	36.1	19.6	18.3	11.9	11.6	2.4
US TARGETS	230	3.65	12.46	0	69.5	36.1	22.2	21.3	11.3	6.1	3.0
UK TARGETS	97	5.00	12.68	0	54	36.1	13.4	11.3	13.4	24.7	1.0

Table II. Bidder's Toehold by nationality of target firm

The table contains bidder's stake in the target firm at announcement date and six month prior to announcement date, by nationality of target firm. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

	Number of Offers	% Over Total	CAR t=-120 to	t=-1	CA t=+1 to	AR t=+100	AF t=0	2
		PANE	L I: ALL DEAL	.S				
TOTAL SAMPLE	311	100.00%	10.03 (6	6.13)	21.21	(12.03)	7.18	(9.82)
US FIRMS	219	100.00%	11.08 (5	5.97)	22.8	(10.51)	9.06	(9.38)
UK FIRMS	92	100.00%	7.42 (2	2.20)	19.67	(5.86)	13.38	(6.78)
		PANEL II: SU	JCCESSFUL	JEFER	S			
TOTAL SAMPLE	127	40.84%	7.62 (3	3.34)	23.64	(8.26)	10.53	(5.53)
	101	46.12%	9.33 (5	5.97)	24.2	(10.51)	9.48	(4.50)
	20				24.0	(4.37)	14.70	(3.33)
	ľ	PANEL III: UN	SUCCESSFUL		:K5			
TOTAL SAMPLE	69	22.19%	17.42 (4	4.67)	11.29	(3.46)	9.42	(5.92)
	36	16.44% 25.97%	18.67 (3	3.42)	11.2	(2.53)	12.01	(3.39)
		55.07 %			11.44 PTV	(2.32)	12.01	(5.05)
						(=		(
	60 52	19.29%	14.29 (3	3.77)	27.72	(7.01) (6.54)	10.3	(4.95)
UK FIRMS	8	8.70%	26.04 (1.72)	23.84	(0.34)	17.2	(1.63)
	PAN	IEL V: TOEHO	LD EXCEEDS	LEGA	L LIMIT	()		()
TOTAL SAMPLE	156	50 16%	11 49 (4	4 82)	18.37	(7.15)	9 84	(6 18)
US FIRMS	95	43.38%	12.92 (4	4.39)	17.62	(5.23)	7.22	(3.57)
UK FIRMS	61	66.30%	9.11 (2	2.23)	20.19	(4.91)	14.2	(5.68)
	PAI	NEL VI: TOEH	OLD UNDER I	LEGAL	LIMIT			
TOTAL SAMPLE	155	49.84%	8.6 (3	3.82)	24.22	(9.98)	9.78	(7.92)
US FIRMS	124	56.62%	9.67 (4	4.05)	26.91	(9.63)	11.47	(7.74)
UK FIRMS	31	33.70%	4.2 (0	0.69)	18.7	(3.17)	11.82	(3.66)
	PANEL V	/II: STOCK PU	IRCHASE IN L	AST SI	IX MONTHS			
TOTAL SAMPLE	50	16.08%	14.23 (4	4.43)	19.67	(4.37)	9.27	(3.98)
US FIRMS	20	9.13%	20.79 (3	3.87)	18.02	(2.93)	8.63	(2.29)
UK FIRMS	30	32.61%	9.71 (2	2.54)	20.45	(3.24)	9.71	(3.23)
	PANEL VIII	: NO STOCK I	PURCHASE IN	LAST	SIX MONTH	IS		
TOTAL SAMPLE	261	83.92%	9.23 (4	4.99)	21.63	(11.20)	9.34	(8.30)
US FIRMS	199	90.87%	10.11 (5	5.15)	23.31	(10.08)	9.13	(8.84)
UK FIRMS	62	67.39%	6.27 (*	1.33)	19.29	(4.78)	15.22	(6.01)

Table III. Cumulative Abnormal Returns around Tender Offer Announcements

The table contains Cumulative Abnormal Returns (CARs) before and after tender offer announcement, and Abnormal Returns (Ars) at announcement date for all hostile tender offers in the sample period, succesful offers, unsuccessful offers, acquisitions by a third party, tender offers in which the bidder purchase a toehold over the legal limit that triggers disclosure, tender offers in which the bidder purchase a toehold below the legal limit that triggers disclosure, tender offers for which the bidder acquire target shares in the last six months preceeding the tender offer announcement, and tender offers in which the bidder does not trade in the target's stock in the last six months preceeding the takeover announcement. Abnormal Returns are calculated using estimated coefficients from the market model in the period t=-420 days to t=-120 days relative to the tender offer announcements. T-statistics are in parentheses. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

	Number of		Chi		Intangibles/	Chi	
	Observations	Intercept	Square	p-value	Total Assets	Square	p-value
	PANE	L I: NATION	IALITY O	F TARGE	T FIRM		
Total Sample	638	-0.175	9.395	0.0022	5.088	31.447	0.0001
US targets	450	-0.259	12.573	0.0004	6.245	30.633	0.0001
UK targets	188	0.053	0.314	0.5752	2.929	3.477	0.0622
		PA	NEL II: SI	ZE			
Size Quartile 1	158	-0.107	0.973	0.3238	2.740	4.727	0.0297
Size Quartile 2	160	-0.137	1.450	0.2285	5.270	5.540	0.0186
Size Quartile 3	160	-0.271	5.184	0.0228	7.127	12.433	0.0004
Size Quartile 4	160	-0.241	4.108	0.0427	6.681	11.757	0.0006

Table IV. Probit Estimation

Probit Regressions relating the Likelihood of a Tender Offer to Intangible Assets. The dependent variable is and indicator function that takes value 1 if the firm is a tender offer target in the sample period 1980-1995, zero otherwise. The independent variable is the ratio of Total Intangible Assets to Total Assets. The total sample contains all the target firms of hostile tender offers from US and UK for which data were available and the corresponding matching firms. For every firm in the original sample, a matching firm is identified satisfying the following criteria: (i.) the nation in which the matching firm primary business or division is located at the time of the transaction is the same as for the original firm, (ii) both firms have the same SIC code, (iii) the matching firm is the closest in size that satisfies (i.) and (ii), (iv) the matching firm is not a takeover target in the period 1980-1995. Accounting data are obtained from Compustat for US firms, Amadeus and Datastream for UK firms. Chi-Square statistic is a Wald test based on the observed information matrix and the parameter estimates. Two-tailed p-values are also displayed.

	Intercept	p-value	Runup	p-value	Volume	p-value	Toehold Size	p-value	Takeover Rumours	p-value	Hazard Ratio	p-value
		1			OTAL SAM					1		
				PANEL I. I	N-285	LE						
Equation 4: Taskald	4 007	(0.0440)	07.000	(0.4444)	0.000	(0.7070)					0.704	(0.0000)
Equation 1: Loenoid	4.837	(0.2442)	-27.660	(0.4111)	0.000	(0.7078)					-0.761	(0.0239)
Equation 2: Runup	0.175	(0.0145)			0.000	(0.7771)	-0.036	(0.4095)	0.000	(0.9988)	-0.028	(0.1004)
N=209	N=209 PANEL II: US FIRMS											
Equation 1: Toehold	-0.409	(0.5249)	0.553	(0.8409)	0.001	(0.1067)					0.028	(0.6539)
Equation 2: Runup	0.781	(0.2300)		· /	-0.002	(0.0629)	1.947	(0.0001)	-0.011	(0.9882)	-0.053	(0.5173)
N=52			PAN	EL IIa: US	FIRMS. SIZE	E QUARTIL	.E 1					
Equation 1: Toehold	0.359	(0.2237)	0.006	(0.9357)	0.000	(0.3140)					-0.027	(0.1894)
Equation 2: Runup	0.334	(0.3807)			-0.004	(0.5120)	0.001	(0.9345)			-0.008	(0.6824)
N=53			PAN	EL IIb: US	FIRMS. SIZE	QUARTIL	E 2					
Equation 1: Toehold	-0.913	(0.4559)	0.921	(0.2059)	0.000	(0.3092)					-0.148	(0.1225)
Equation 2: Runup	0.237	(0.4096)			0.000	(0.8004)	0.025	(0.0364)			0.003	(0.9644)
N=52			PAN	EL IIc: US	FIRMS. SIZE	E QUARTIL	.E 3					
Equation 1: Toehold	-0.513	(0.4374)	2.056	(0.0899)	0.000	(0.2646)		(0.4070)			0.127	(0.2517)
Equation 2: Runup	-0.034	(0.8840)			0.001	(0.6365)	0.054	(0.1872)			-0.041	(0.0169)
N=52			PAN	EL IId: US	FIRMS. SIZE	QUARTIL	E 4					
Equation 1: Toehold	0.237	(0.6883)	-0.163	(0.8463)	0.000	(0.9794)					0.069	(0.4553)
Equation 2: Runup	0.346	(0.0039)			-0.001	(0.0240)	0.001	(0.9626)	0.146	(0.0183)	-0.007	(0.6822)
N=76				PANE	EL III: UK FIF	RMS						
Equation 1: Toehold	4.288	(0.0017)	16.536	(0.0586)	0.000	(0.4000)					-0.402	(0.2287)
Equation 2: Runup	-0.311	(0.0372)		()	0.000	(0.4119)	0.069	(0.0001)	0.046	(0.8295)	0.030	(0.2348)
N=19			PAN	EL IIIa: UK	FIRMS. SIZ	E QUARTIL	_E 1					
Equation 1: Toehold	8.759	(0.0652)	3.538	(0.4406)	-0.003	(0.1790)					-0.743	(0.1024)
Equation 2: Runup	-0.031	(0.9183)			0.003	(0.8681)	0.008	(0.4951)			-0.028	(0.3754)
N=19			PAN	EL IIIb: UK	FIRMS. SIZ	E QUARTIL	E 2					
Equation 1: Toehold	10.228	(0.0310)	6.908	(0.4695)	-0.001	(0.0497)					-1.126	(0.0288)
Equation 2: Runup	0.119	(0.2046)			0.001	(0.0291)	0.001	(0.4418)			-0.009	(0.3303)
N=19			PAN	EL IIIc: UK	FIRMS. SIZI	E QUARTIL	E 3					
Equation 1: Toehold	0.415	(0.7716)	-6.916	(0.3839)	0.001	(0.3651)					0.090	(0.8088)
Equation 2: Runup	-0.092	(0.3367)			0.010	(0.0002)	-0.012	(0.0725)			0.045	(0.0054)
N=19			PAN	EL IIId: UK	FIRMS. SIZ	E QUARTIL	_E 4					
Equation 1: Toehold	6.191	(0.0976)	-2.868	(0.7041)	0.000	(0.6919)					-2.480	(0.1885)
Equation 2: Runup	0.214	(0.1199)			0.000	(0.3996)	-0.006	(0.2473)	-0.303	(0.1917)	-0.124	(0.2099)

Table V. GMM estimates of the econometric model:

$$Toehold_{i} = \mathbf{a} + \mathbf{b}_{1}Runup_{i} + \mathbf{b}_{2}Volume_{i} + \left(\frac{\mathbf{s}_{pe}}{\mathbf{s}_{p}}\right)\hat{\mathbf{f}}_{i} + \mathbf{w}_{1i}$$

$$Runup_{i} = \mathbf{g} + \mathbf{d}_{1}Volume_{i} + \mathbf{d}_{2}Toehold_{i} + \mathbf{d}_{3}Rumors_{i} + \left(\frac{\mathbf{s}_{pn}}{\mathbf{s}_{p}}\right)\hat{\mathbf{f}}_{i} + \mathbf{w}_{2i}$$

Toehold Size is defined as the percentage of common, or common equivalent, shares purchased by the acquiror during the last six months preceeding the takeover announcement. Stock Price Runup is the Cumulative Abnormal Return for the target firm's stock from day t=-120 to t=-1 relative to the announcement date. Trading Volume is defined as the average turnover (daily) calculated from t=-150 to t=-120 relative to the announcement date. Takeover Rumours is a dummy variable that takes value '1' where the transaction ir rumored or began as a rumour, i.e., was not confirmed by the players, '0' otherwise. Hazard Rate is estimated from the Probit model in Table IV as:

$$\hat{I}^{i} = \frac{f\left[\begin{pmatrix}\hat{b}\\\hat{s}^{p}\end{pmatrix}^{i}\right]}{\Phi\left[\begin{pmatrix}\hat{b}\\\hat{s}^{p}\end{pmatrix}^{j}\right]}$$

Panels a through d display results for subsamples calculated depending on the target firm's total assets size. Quartile 1 represents the smallest firms in the sample. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

	Number of Observations	Intercept	t-Ratio	p value	Toehold Size	t-Ratio	p value	Trading Volume	t-Ratio	p value	Hazard Rate	t-Ratio	p value
					PANEL I: NATIO	ONALITY (OF TARG	ET FIRM					
Total Sample	216	38.859	(9.40	,0.000)	-0.209	(-1.29	,0.199)	0.000	(-0.59	,0.556)	2.056	(1.05	,0.296)
US targets	146	-33.528	(-1.65	,0.102)	-0.518	(-2.92	,0.004)	0.011	(3.49	,0.001)	4.298	(2.58	,0.011)
UK targets	70	35.745	(3.39	,0.001)	-0.117	(-0.34	,0.737)	0.000	(-0.54	,0.588)	1.815	(0.44	,0.659)
					P	ANEL II: S	SIZE						
Size Quartile 1	54	50.577	(2.86	,0.006)	-0.287	(-0.82	,0.414)	-0.001	(-0.56	,0.580)	-3.185	(-0.92	,0.360)
Size Quartile 2	54	37.704	(2.60	,0.012)	-0.081	(-0.18	,0.856)	-0.001	(-0.60	,0.550)	12.000	(1.56	,0.125)
Size Quartile 3	54	29.857	(6.60	,0.000)	-0.216	(-1.84	,0.071)	0.000	(2.19	,0.033)	2.920	(1.56	,0.124)
Size Quartile 4	54	33.102	(3.42	,0.001)	-0.149	(-0.40	,0.693)	0.000	(-0.51	,0.612)	11.004	(1.65	,0.105)

Table VI. Determinants of the Takeover Premium

Regression of takeover premium on tender offer characteristics. Takeover premium is the difference between the bid price and the stock price one day prior to the announcement date. Toehold Size is defined as the percentage of common, or common equivalent, shares held by the acquiror as of the announcement date. Trading Volume is defined as the average turnover (daily) calculated from t=-150 to t=-120 relative to the announcement date. Hazard Rate is estimated from the Probit model in Table IV as:



Panels 4 through 7 display results for subsamples calculated depending on the target firm's total assets size. Quartile 1 represents the smallest firms in the sample. Standard errors are White's heteroskedasticityconsistent. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.

					Toehold			
	Intercept		t-Stat	p-value	Size		t-Stat	p-value
		F	ANEL I	TOTAL S	SAMPLE			
				N=304				
R ² =0.0006	0.566	(0.240	,0.8069)	0.151	(1.350	,0.1789)
			PANE	L II: US F N=217	IRMS			
R ² =0.01	0.154	(0.090	,0.9258)	1.722	(2.000	,0.0468)
			PANE	L III: UK F N=85	TIRMS			
R ² =0.0003	0.531	(0.070	,0.9458)	0.096	(0.340	,0.7379)
		PA	NEL IV	SIZE QU	ARTILE 1			
· · · · · · · · · · · · · · · · · · ·				N=76				
R ² =0.000	0.768	(0.210	,0.8305)	0.037	(0.190	,0.8523)
		P/	ANEL V:	SIZE QU	ARTILE 2			
				N=76				
R ² =0.0011	-3.666	(-0.520	,0.6057)	0.197	(0.880	,0.3805)
		PA	NEL VI	SIZE QU N=76	ARTILE 3			
R ² =0.0033	-1.791	(-0.460	,0.6474)	0.449	(0.960	,0.3394)
		PA	NEL VII	: SIZE QU N=76	IARTILE 4			
R ² =0.0006	7.060	(3.200	,0.0020)	0.087	(0.460	,0.6473)

Table VII. Determinants of the ratio Runup/Markup

Regression of the ratio Runup/Markup on Toehold Size. Toehold size is defined as the percentage of common, or common equivalent, shares purchased by the acquiror during the last six months preceeding the takeover announcement. Stock Price Runup is the Cumulative Abnormal Return for the target firm's stock from day t=-120 to t=-1 relative to the announcement date. Markup is the Cumulative Abnormal Return for the target firm's stock from day t=-1 to t=+1 relative to the announcement date. Panels 4 through 7 display results for subsamples calculated depending on the target firm's total assets size. Quartile 1 represents the smallest firms in the sample. Standard errors are White's heteroskedasticity-consistent. The sample includes all the hostile tender offer announcements identified by Security Data Corporation that took place in the US and UK in the period January 1980-December 1995, for which data on toeholds was available. All deals are first bids.