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A Theory of Acquisition Markets - Mergers Vs. Tender Offers*

by

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Abstract

We develop a model of the acquisition market in which the acquirer has a choice between two takeover mechanisms, mergers and tender offers. We model mergers as a bargaining game between the managements of the acquiring and target firms, and tender offers as independent, private value auctions in which bidders arrive sequentially. In equilibrium, there is a unique level of synergy gains below which the acquiring firm will not make a tender offer as it will loose in the ensuing competition. However, the acquiring firm does make a merger attempt for such low realizations.

We show how "Golden Parachutes" eliminate an agency problem that may exist between target management and shareholders. "Golden Parachute" contracts, however, are not easy to construct because they must take into account the ability of acquiring firms' to choose between mergers and tender offers. If this aspect is ignored then target management may find itself unable to force the acquiring firm to select that mechanism which is preferred by target shareholders. A well constructed contract needs to ensure that a tender offer is forthcoming for all synergy gains higher than the above mentioned unique level, without eliminating the possibility of mergers for the low realizations. We construct one such contract.

Finally, we are able to show that target managements may use "Greenmail" to buy out low synergy acquirers who wish to merge, thus, generating competition which results in improved target shareholders' and social welfare.

INTRODUCTION

In recent years takeovers have made a substantial impact on financial markets. These takeovers have been achieved through different mechanisms, namely mergers, tender offers, proxy fights, and leveraged buyouts. Whereas, before the 60's, the merger was the most frequently used mechanism, in recent times tender offers have also become quite common (Bradley and Kim 1985). Proxy fights and leveraged buyouts, however, have been used relatively infrequently. The acquisition market has also witnessed the emergence of controversial instruments like "Golden Parachutes"[1] and "Greenmail".[2] Though, public opinion has generally been opposed to such instruments on the ground that they lead to management entrenchment, these instruments have survived and the market continues to use them. In this paper we concentrate on the two more frequently used mechanisms, mergers and tender offers, and address the following questions: why do two different mechanisms exist for performing the same task; when is one preferred over the other; and how does each contribute to making the acquisition market more efficient. We also investigate the role of "Golden Parachutes" and "Greenmail" in this market.

We are not aware of any existing literature which considers mergers and tender offers as alternative mechanisms for acquisitions. Fishman 1984 uses search costs to explain preemptive bidding in tender offers. Khanna 1985 explains preemptive bidding through the sequential arrival of bidders, and also studies the effect of resistance by target firms. Vishny and Shleifer 1984 solves the free ride problem posed by Grossman and Hart 1982, through a large shareholder who can make a profitable tender offer. Shleifer and Vishny 1984 explains Greenmail in a model with incomplete information where the target makes search more profitable to potential bidders by reducing competition. By considering the two mechanisms together, we are able to generate more insights into the acquisition markets.

There are some obvious differences between tender offers and mergers as mechanisms for takeover. Mergers take place when the managements of both acquiring and target firms are prepared to cooperate in arriving at a decision about how to split the synergy gains generated by their coming together. Tender offers, on the other hand, do not require that target managements be sympathetic to the acquisition, and are made directly to the target shareholders who decide the outcome by either tendering the required number of shares or rejecting the offer by not tendering.

We model tender offers as auctions where bidders arrive sequentially and payoffs are determined competitively (Khanna 1985). On the other hand, we model mergers as bargaining between the two managements, where the synergy gains are divided on the basis of Rubinstein's solution concept. The structure of the model is complicated by the requirement that the returns to buyers when they use one mechanism is dependent on what returns they would have got from the other.

The acquisition market comprises of a set of acquiring firms that are always searching for profitable matches with a set of target firms. Only a subset of target firms has the potential for generating synergy gains, but the identity of the elements of this subset is unknown to the market. A bidder and a target learn the amount of their match specific synergy gains, if any exist, only on meeting. If positive synergy gains exist, the bidder may choose to make a tender offer. As tender offers can be made only through public bids, once a tender offer is made the market becomes aware that the target is one with synergy generating potential. Since the bid has to statutarily remain open for a minimum length of time, other bidders get the opportunity of entering their own bids for the same target and competition may develop. The market anticipates the possibility of competition and immediately reacts through an increase in the price of the target shares. We refer to this phenomenon as the target being 'discovered' by the market. Unlike a tender offer, a merger attempt, before it is completed, does not necessarily lead to the target being 'discovered" since merger negotiations are neither publicly observable nor the seriousness of the intent of the two negotiating parties confirmable. Consequently, the market does not react to information about ongoing mergers in the same manner as it does to outstanding tender offers.

In the event a tender offer is made, we permit another bidder to enter and raise the existing bid if his synergy gains permit him to do so. Competitive bidding takes place and the bidder with the higher match-value wins for a bid which is at least as high as the value of the second bidder. The loser exits from the competition and continues searching for another match. The winner also continues searching but as a new entity.

When an acquiring firm meets a potential target, it has three choices available. It can negotiate for a merger, make an unfriendly tender offer or wait. If it negotiates, the target may not get 'discovered' and, thus, no competition may develop. But, for negotiations to be successful, the target management must cooperate, and it will agree to do so only if this is the best possible outcome for it. If the bidding firm makes an unfriendly tender offer, the target gets discovered and competition develops, so the bidding firm will make a tender offer only if it has a good probability of winning in the ensuing competition. Alternatively, both firms could choose to wait, but waiting is costly.

One of the more important results of this paper is that there exists a unique value of synergy gains below which the two firms will agree to merge, and above which only tender offers will succeed. We also show that tender offers will be necessarily preemptive in nature, because the discount rate makes it costly for the first bidder to open with a low bid which he knows will be rejected by the target, thus forcing him into making a higher bid and keeping the auction open for a longer time.

Some other results are with regard to "Golden Parachutes" and Greenmail. Golden Parachutes are shown to be contracts used by targets to eliminate an agency problem which may exist between their shareholders and their managements. But for Golden Parachutes to work effectively, it is not enough that only existing agency problems be resolved, but also that the contract be so constructed as to enable the target management to force the acquiring firm to select that mechanism which is optimal for target shareholders. In this respect Golden Parachutes contracts are shown to be more complicated than previously understood. We develop a contract which is able to take care of the agency problem without eroding target management's effectiveness. We also show how Greenmail improves target shareholder welfare and the efficiency of the acquisition markets by buying out low-synergy generating acquirers so that the target can be acquired by bidders who can generate higher synergies.

The paper is organized as follows. Section 1 develops a model for the acquisition market while Section 2 describes the game which takes place whenever a tender offer is made. Section 3 lays out a model of the "complete" game where the acquiring firms have a choice between making a tender offer or a merger attempt. The role of "Golden Parachutes" in eliminating target shareholders and target management agency problems and the peculiar nature of this agency problem are also discussed in this Section. Section 4 develops a positive role for "Greenmail" and "Golden Parachutes" in improving target shareholder welfare as also its social implication. Section 5 consists of the conclusion and some testable implications.

Section 1: The Market

Consider an acquistions market in which there are a finite number of potential bidders and a continuum of targets.[3] The bidders are continuously searching for targets with which they can generate synergy gains. It is common knowledge that a proportion $q < 1$ of all target firms has the potential for generating synergies, but the identity of these firms is unknown to the acquiring firms and to the targets themselves. Once a target firm gets revealed to be one which can generate synergy gains with any one bidder then it can generate synergy gains with all bidders. These synergies, however, are match specific and not known to either the bidder or the target, before they meet, but are fully revealed to both players, immediately, on meeting. Ex ante, the synergy gains are uniformly distributed over the support $[0,1]$.

It is assumed that the acquiring firms are owned by their managers, while target managers do not own any of their firm's stock.[4] All managers are risk neutral and draw utility only from wealth. Acquiring firms have two mechanisms for taking over the target firms: tender offers and mergers. In tender offers the acquiring firms do not require the cooperation of the target managements for making a successful acquisition as they approach the target shareholders directly. In mergers, though, the acquisition is orchestrated through the mutual cooperation and consent of the two managements.

The acquisitions market works as follows. An acquiring firm meets with a potential target which has neither a bid outstanding on it nor is participating in any merger negotiations. The acquiring firm investigates the target and if the synergy gains are zero, the two firms separate and the acquiring firm continues searching for other targets. If synergy gains exist, the acquiring firm decides either to make a tender offer or to start negotiating with the target management to affect a merger.

We assume that acquirers identify the targets they wish to look at at random. When some of the targets thus investigated reveal synergy generating potential, the acquirers have to decide whether to acquire via a tender offer or through friendly merger negotiations. Whenever a merger attempt is made, since it does not have to be made publicly, the target is not discovered in the sense that the market does not become aware of its synergy generating potential and thus, no competition develops. Tender offers, though, lead to competition by one other bidder referred to as bidder-2 each period. We assume that bidder-2s are picked at random from a set of potential bidders. We also permit a bidder to participate in more than one acquisition at any time in the following circumstances. If a bidder is already engaged in one acquisition attempt at the time he is selected to be bidder-2 for some other acquisition attempt, he is permitted to enter a competitive bid while continuing with the original acquisition. Also, if merger nogotiations last more than one period, the acquirer may investigate additional targets every period so that negotiating with a target involves no other cost except the delay of the payoff from the acquisition. This cost is represented by a discount factor, δ. We also assume that all bidders and targets forget each others identity after unsuccessful investigations for synergy gains. Potential targets also forget the number of acquirers who have investigated it unsuccessfully. Next, we describe the subgame in which an acquirer makes a tender offer.

Section 2: Tender Offer

Whenever a tender offer is made, it immediately becomes public knowledge. Since a tender offer is a binding contract undertaken by the acquiring firm, the market identifies this particular match to be synergy generating and the target firm as one belonging to the set which can generate synergy gains. This learning process we call "discovering" the target. The bid is assumed to necessarily remain open for one period during which another player gets informed about the potential of synergy gains from acquiring the target, investigates it and then possibly bids for it. If his match value is less than the opening bid, he does not compete and the first bid becomes the final bid for the opening period. If his match value is higher, competitive bidding ensues and the final bid is at least as high as the value of the second highest bidder. At this point the shareholders of the target firm decide whether to accept the final bid by tendering their shares, or to reject the bid by refusing to tender. Ths sequence of events and decisions is given in Figure 1, where the time from the final bid to the end of the period represents the minimal length of time the bid must remain open.

If the target shareholders tender their shares, the auction is over and the highest bidder buys the firm for the value of the final bid. If they reject, the auction remains open for another period during which one more bidder gets informed. The new bidder now competes against only the highest bidder of the first period who gets to bid again in the second period while the bidder with the lower valuation in the first period drops out of the auction completely. Consequently, independent of how long the auction remains open due to repeated rejection of the final bids in each successive period by the target shareholders, only two bidders compete against each other per period.

The auction continues until such time as the target shareholders accept an outstanding final offer for some period. The payoffs to the target firm become available at the end of the period in which the auction ends. To simplify our model, we abstract away from the free rider problem (Grossman and Hart 1982), and the two tier bids problem (Bradley and Kim 1985) by assuming that the acquirer must purchase 100% of the shares in order to gain control.

Formally, suppose an acquiring firm meets a target and realizes the value of the synergy gains as 'a'. He may bid any $w_1 \varepsilon (0,a]$, and the bid remains open for one period in which another bidder whom we refer to as bidder-2, gets informed about his match-value 'b' with this target. There are three possible cases.

Case 1: $b < w_1$. Since the existing bid w_1 exceeds the match value of bidder-2, he does not bid and leaves the auction permanently. At this juncture, the target shareholders have to decide either to tender their shares or to reject the offer 'w_1'. If they tender, the game is over and bidder-1 acquires the target for his opening bid of 'w_1'. If they reject the offer, the game continues into the second period where another bidder gets informed about the target and competes with the higher bidder of the first period, who in this case is bidder-1.

Case 2: $w_1 < b < a$. Here, bidder-2 raises bidder-1's bid of 'w_1' and competition develops.[5] Bidding continues until such time as the final bid is at least 'b'. At this point bidder-2 exits from the game and the target shareholders face the same choices as in case-1.

Case 3: $b > a$. Bidder-1 loses to bidder-2 who bids a $w_1' \geq a$. Again the target shareholders face the same situation as in case-1, except that if they resist it is bidder-2 who is given the opportunity to bid again in the second period by virtue of his being the highest bidder in the first period.

A part of a subgame of this game is described in Figure 2. First, bidder-1 gives a bid $w = w_1$. Then, nature moves by choosing the value of the second bidder. If this value is smaller than w_1 (as in case-1 above), the final bid of the period is w_1. If the value is $b > a$ (case-3 above) the first bidder leaves after bidder-2 makes a final bid of $w_1' \varepsilon [a,b]$. If bidder-2's value satisfies $w_1 < b < a$, the first bidder makes a final bid of $w_1^f \varepsilon [b,a]$. After a final bid, the target shareholders either tender their shares or reject the offer.

A strategy for bidder-1 can be described as follows. In the beginning of period 1 he must bid a $w_1 \varepsilon (0,a)$. Also, after the second bidder has arrived, he has to bid again. We assume that if the value of the second bidder is smaller than the first bid, bidder-1 may not change his first bid. If the value of bidder-2 is higher than w_1 (but smaller than the value of the bidder-1), bidder-1 has to bid another $w_1^f \varepsilon [b,a]$. Thus, w_1^f represents bidder-1's final bid in period-1. Any sequence of two bids in the first period defines a subgame in the second period (note that if $b \leq w_1$ then $w_1^f = w_1$). Thus, given any possible bids in the first period, bidder-1 has to bid again in the beginning of the second period, after the bidder-2 of period one has dropped out and been replaced by another bidder-2. Therefore, he has to specify a mapping g_2^1: $(0,a]^2 \dashrightarrow (0,a]$ for the first bid in the second period, and a mapping g_2^2: $(0,a]^4 \dashrightarrow (0,a]$ for the second bid in the second period, where

$$g_2^2(w_1, w_1^f, w_2, b) = \begin{cases} w_2 \text{ if } b \leq w_2 \\ \\ w_2^f \geq b \text{ is } b > w_2 \end{cases}$$

where w_2^f represents the bidder-1's final bid in period-2. Similarly, w_1' and w_2' would represent the final bids of bidder-2 in period 1 and period-2 respectively, whenever bidder-2 has the higher valuation. In the third period, given any sequence of bids (w_1, w_1^f, w_2, w_2^f) bidder-1 has to specify a functions g_3^1: $(0,a]^4 \dashrightarrow (0,a]$, and g_3^2: $(0,a]^6 \dashrightarrow (0,a]$. Therefore, a strategy for bidder-1 is a sequence of functions $g^a \varepsilon G^a$, such that

$g_a = \{g_\tau^{1a}, g_\tau^{2a}\}_{\tau=1}^{\infty}$ where

$g_1^{1a} \varepsilon (0,a]$, g_τ^{1a}: $(0,a]^{2(\tau-1)} \rightarrow (0,a]$, and g_τ^{2a}: $(0,a]^{2\tau} \rightarrow (0,a]$.

In any period, and for every node (i.e., afer a final bid), the target shareholders must specify their response to the bid made by the first bidder. This response can be either to tender (yes) or to reject the outstanding offer (no). Therefore, in each period, they specify a function f^a: $(0,a]^{2\tau} \rightarrow$ {yes, no}. The strategy for the target firm will be a sequence of such functions $f^a \varepsilon F^a$, $f^a = \{f^a\}_{\tau=1}^{\infty}$.

It is clear from this description that what happens upon the arrival of the second bidder is an important part of the game. In particular, if bidder-2's value is $b > a$, the game takes place between bidder-2 and the target as bidder-1 leaves when he is out-bid, and gets nothing. Thus, what the target expects to obtain from a tender offer depends, in part, on what its profit can be if bidder-2 has synergies higher than 'a'. Therefore, its decision to either reject or accept depends upon the expected return from such possibilities. In order to proceed with our analysis, we first define the value for the target when bidder-2 has higher synergy gains than bidder-1. Let v: $(a,1] \rightarrow (0,1]$ be a differentiable and strictly increasing function, such that $v(s) < s$ for all $s \varepsilon (0,1]$. The function v represents the value to the target of a synergy gain of 's' with bidder-2 when $s > a$, e.g., $v(b)$ is the payoff for target from meeting bidder-2 with synergy $b > a$. We first analyze the game between bidder-1 and the target given the payoff $v(s)$ for the target, and then solve for v to show that it is consistent with our assumptions. In order to do so, however, we assume that any game between a target and an acquirer is independent of what has happened in any of the previous time periods. In particular, if bidder-2 has value $b > a$, the game that takes place at $\tau = 2$ is exactly the same game as that at $\tau = 1$ between the target and a bidder-1 with value b (see discussion at this point in Rubinstein and Wollinsky 1983).

Given v, let $V^{\tau}_{B=1}(a,g,f,v)$ be the expected value of bidder-1 in time τ, if his match-value is 'a', his strategy is g, and the target's strategy is f (since bidder-1 receives the payoff at the end of the period, his actual market value at this time is $\delta V^{\tau}_{B=1}(a,g,f,v)$). Similarly $V_t(a,g,f,v)$ is the value for the target firm. An equilibrium (Nash) is a set of strategies (g^*,f^*) such that

1. $V^{\tau}_{B=1}(a,g^*,f^*,v) \geq V^{\tau}_{B=1}(a,g,f^*,v)$ for all $g \in G$.
2. $V^{\tau}_{t}(a,g^*,f^*,v) \geq V^{\tau}_{t}(a,g^*,f,v)$ for all $f \in F$.

The game characterized above is a result of bidder-1's decision to make a tender offer in preference to negotiating for a merger. However, the above conditions for equilibrium are inadequate. To see why, consider the following strategies:

$$g^a_\tau \equiv w \in (0,a] \text{ for every } \tau$$

$$f^a_\tau(w_1, w_2, \ldots\ldots, w_\tau) = \begin{cases} \text{yes if } w_\tau \geq w \\ \\ \text{no if } w_\tau < w \end{cases}$$

It can be seen that given this constant bid, the value for the target is constant over time, say c. If $a \geq w \geq \delta c$, the above strategies form a Nash equilibrium. Yet, this equilibrium may not be reasonable. Suppose that $a \geq w > \delta c$. Now, if the bidder bids any $w' \epsilon (\delta c, w)$, the target as a result of its equilibrium strategy, rejects this bid. However, by accepting the bid, the target makes higher profits, since $w' > \delta c$ which is the target's market value discounted one period. In order to avoid this problem we use the notion of Subgame Perfect Equilibrium (Selten 1975), and we define it in a way similar to Rubinstein (1982). Let $g|w_1,\ldots,w_\tau$ and $f|w_1,\ldots,w_\tau$ be the strategies derived from g and f after the bids $w_1,\ldots,w_\tau$ have been announced and already rejected. Then (g^*,f^*) is Subgame Perfect Equilibrium (SPE) if, for all τ and for all $w_1,\ldots,w_\tau$;

i) there is no $g \varepsilon G$ such that

$$V^\tau_{B=1}(a,g,f^*|w_1,\ldots w_\tau) > V^\tau_{B=1}(a,g^*|w_1,\ldots,w_\tau,\ f^*|w_1,\ldots,w_\tau)$$

ii) there is no $f \varepsilon F$ such that

$$V^\tau_t(a,g^*|w_1,\ldots,w_\tau,f) > V^\tau_t(a,g^*|w_1,\ldots,w_\tau,f^*|w_1,\ldots,w_\tau).$$

Henceforth, whenever we write $V^\tau(a,g^*,f^*,v)$ with reference to some prescribed g and f, we imply the above restrictions for g and f, i.e., the V's are as given by (i) and (ii). Given the above definition, it is easy to see why the Nash Equilibrium strategies described are not SPE. If the target sees an off-equilibrium bid of $w' \varepsilon (w,\delta c)$, it is better off accepting it and, thus, condition (ii) will not hold.

It can be seen that given v and a, $V^\tau_t(a,g,f,v)$ is well defined by g and f. Therefore, we proceed as follows: first, we "allow" the bidder to bid only a constant bid of the form $g^a \equiv w^a = \delta\ V^\tau_t(a,g^a,f^a,v)$, even in the cases where $w^a > a$ (f^a here is the strategy to accept any bid that is equal to or greater than w^a, and to reject all other bids). We show that such a constant bid exists, and whenever $w^a < a$, this strategy, together with the above shareholder's strategy, constitutes a unique SPE. After establishing this, we show that there exists a unique V that solve for the target and the acquirer values.

<u>LEMMA-1</u>: Given the function v, for any $a \varepsilon (0,1]$ there exists a unique $w^a \varepsilon (0,1]$ such that

$w^a = \delta V_t(a,g^a,f^a,v)$, where $g^a \equiv w^a$ and

$$f^a_\tau(w_1,\dots,w_\tau) = \begin{cases} \text{yes if } w \geq w^a \\ \\ \text{no if } w < w^a \end{cases} \quad \text{for all } \tau. \tag{1}$$

PROOF: Suppose $g^a \equiv w\varepsilon(0,1]$, and the shareholders' strategy is f' which equals f^a with w replacing w^a (i.e., the shareholders tender their shares for w). Then, δV_t is calculated as below.

$$\delta V^\tau_t(a,w,f',v) = \begin{cases} \delta\int_a^1 y_a(s)ds + \delta w^2 + \int_w^a sds \text{ if } w \leq a, \text{ where } y_a = \max\{a,\delta v(s)\} \\ \\ \delta\int_w^1 y_w(s)ds + \delta w^2 \text{ if } w > a \text{ where } y_w = \max\{w,\delta v(s)\} \end{cases} \tag{2}$$

The first element in the upper RHS expression represents the target's expected gains in the event $b > a$ (bidder-2 has then to bid the maximum of a and $\delta v(b)$). The second element is the target's expected payoff whenever $b < w$ and the third term in his expected gain when $w < b < a$. The first term of the lower RHS expression is the expected payoff to the target when the value of bidder-2 is above w and the second term his payoff when bidder-2's value is below w.

Now, $\delta V_t(w)$ is continuous in w since both functions are continuous in w, and at $w = a$ have the same values.

At $w = 0$, $V^\tau_t(w) = \delta\int_a^1 y_a(s)ds + \delta\int_0^a sds = \delta\int_a^1 y_a\,(s)ds + \delta a^2/2 < 1$, and at $w = 1$, $\delta V^\tau_t(w) = \delta < 1$. By the intermediate value theorem, there exists w^a s.t. $w^a = \delta V^\tau_t(w^a)$. The proof for uniqueness is given in the appendix.

LEMMA-2: For any $\delta\varepsilon(0,1]$, there exists $a^*\varepsilon(0,1)$ s.t.

$$w^a = \delta V^\tau_t(a,g^a,f^a,v) \text{ which is } \begin{cases} \leq a \text{ if } a \geq a^* \\ \\ > a \text{ if } a < a^* \end{cases}$$

where g^a and f^a are given in Lemma-1 .

PROOF: Follows directly from the proof of uniqueness of Lemma-1.

LEMMA-3: Given v, any SPE must satisfy:

$$g_\tau^*(w_1,\ldots,w_\tau) = \delta V_t^{\tau+1}(a,g^*,f^*,v)$$

$$f_\tau^*(w_1,\ldots,w_\tau) = \begin{cases} \text{yes if } w_\tau \leq \delta V_t^{\tau+1}(a,g^*,f^*,v) \\ \\ \text{no if } w_\tau < \delta V_t^{\tau+1}(a,g^*,f^*,v) \end{cases} \tag{3}$$

Note that g^* in V is, $g^*|w_1,\ldots,w_t$, and so also f^*.

PROOF: See appendix.

What the above analysis shows is that for an acquiring firm to make a tender offer which is profitable and has the possibility of acceptance by the target shareholders, its match-value with the target must exceed a reservation value a^*, provided the market value for the target firm is well defined. In order to show the latter, we must replace the function 'v' by the solution for the game defined earlier. If the strategies g^a and f^a, given in Lemma-1, form the equilibrium for $a \geq a^*$, then for any value $b > a^*$, bidder-1 makes positive gain. Thus, we can write $v(s)$ explicitly under the assumption that the other bidders with $b > a > a^*$, will use identical strategies. The next theorem shows that the market value for the target is indeed well defined.

THEOREM 1: V_t has a unique solution among the set of differentiable and strictly increasing functions on the interval $[a^*,1]$.

PROOF: Given in the appendix.

The above discussion shows that the strategies (g^a,f^a) that are given by (1) are SPE for $a \geq a^*$, and they are unique SPE among "constant" strategies. Now, we want to show that (g^*,f^*) in (3) is the unique SPE (for $a \geq a^*$) amongst all strategies.

THEOREM 2: Strategies (g^*,f^*) form a unique SPE.

PROOF: Given in the appendix.

In the above analysis we derive the optimal bidding strategy for a bidder-1 of "type" $a \geq a^*$. We now show the condition under which bidder-1 of "type" $a < a^*$ will not make a tender offer in equilibrium. For this to hold it must be that if such a bidder-1 decides to make a tender offer (i.e., make an off equilibrium move), he will either be rejected by target shareholders or will make negative profits.

Suppose an acquirer with value $a < a^*$ bids some $w \varepsilon (0,a]$. For the shareholders to reject any such bid, their market value after the tender offer has been made must be higher than a. To show that the shareholders reject any such tender offer, their post-tender-offer market value, V_t^p, must be higher than a*. Thus, the shareholders believe that the acquirer, after making one off-equilibrium move, will not persist with bidding in subsequent periods. In order to retain the nature of our game, we assume that, in the period such a bidder leaves the bidding, two bidders may enter simultaneously. (In this respect, the assumption about "only two bidders may compete" may reflect a limit of space.) The market value of the shareholders in this case may be calculated as below:

$$
\begin{aligned}
V_t^p &= \int_{a*}^{1} \delta V_t(s)ds + a^*\delta \;[\int_{a*}^{1} \delta V_t(s)2sds \\
&\quad + \delta(a^*)^2 \;[\int_{a*}^{1} \delta V_t(s)2sds + \ldots.. \qquad (4)\\
&= \int_{a*}^{1} \delta V_t(s)ds + a^*\delta\int_{a*}^{1} V_t(s)ds \;[1 + (a^*)^2\delta/1-\delta]
\end{aligned}
$$

The first element on the RHS is the expected value of the payoff to the target from the second bidder in the period the tender offer has been made. The second term is the expected payoff if the second bidder has value below a* and, thus, leaves (the density function in this case is 2s, as it represents the c.d.f. of the maximum of two random variables from the uniform distribution).

The above expression is not necessarily larger than a*, but it can be shown that, under most reasonable conditions $V_t^p \geq a*$. In order to avoid undesired complications, we assume that this inequality holds. Hence, the strategy of "leaving the auction" is an equilibrium strategy for an acquirer with synergies of $a < a*$.

3. Merger Negotiations

In the previous section we have characerized the subgame that occurs whenever bidder-1 decides to make a tender offer. In the "complete" game, however, he has a choice between making a tender offer and entering into merger negotiations, provided the target has not yet been "discovered." What this implies is that once the acquirer makes a tender offer, he eliminates the alternative of any merger negotiations then or later. The choice to merge, therefore, exists only as long as no tender offer has been made.

As a merger occurs through negotiations between the two managements (the target shareholders give their approval only for the final agreement), it is necessary to add the target manager as an additional player in the game. The manager's payoff from either a merger or a tender offer depends upon his particular circumstances. For instance, if a manager is "bad" in the sense that his ability is below average, then a takeover reveals this fact earlier than it woud have otherwise been revealed. Thus, this manager gets a negative payoff from both a successful tender offer and a successful merger. On the other hand, if the manager is "good," and if this fact is more likely to be revealed upon a friendly merger, then this manager's payoff is higher in case of a successful merger.

We now describe a game that enables us to analyze the above cases amongst others. Let m(a) ($m\colon [0,1] \to R$) represent the payoff for the target manager in case of a merger with an acquirer that has a synergy gain of 'a' with the target. Let t(a) be the manager's payoff in the case of a successful tender offer by the same acquirer. It is assumed that these functions are given at the beginning of the game, and remain fixed. The manager, as well as the shareholders and the acquirer, know m and t. Note that we allow m and t to include some transfer of money between the shareholders and the manager, as part of a predetermined contract. This point is explained later in more detail.

Given any m and t, the "complete" game can be described as follows. Upon identifying a target that generates a synergy of a, an acquirer may either make a public tender offer or a private merger offer of $w \in (0,a]$. If a tender offer is made, the game proceeds as described in the previous section. However, if a merger attempt is made, the target manager has to respond either "yes" (agree) or "no" (reject). If the manager agrees, the game is over and the merger is completed. The payoff to the manager then is m(a), and to the acquirer is 'a-w', and to the target shareholders is 'w' minus the agreed-upon transfer to the manager, all discounted by one period. If the manager rejects the merger attempt, he may submit, in the second period, a counter offer of his own merger terms $w \in [0,1]$ (whenever he makes an offer $w > a$, he, in fact, refuses to make any counter offer, i.e., refuses to negotiate). After such an offer, the acquirer has to respond by "yes" or "no" and to decide whether to make a tender offer. If he rejects the counter offer then it is his turn to either make his own counter offer of new merger terms, or to announce a tender offer, and so on. If he says "yes" without submitting a tender offer, the game is over, while if he says "yes" but also makes a tender offer, the firm gets revealed and the game continues as a tender offer.

We simplify the description of the game by deleting the subgames that occur after a tender offer has been made, and assign to these cases the payoffs that are described in the previous section. Thus, a strategy for an acquirer with synergy gains 'a' can be written as a sequence of functions $g^a = \{g_\tau^a\}_{\tau=1}^{\infty}$, where $g_1^a \varepsilon S$, g_τ^a: $[0,1]^{\tau-1} \to S$ for τ odd, and g_τ^a: $[0,1]^{\tau} \to$ {yes, no} x S for τ even, where $S = \{T \times NT\} \times [0,1]$. Here, T represents a tender offer, while NT represents a merger attempt whenever τ is odd, and no action otherwise (i.e., in case the acquirer is reacting to the manager's proposal, he may not submit a merger offer of his own in the same period and, thus, NT means he is not making a tender offer). Therefore, the 3-tuple $\{(\text{no}, NT, w) | w \varepsilon [0,1]\}$ in an even period represents a rejection of the manager's offer and waiting, i.e., not making a tender offer. Accordingly, an acceptance of the manager's offer is represented by the 3-tuple $\{(\text{yes}, NT, w) | w \varepsilon [0,1]\}$. We denote the set of all such functions by G.

Every subgame that starts in an odd period has the above set of strategies. It is necessary, also, to describe the strategies for every subgame that is starting with a manager's offer (even periods). In this case, a strategy for the acquirer is a sequence of functions $g'^a = \{g'^a_\tau\}_{\tau=1}^{\infty}$ where g'^a_τ: $[0,1] \to$ {yes,no} x S for τ odd, and g'^a_τ: $[0,1] \to S$ for τ even. The space of all such functions is denoted by G'.

Whenever it is the acquirer's turn to make an offer, a strategy for the manager is a sequence of functions $f^a = \{f_\tau^a\}_{\tau=1}^{\infty}$ such that, for τ odd, f_τ^a: $[0,1] \to$ {yes, no}, and for τ even, f_τ^a: $[0,1]^{\tau-1} \to [0,1]$. The space of all such functions is denoted by F. Whenever it is the manager's turn, his strategy is a sequence of functions $f'^a = \{f'^a_\tau\}_{\tau=1}^{\infty}$ such that, for τ odd, f'^a_τ: $[0,1] \to [0,1]$, and for τ even f'^a_τ: $[0,1] \to$ {yes,no}. The space of all such functions is denoted by F'.

Part of this game, starting when it is the acquirers turn to submit a merger offer, is presented in Figure 3. Subgame Perfect equilibrium can be defined as follows: Let $g|w_1,\ldots\ldots, w_\tau$ and $f|w_1,\ldots\ldots, w_\tau$ be the strategies derived from g and f after the bids $w_1,\ldots\ldots, w_\tau$ have been announced and already rejected. Then, (g^*, f^*) is SPE if, for all τ and for all $w_1,\ldots\ldots,w_\tau$:

i) If τ is even, there is no $g\varepsilon G$ and $f\varepsilon F$ such that

$$V^{\tau}_{B=1}(a,g,f^*|w_1,\ldots w_\tau) \geq V^{\tau}_{B=1}(a,g^*|w_1,\ldots,w_\tau, f^*|w_1,\ldots w_\tau)$$

$$V^{\tau}_{t}(a,g^*|w_1,\ldots,w_\tau,f) > V^{\tau}_{t}(a,g^*|w_1,\ldots,w_\tau,f^*|w_1,\ldots,w_\tau)$$

ii) If τ is odd, there is no $g'\varepsilon G'$ and $f'\varepsilon F'$ such that, the inequalities in (i) holds with g' replacing g, and f' replacing f.

Let us use this framework to analyze several cases. It is easy to see what happens in the case where the target manager is "bad" and has no clear instructions in his contract with the target shareholders as to what action to take in the event of a takeover. Suppose that the manager suffers some loss in income from losing his job after a successful takeover, but that this loss is independent of the form of the takeover. In particular, let $m(a) \equiv t(a) \equiv K < 0$, where K is a constant. The manager has no decision to make in the case of a tender offer, as the target shareholders decide the outcome of the offer and an acceptance will result in the loss of K to him. However, if the acquirer tries to merge, the manager has an opportunity to delay this loss by rejecting the offer, and in turn, submitting a counter merger offer of $w > a$. Faced with this response in the beginning of the second period, the acquirer's best action is to make a tender offer, as any new offer for a merger will only be rejected again, causing further delay. Therefore, the unique equilibruim here is for the acquirer to make a tender offer immediately (and from every node in every period), and for the manager to always reject a merger attempt.

Is this a desirable result for the shareholders? The answer depends crucially on the action of a potential bidder with a synergy gain of $a < a^*$.

Without any bidding costs, this bidder may bid, even though he knows he is going to be rejected. Now, it is more likely that a tender offer yields a higher payoff for the target shareholders than a merger (for any a close enough to a* this is trivially true, and by and large it is true for every a). Therefore, the target shareholders get what they prefer, a tender offer. It is more reasonable, however, to assume that a bidder with $a < a^*$ will abstain, thus preventing the target from being 'discovered,' and causing the target shareholders a loss of potential profits. Next, we analyze a case which shows that target shareholders have some tools to remedy this situation.

Suppose the manager's payoff in the case of a successful merger is zero, and in the case of a successful tender offer is some negative amount. One can think, for example, of a situation where the manager suffers some costs upon dismissal (search costs, loss of reputation, etc.), and the probability of his being dismissed is less in the case of a friendly takeover.[6] In this case, whenever an acquirer has some synergy and wants to take over, the manager prefers merger negotiations over a tender offer. Moreover, if he does not own any of the target's stock, he does not even care about the price at which the merger is consummated. The bidder may take advantage of this by offering a merger at a low price, as can be seen from the following proposition:

<u>PROPOSITION 1</u>: Suppose that $m(a) \equiv 0$ and $t(a) \equiv K < 0$. Then any SPE has the form

i) for τ odd, $g^a_\tau \equiv (NT,0)$ and $f^a \equiv$ yes

ii) for τ even, $g^a = \begin{cases} (\text{yes, NT, .}) \text{ if } f|w_1,\ldots\ldots,w \leq \delta(a-\delta a) \\ (\text{no, NT, .}) \text{ otherwise} \end{cases}$

and $f^a_t = w, \; w\varepsilon[0,1]$

<u>PROOF</u>: See appendix.

Proposition 1 suggests that the acquirer, in his turn, always offers a merger for 0, and the manager accepts this offer, since he is indifferent between all the prices he may be offered and to whether the merger takes place now or in the future. As the target manager accepts any w, the acquirer offers only those prices that give him at least as much as he would get upon waiting for another period. (This payoff is δa discounted for one more period.) Thus, the outcome in equilibrium is a successful merger offer of zero in the first period itself.

The target shareholders, therefore, are facing problems from two sources. First, no tender offer is going to be made (remember, a tender offer gives them a higher payoff). Second, in the case of a merger, nobody is taking care of their interests in the bargaining process. Separately, these two problems may be easily solved via a pre-written contract. The shareholders can promise to pay the manager a sufficiently large sum of money, to guarantee him a positive payoff in the event of a successful tender offer, while in the case of a merger, the shareholders may promise to pay the manager a percentage of their profits from the takeover. With such a contrast, the manager is no longer indifferent between mergers at different prices. In fact, the manager wants as high a price as he can get, and the bargaining situation becomes similar to that of Rubinstein (1982).

However, when these two incentives are offered together, some problems arise. Even though the compensation in the event of a successful tender offer may be much higher than in the case of a merger (so that, whenever it is possible, the manager prefers a tender offer), the manager will not be able to force the acquirer to make a tender offer, as the following proposition shows.

<u>PROPOSITION 2</u>: Let A(a) be the shareholders payoff from a merger with an acquirer of type a, and suppose that $m(a) = \alpha A(a)$, $\alpha \varepsilon (0,1]$. Also let $t(a) = K$, $K \varepsilon R$. Then, the unique SPE outcome is a merger with payoff of $\delta a(1/1+\delta)$ for the acquirer.

<u>PROOF</u>: See appendix.

Propositon 2 claims that whenever a target manager has a positive payoff from a merger, then that is the only feasible outcome of the game and the payoff he gets from a successful tender offer is of no importance because the manager cannot force the acquirer to make a tender offer. (The acquirer prefers a merger when the outcome is as described in the proposition.) The acquirer, knowing that the manager has positive profits from a merger, will offer only a merger, forcing the manager to enter into successful merger negotiations. The case where the manager owns a small number of the firm's shares may be viewed as a special case of this proposition. In the event the manager holds a substantial stake in the firm, he will be unable to force bidder-1 to make a tender offer, so only a merger will take place.[7]

The target shareholders have two alternatives. Whenever it is possible, the best approach for them is to condition the contract on the acquirer's synergy gains. For example, they may write the following contract:

$$m(a) = \begin{array}{ll} \alpha A(a) & \text{whenever } a \leq a^* \\ 0 & \text{whenever } a > a^* \end{array} \quad \text{where } \alpha \varepsilon (0,1] \tag{5}$$

and $t(a) = K > 0$ whenever a successful tender offer occurs. It can be seen that, whenever $m = 0$ and $t > 0$, the only equilibrium is for the manager to resist any merger attempt, and for the acquirer to make a tender offer (although merger for price of 0 also can be an equilibrium outcome, this equilibrium is not perfect). Therefore, contract (5) will yield the desired outcomes for the shareholders.

Whenever the contract cannot be conditioned on the value 'a', the shareholders have to decide whether they prefer to see only tender offers (if the synergy gains are above a*) and nothing if $a < a^*$, or to see only mergers independent of what the 'a' may be. Accordingly, they can develop contracts that will give them the best feasible outcomes.

In order to complete the analysis, we discuss briefly the case where the manager has negative payoffs from both tender offers and mergers. In particular, the case where his losses from a tender offer are bigger than his losses from a merger is interesting. It is shown in the appendix that this case may yield a merger for the price of zero as an equilibrium. (Although not unique, this equilibrium is a reasonable one to consider.) Thus, the target shareholders face the same problem as they faced in the case of zero payoffs to the manager. The contract that gives the right incentives is again very similar to contract (5), but now the shareholders have to pay the manager a lump-sum to bring him to zero profits (in the case of a merger). Apart from this, the contract is the same, with the same results.

Section 4. Golden Parachutes, Greenmail and Some Welfare Implications

The above analysis shows that the shareholders must give some incentive to the manager in order to induce him to act in their best interest. In particular, they have to compensate him (by some monetary transfer) for any loss he may suffer because of a takeover. This feature of the contract is very similar to a mechanism that is frequently observed in take-over situations, namely, the "Golden Parachute" mechanism. Golden Parachutes guarantee the target manager some compensation, usually a large sum of money, upon a successful takeover of the target.

The above explanation for "Golden Parachutes" belongs to the class of explanations that uses "agency costs" (usually, moral hazard) as the main reason for this mechanism. It should be pointed out, however, that our analysis identifies some complications in the implementation of this mechanism. The shareholders must be aware of the fact that the pre-determined contract that they are giving to the manager may change his position in the game that takes place upon the arrival of an acquirer. In particular, a "Golden

Parachute" that pays out in the case of any merger may prevent a tender offer from taking place even when an acquirer has type $a > a*$ and this may happen even when the same "Golden Parachute" contract promises the target manager a higher payment in the case of a successful tender offer. This is no longer a conventional "moral hazard" problem, as the manager himself prefers a tender offer. The problem is the result of the linkage between the manager's contract and his position in the manager-acquirer game. In this respect, our model has enough structure to identify the kind of contracts we are likely to see in different situations. It, thus, contains some empirical implications about the "Golden Parachute" mechanism.

The "Golden Parachute" contract may yield another benefit for the target shareholders in the following way. Suppose that the amount paid to the manager upon a successful tender offer is relatively high compared to the amount he gets in the case of a successful merger. It is clear from the analysis of the previous sections that the manager cannot force an acquirer with the synergy of $a < a*$ to make a tender offer. However, if an acquirer has identified the target to be synergy-generating, the information that both he and the manager have, may be worth a lot, since they both know that the target can produce higher synergies with other acquirers. In this case, both the manager and the target shareholders will be better off letting the market 'discover' this firm without merging with the low value acquirer. But, without a public tender offer, how can the manager transmit his information to the market? The way in which he can do this is known as 'Greenmail,' under which a target buys back the shareholding of a major shareholder at a premium over the share market value. For example, consider the case where the target's value upon 'discovery' is some $c > 0$, and an acquirer with match-value of $a < c$ arrives. Let the bargaining solution be 'split the synergy gains,' i.e., each player gets $a/2$ (any other solution, including that of Proposition 2, is as good for our purpose). The target can now offer the acquirer a payoff of $a/2 + \varepsilon_a$. The market observes this action and discovers the targer provided the following conditions hold.

1. An undiscovered target makes negative profits at the level of Greenmail, i.e., cost of Greenmail must satisfy $a/2\ \varepsilon_a > qc$.
2. A discovered target must make a positive profit after it pays out Greenmail, i.e., $\varepsilon_a/2 + a < c$.

Thus, the range of Greenmail payments so that incentive compatibility and individual rationality are both satisfied is $qc < a/2 + \varepsilon_a < c$.

The existence of "Greenmail" suggests that acquisitions through merging are always undesirable for the target, the acquirer and the society. The following proposition proves that point.

PROPOSITION 3: For any match-value $a \varepsilon [0,1)$, a tender offer yields a higher social gain than a negotiated merger.

PROOF: The synergy gain is a. Therefore, a merger yields a total social gain of a. Whenever $a < c$, the target alone gets more than 'a' in the event of discovery through a public bid. Whenever $a > a^*$ and the acquirer make a tender offer, the target gets

$$V_t(a) = \delta\int_a^1 \max\ (a,\ \delta V_t(a))ds + \delta w^2/2 + \delta a^2/2$$

and the acquirer gets

$$V_b(a) = \delta w(a-w) + \delta\int_w^a (a-s)ds = \delta(a^2+w^2)/2$$

Now, the two values combined yield

$$V_t(a) + V_b(a) = \delta\int_a^1 \max\ \{a,\delta V_t(s)\}ds + \delta a^2$$

$$\int_a^1 \max\ (a,\delta V_t(a)) \geq \int_a^1 ads = (1-a)a \dashrightarrow V_t(a) + V_b(a) \geq \delta a,$$

Morever, the second acquirer makes, in expectation

$$V_{b=2} = \delta\int_a^1 (s-a)ds = \frac{\delta}{2}(1+a^2) - \delta a.$$

It is easy to see that this function is decreasing in a and, for a=1 it equals 0. Therefore, for a < 1, it is strictly positive. Hence, the total social gain is strictly bigger than a in this case.

Q. E. D.

Proposition 3 is intuitively clear. A tender offer generates the type of information that leads to competition which may result in an acquirer with higher synergies taking over. A merger, in contrast, has no such advantage (in our model). It does not lead to the generation of additional synergies, and it does not reduce costs (such as time). It appears, therefore, that in order to justify such a commonly used mechanism, we have to rely upon other explanations. One such explanation, which we will not discuss here, is "managerial synergies" (see Berkovitch and Khanna 1985 for a model that incorporates this idea). Instead, we focus on another explanation for mergers, namely timing. A merger, as a friendly way of taking over, may speed up the process of acquiring a target viz-a-viz an unfriendly takeover (i.e., a tender offer). Consequently, the payoff that is generated by this process may be realized earlier in the event of an acquisition through a merger. Whenever the advantage to the target from this fact is bigger than the value of "discovery," a merger may be socially preferred.

In particular, let us assume that the payoff in the case of a merger is realized immediately upon reaching an agreement (i.e., in the beginning of the period), while the payoff in the case of a tender offer is realized only at the end of the period. In this scenario, the higher the synergy gains the higher are the costs of delay and the smaller is the chance that an acquirer with higher synergies will arrive after a tender offer has been made. We may, therefore, expect that mergers may be socially preferred when bidder-1 has high synergies, and tender offers may be preferred for low synergies. This idea is reflected in the following proposition.

PROPOSITION 4: Under the above assumption, for any $\delta \varepsilon (0,1)$, there exists $a^{**} \varepsilon (0,1)$ such that, for every $a \geq a^{**}$, a merger yields higher social gains, and for every $a < a^{**}$, a tender offer yields higher social gains.

PROOF: Given a match value of a, the social gain from a merger is a. For every $a \geq a^*$, the social gain is $\frac{\delta}{2}(1+a^2)$. This value is calculated as follows. The probability that bidder-1 will take over the target is a, and in this case the social gain is δa. The expected social gain from the second bidder is $\delta \int_a^1 s ds$. Therefore, the total social gain is $\delta a^2 + \delta \int_a^1 s ds = \frac{\delta}{2}(1+a^2)$. The social gain from a tender offer when $a < a^*$ is given by ( ), and is equal to some strictly positive constant. Now, with a = 1, the social gain from a tender offer is δ, smaller than the social gain from a merger. Whenever a = 0, the social gain from a merger is 0, while the social gain from a tender offer is bigger. Moreover, the social gain from a tender offer increases at a rate which is no bigger than the gain from a merger. Therefore, such an a^{**} exists.

Q. E. D.

Proposition 4 presents a problem. Although a complete analysis of the model under differences in the amount of time needed to acquire a target via different mechanisms is beyond the scope of this paper, it seems that the result that mergers occur for low synergies and tender offers for high, will hold. Thus, the market may be inefficient. However, in the case of low synergies for bidder-1, Greenmail will induce inefficiencies. Also, it appears that a merger, if it is desired, may take place when synergies are high. Given that he will be forced to make a tender offer, an acquirer with high synergies may approach the target with a merger offer for a price which is equivalent to (or slightly higher than) the expected gain for the target firm from the tender offer. The target shareholders prefer this procedure and, therefore, the only remaining problem is the manager. He may resist this proposal if his compensation in the event of a tender offer is higher than for a merger. This possibility would have to be incorporated into the manager's contract for the manager to take the desirable action.

It appears, therefore, that some of the instruments that induce efficiency may already exist in the market. It should be mentioned, however, that a complete analysis of the market with the above possibilities is not simple, as it introduces additional solution concepts to the bargaining game between the acquirer, the manager and the target shareholder.

Section 5. Conclusions and Empirical Implications

We have demonstrated that mergers and tender offers have distinct roles to play in the acquisition markets. Tender offers are optimal when the synergy generated by bidder-1 is above a unique level in the range of possible synergy gains. Below this level we do not observe any tender offers as it is not optimal for bidder-1 to make a public bid that he does not expect to win with in the ensuing competition. He will, however, choose to make a private merger offer and thus prevent any competition from developing.

We are able to show that "Golden Parachutes" eliminate an agency problem that may exist between target management and shareholders. It is not enough, though, to get rid of the agency problem alone, as the consequences of giving management such a contract may not be in the best interest of target shareholders. A contract which takes care of just the agency problem also reduces the ability of target management in forcing bidder-1 to take that action which is in the interest of target shareholders. We develop a contract which is able to take care of the agency problem without reducing target management's effectiveness.

Under the assumption of our model, mergers are suboptimal for the target and society at large since they occur when bidder-1's realization is low and he wishes to prevent competition via a private merger attempt. This approach excludes, on occasion, potential bidders with higher synergy gains. Target management may use Greenmail to buy out the low synergy bidder-1 and generate competition, thus, improving both target shareholders' and social welfare.

We suggest, without rigorous modeling, that mergers may still be important for reasons like manager's specialized resources or in instances where mergers are expected to take a shorter length of time than tender offers to complete. We postpone a detailed analysis of these claims to a succeeding paper.

The most obvious testable implication of our model is that, on average, synergy gains generated should be higher in the case of tender offers than in the case of mergers, since mergers take place only for low realizations. We are not aware of any empirical paper which studies this aspect of acquisitions. Another implication of our model is, since target firms by and large prefers tender offers over merger attempts and since tender offers take place for the higher realizations of synergy gains, target firms should make larger profits when taken over by tender offers. A causal analysis of the data put together in Jensen and Ruback '85 strongly suggests that this may indeed be the case.

Other testable hypothesis are with regard to Golden Parachutes and Greenmail. Managers of firms that have Golden Parachutes should generally hold little or no stock in their firms. Firms whose managers hold substantial positions should usually see merger attempts being made on them. This is also the finding of Bradley and Kim '85. When Greenmail substitutes a tender offer as a discovery mechanism, it should lead to an increase in the market value of the target firm, though the extent of this increase will depend on the bargaining solution used in the market. However, in case Greenmail occurs concurrently with an actual or probable tender offer, we should see a drop in the value of the target shares, at least as large as the premium paid. A study by Bradley and Wakeman 1983, concludes that when Greenmail terminates a tender offer, the value of the target firm drops.

FOOTNOTES

1. Golden Parachutes are usually written into the incentive contracts of some target managements, promising them large sums of money in the event the firm is successfully acquired.

2. Greenmail is essentially a technique used by target firms to forestall a a possible takeover attempt by repurchasing at a premium the block of shares held by a potential acquirer.

3. In this paper for the sake of simplification we assume that the set of targets and the set of acquirers are mutually exclusive, but relaxing this condition should not alter any of our results.

4. We relax this requirement in Proposition-2.

5. In this case, since bidder-2 knows he cannot win, he is indifferent between bidding and not bidding. In fact, if he has some bidding costs, he will not bid. Our model holds for this case too, but it yields a decreasing tender offer by bidder-1, i.e., a bidder with the higher synergy bids lower, since he is less afraid of competition. We prefer to stay with our study of competitive bidding as, without it, the target has an incentive to reach a private agreement with bidder-2 and freeze-out bidder-1. This can be done, for example, via a "white knight" agreement, in which at the target's behest, bidder-2 bids above bidder-1's first bid, and the target accepts this regardless of the reaction of the first bidder. Such considerations will yield results similar to ours, but the analysis will be more complicated.

6. We assume that the probability of being dismissed in the case of a merger is the same as in the case of no-takeover. However, even if this probability is higher than in the case of no-takeover, but lower than that in the case of a tender offer, our results will still hold.

7. This may be the reason why mergers were much more common before the 60's, when managers held larger proportions of their firms' stock (see Bradley and Kim, '85).

APPENDIX

Lemma 1- proof of uniqueness

To show uniqueness, consider the function for w

$$\text{A1)}\quad w(a) = \begin{cases} \delta\int_a^1 y_a(s)ds + \delta w(a)^2 + \delta\int_{w(a)}^a sds & \text{if } w(a) \leqslant a \\ \delta\int_w^1 y_w(s)ds + \delta w^2 & \text{if } w > a \end{cases}$$

At a=1, $w = \frac{\delta}{2} w^2 + \delta/2 \implies w = 1/\delta - [1/\delta^2 - \delta/2]^{1/2} < 1$

Therefore, this is the appropriate solution for w (since w<1). It follows that at a=1 w<a, and , at a=0 w>a. In fact, as can be seen from the lower part of the RHS of (1), at this point (and at any other point that satisfies a < w), the value of w is independent of the value of a. Thus, it remains to show that, whenever w(a) < a, w(a) is strictly increasing with a slope less than 1 (and continous) in order to guarantee uniqueness. It is easy to see that there exists $\varepsilon > 0$ such that w(a) < a whenever $a > 1-\varepsilon$ and the solution for (1) is the appropriate solution for w, which is the solution for the following equation

$$\text{A2)}\quad w^2 - \frac{2}{\delta} w + 2\int_a^1 y_a(s)ds - a^2 = 0$$

The solution for 2 is given by

$$\text{A3)}\quad w(a) = 1/\delta - [1/\delta^2 - 2A - a^2\ ]^{1/2} \text{ and } A = \int_a^1 y_a(s)ds.$$

Now, $A = \int_a^1 \max\{a, \delta v(s)\}ds = \int_a^{s*} ads + \int_{s*}^1 \delta v(s)ds$

where $s^* = v^{-1}(a/\delta)$. We can now write (1) as follows

$$\text{A4)}\quad w(a) = \delta[\int_a^{s*} ads + \int_{s*}^1 \delta v(s)ds] + \delta/2\ w(a)^2 + \delta/2\ a^2 =$$

$$\delta a(s*-a) + \delta\int_{s*}^1 \delta v(s)ds + \delta/2\ w^2 + \delta/2\ a^2 =$$

$$\delta s*a - \delta/2\ a^2 + \delta\int_{s*}^1 \delta v(s)ds + \delta/2\ w(a)^2.$$

Using the implicit function theorem we obtain

$$[\delta s* + \delta a \frac{\partial s*}{\partial a} - \delta a - \delta^2 v(s*) \frac{\partial s*}{\partial a}]\ da + (\delta w - 1)\ dw = 0$$

which yields

$$\frac{\partial w}{\partial a} = \frac{\delta s* + \delta a\ \partial s*/\partial a - \delta a - \delta^2 v(s*)\ \partial s*/\partial a}{1 - \delta w}$$

Now, $a = \delta v(s^*) < s^*$, and, thus, $\delta s* > \delta a$. In addition,

$$\delta a \frac{\partial s*}{\partial a} = \delta^2 v(s*) \frac{\partial s*}{\partial a} \text{ and, therefore, } \frac{\partial w}{\partial a} = \frac{\delta(s*-a)}{1-\delta w} > 0.$$

Let $g(\delta) = \frac{\partial w}{\partial a}$; $g(1) = \frac{s*-a}{1-w} < \frac{1-a}{1-w} < 1$, and $g(0) = 0$. Also

$$\frac{\partial g}{\partial \delta} = \frac{(s*-a)(1-\delta w) + w\delta(s*-a)}{(1-\delta w)^2} > 0.$$

Therefore, $0 < \frac{\partial w}{\partial a} < 1$ for any $\delta \varepsilon (0,1)$, whenever $a > w$. Thus, if we can now show that there exists an a* for which w(a*) = a*, we are done. If such an a* exists, than $w(a) < a$ for any $a>a^*$ (w increases "slower" than a), and for any $a<a^*$, $w(a) = w(a^*) > a$. Since $w=K > 0$ whenever $w > 0$ (K is constant in a), there exists an a^* s.t. $a^* = K$. It is easy to check that at this a^*, $w(a^*)$ as given by (1) is equal K. Therefore, for any $a > K$, $a>w(a)$, and uniqeness is established. Q.E.D.

Proof of Lemma 3

Given strategies (g,f), the shareholders best response at time τ is not to tender for any $w_\tau < \delta V_t^\tau(a,g,f)$, since they can do better by not tendering, and to tender if $w_\tau \geqslant \delta V_t^\tau(a,g,f)$. Also, given the target shareholders' best response, the acquiring firm will not bid $w_\tau > \delta V_t^\tau(a,g,f)$. Thus, it remains to be shown that the bid may not be below $\delta V_t^\tau(a,g,f)$. In order to do so, we first show that, given the above strategy of the targets' shareholders, the equilibrium $V_{B=1}$ must be constant over time. Indeed, suppose not. Then there exists τ and $\tau+i$ such that $V_{B=1}^\tau(a,g^*,f^*) > V_{B=1}^{\tau+i}(a,g^*,f^*)$. However, it is easy to see that if, at time $\tau+i$, bidder-1 chooses to continue according to $g|_t$, i.e.,

$g'(\cdot,\cdot,\ldots\ldots,w_i,w_i',\ldots\ldots,w_{\tau+i},w_{\tau+i}') \equiv g^*(w_1,w_1',\ldots\ldots,w_\tau,w_\tau')$, then he can obtain $V'^{\tau+i}_{B=1}(a,g',f') = V^{*\tau}_{B=1}(a,g^*|_\tau,f^*|_\tau)$. In addition, due to the compactness of the problem, the optimal bid at time τ is well defined (in any strategy). Therefore, $V_{B=1}$ is constant over time, and so is V_t.

Note also that $V_{B=1} < \delta(a - \delta V_t)$. Indeed, given the above strategies of the targets' shareholders, bidder-1 can win only for the price of δV_t (or higher), in which case he gets $\delta(a - \delta V_t)$. However, with some positive probability he is going to lose and get zero), or get the above payoff a delay. Now, consider the value of bidder-1 if he bids $w_0 \in (0, \delta V_t)$ as the first bid, and, as a second bid he bids the value of bidder-2, if bidder-2's value is above δV_t, and some $w_0' \in (0, \delta V_t)$ otherwise. The following holds

$$V_{B=1}\Big|_{w_0,\ w_0'} = \int_{\delta V_t}^{a} (a-s)ds + \delta^2 V_t \delta V_{B=1} \leqslant$$

$$\int_{\delta V_t}^{a} (a-s)ds + (\delta V_t - w)(a-\delta V_t) + \delta^2 w V_{B=1} = V_{B=1}\Big|_{w_0,\ w'=\delta V_t} <$$

$$\int_{\delta V_t}^{a} (a-s)ds + \delta V_t(a-\delta V_t) = V_{B=1}\Big|_{w=\delta V_t, w'=\delta V_t}.$$

Where $\int_{\delta V_t}^{a} (a-s)ds$ is the expected payoff for bidder-1 upon the arrival of a second bidder with synergy of b, $b \in (\delta V_t, a)$, and $\delta^2 V_t V_{B=1}$ is the expected value if b is lower than δV_t. In the latter event, the shareholders reject bidder-1's bid and he gets the discounted value of the next period profits.

The above inequalites mean that to bid $w = \delta V_t$ and $w' = \delta V_t$ whenever the value of the second bidder is below δV_t yields higher payoff than any other lower bid. Q,E,D.

Proof of theorem 1

If $V_t^\tau(a)$ exists for every $a \geqslant a^*$, we have to replace the function v(s) by $V_t^\tau(s)$. Therefore, $V_t^\tau(a)$ can be written as follows

$$V_t^\tau(a) = \int_a^1 \max\{a,\ \delta V_t^\tau(s)\}ds + \frac{\delta^2}{2}[V_t^\tau(a)]^2 + \frac{a^2}{2}, \quad \delta V_t^\tau(a) < a.$$

For a=1, $V_t^\tau(1) = \frac{1}{2}\left((\delta V_t^\tau(1))^2 + 1\right)$. This equation has a unique root in (0, 1) that is given by

$V_t^\tau(1) = \delta^{-2} - [\delta^{-4} - \delta^{-2}]^{1/2} < 1$. Thus, $w = \delta V(1) < 1$, and the solution is consistent. Now, assume that V is, continous, differentiable and strictly increasing for $a > a^*$. Then, for every $a > a' = \delta V(1)$, $\max\{a, \delta V_t^\tau(s)\} = a$. Therefore, if $a > a'$ we may calculate V(a) as follows

$$V_t^\tau(a) = \int_a^1 a ds + \frac{1}{2}[\delta V_t^\tau(a)]^2 + \frac{1}{2}a^2 = a - \frac{1}{2}a^2 + \frac{1}{2}[\delta V_t^\tau(a)]^2.$$

Hence, the uniqe solution for these V(a)'s is given by

A5) $V_t^\tau(a) = \delta^{-2} - \delta^{-1}[\delta^{-2} - 2a + a^2]^{1/2}$

We later show that this solution satisfies all the required properties. Now, for any $a > a'' = \delta V_t^\tau(a')$ we may calculate V as follows

$$V_t^\tau(a) = \int_a^{a'} a ds + \int_{a'}^1 V_t^\tau(s) ds + \frac{1}{2}[\delta V_t^\tau(a)]^2 + \frac{1}{2}a^2.$$

For all $s > a'$, $V_t(s)$ is given by (5). Therefore, this equation may be solved exactly as (5) and yields a unique solution . Continuing in this way we may compute any $V_t(a)$ for $a > a^*$. Indeed, suppose that V is continous, and satisfies $v(a) < a$ for every $a > a^*$. Then, for any $a > a^*$ there exists $\varepsilon_a > 0$ s.t. $\max\{a, V_t^\tau(s)\} = a$ for any $s \in (a, a+\varepsilon)$. Let $I_a = (a, a+\varepsilon_a)$ and define $I = \cup_{a\in(a^*,1)} I_a$. I is an open cover for $(a^*, 1]$ and, therefore, for $[a+1/n, 1]$ too (for n sufficently large). Thus, there exists a finite cover $\{I_{a1}, I_{a2}, \ldots\ldots\ldots, I_{am}\}$ that covers $[a+1/n, 1]$. Let Ia_i be the open cover that contains a', $a_i < a'$. Clearly,

$$V_t^\tau(a_i) = \int_{a_i}^{a_i+\varepsilon} a_i ds + \int_{a_i+\varepsilon}^{1} V_t^\tau(s)ds + \frac{1}{2}[\delta V_t^\tau(a_i)]^2 + \frac{a^2}{2}$$

Since, for any $a > a_i+\varepsilon$, $V_t^\tau(a)$ is given by (5), we may solve $V(a_i)$ as in (5). Moreover, since $a_j+\varepsilon_{a_j} > a_i+\varepsilon_{a_i}$ if $a_j > a_i$, we can calculate any value $V_t(a)$ for $a > a_i$.

Now, let Ia_j be the open interval that contains a_i ($a_j > a_i$). For any value $a > a_j$ we may calculate $V_t(a)$ as above, given the solution that we obtained for $V(a)$, $a > a_i$. Proceeding in this manner, we may calculate (in a finite number of steps) any value $V(a)$ for $a \varepsilon [a^*+1/n, 1]$. We can do the same for any closed interval $[a^*+1/n, 1]$, $n = n^*, n^*+1, \ldots$. Since the set $(a^*, 1]$ is equal to the (infinite) union of such sets, we may calculate any value $V(a)$ for $a \in (a^*, 1]$. However, given that there exist a unique value $V(a)$ for any a above a^*, it is easy to solve for the (unique) value $V(a^*)$.

It remains to show that V satisfies differentiability and that $V(a) < a$. From the solution (5) it can be seen that V is differentiable (the solution for other values of a has the same structure). Therefore, we now show that $V(a) < a$. First, we show that (5) satisfies this property. let

$$g(\delta) = \delta v(a) = \delta^{-1} - [\delta^{-2} - 2a + a^2]^{1/2}.$$

Now, $g(1) = 1 - [(1-a)^2]^{1/2} = 1 - (1-a) = a$. Also

$$\frac{\partial g}{\partial \delta} = -1/\delta^2 + \frac{1}{\delta^3}[1/\delta^2 - 2a + a^2]^{-1/2} > 0 \iff -1 + \frac{1/\delta}{[1/\delta^2 - 2a + a^2]^{1/2}} > 0$$

But this is true since $1/\delta > [1/\delta^2 - 2a+a^2]^{1/2}$. Now, from the proof of uniqueness in theorem 1 it can be seen that if $V(a) < a$ for any a above a',

$V(a')$ also satisfies this property. Using the continuity of V we can now extend this result to any other $a > a^*$, Q.E.D.

Proof of Theorem 2

Consider any strategy w when the target's strategy satisfies the condition in lemma 3, i.e. $f_\tau =$ yes if $w_t \geq \delta V_t(a,w,f)$ and "no" otherwise. By lemma 3, if w forms a SPE along with the target's strategy, it must satisfy (*) $w_\tau = \delta V_t(a,w,f)$ for every τ. The minimal value for the target is $w=0$ for every τ. With this strategy, however, $\delta V(a) = K > 0$. Therefore, no bid below K may be allowed if condition (*) holds. But, if no bid below K is made, $\delta V(a) = K' > K$. Continuing in this way we may see that the possible first bid is $w(a)$ as given by Lemma 1. The same process may be applied to any bid above $w(a)$. Therefore, the only bid that satisfies lemma 3 is $w_\tau = w(a)$ for every τ. Q.E.D.

Proof of proposition 1

It can be seen that the manager's strategy yields, from every node of the game, a payoff of zero for himself (provided that no tender offer has been made). Therefore, he has no prefered strategy. Given that the manager has this strategy, the acquirer's best strategy is to offer the price zero whenever he says merger (NT). This gives him a payoff of δa. Therefore, whenever it is the manager's turn to make an offer, the acquirer is willing to accept any offer that gives him at least the discount value of

δa, which is $\delta^2 a$. He gets this payoff if he pays $\delta(a-\delta a)$ for the target. Hence the above strategies are SPE.

In order to be precise, however, we should mention that other sets of strategies may be SPE as well. For example, if we replace the manager's first period response by "no", and let him offer $w = 0$ in the second period, while keeping all the responses in the other periods the same, we get another SPE. However, this equilibrium is not "perfect" (see Zelten 1975) in the sense that, if we put some positive probabilities on every strategy of each player (i.e. some "tremble"), these kinds of equilibrium will be eliminated, Q.E.D.

<u>Proof of proposition 2</u>

We first show that the solution given in the proposition is the limit of the games in which a tender offer must be made after the n-th period. Suppose that a tender offer must be made after the first period. Then, only bidder-1 has the opportunity to make a merger offer, and he will use this to offer the manager a merger for δk. The manager knows that, if he rejects, he will get k, discounted for one period. Therefore, his best response is to accept any merger offer that yields any return that is above/equal δk. This is the unique SPE in this game. If the game ends after two periods, it is the manager's turn to move in the second period. Let the acquirer's value from a tender offer be D $(D = \delta V_b)$. Then, the manager can ask a price of $\delta(a-D)$ from the acquirer, i.e., the acquirer will end up with net gain of δD. Given this, the acquirer can offer, in the first period, a price of $\delta^2(a-D)$, and this sequence of offers (together with acceptance by the reciever) is the unique SPE. Extending the same argument, it can be shown that the sequence of offers for the three-period game is δk, $\delta a-\delta^2(a-k)$, $\delta^2 a-\delta^3(a-k)$, and for the four-period game is

$\delta(a-D)$, $\delta^2(a-D)$, $\delta a-\delta^2 a+\delta^3(a-D)$, $\delta^2 a-\delta^3 a+\delta^4(a-D)$. Continuing this way, one can calculate the sequence of SPE offers of the game that ends up after the n-th period. The first-period-offer of the game that ends after n period, n odd, is

$$\delta^2 a - \delta^3 a + \delta^4 a - \delta^5 a +, \ldots\ldots\ldots\ldots, - \delta^n(a-k)$$

and, for n even is

$$\delta^2 a - \delta^3 a + \delta^4 a - \delta^5 a + \delta^6 a -, \ldots\ldots\ldots\ldots, + \delta^n(a-D).$$

The limit for both offers, as n goes to infinity, is $\delta^2 a\ (1/1+\delta)$. Therefore, the payoff for the acquirer is $\delta[a - \delta^2 a\ (1/1+\delta)]$.

We now show that this outcome can be supported by strategies that form SPE in the infinite game. For this, consider the following strategies

i) For τ odd, $g^a_\tau \equiv (NT, \delta^2 a/1+\delta)$, and

$$f^a_\tau = \begin{cases} \text{yes} & \text{if } g^a_\tau = (NT, w), \quad w \geq \delta^2 a/1+\delta \\ \text{no} & \text{otherwise} \end{cases}$$

ii) For τ even, $g^a_\tau = \begin{cases} \text{yes} & \text{if } f^a_\tau = w, \quad w \leq \delta^2 a/1+\delta \\ \text{no} & \text{otherwise} \end{cases}$ and

$$f^a_\tau \equiv \delta^2 a/1+\delta$$

Note, first, that we are assuming $\delta(a-\delta w(a)) < \delta^2 a/1+\delta$, so that there exists no τ such that the acquirer has positive profits from making a tender offer. Thus, it can be checked that the above strategies indeed form SPE.
Q.E.D.

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Figure 1

The chain of events that take place in the first period, after the acquirer has decided to make a public tender offer is as follows:

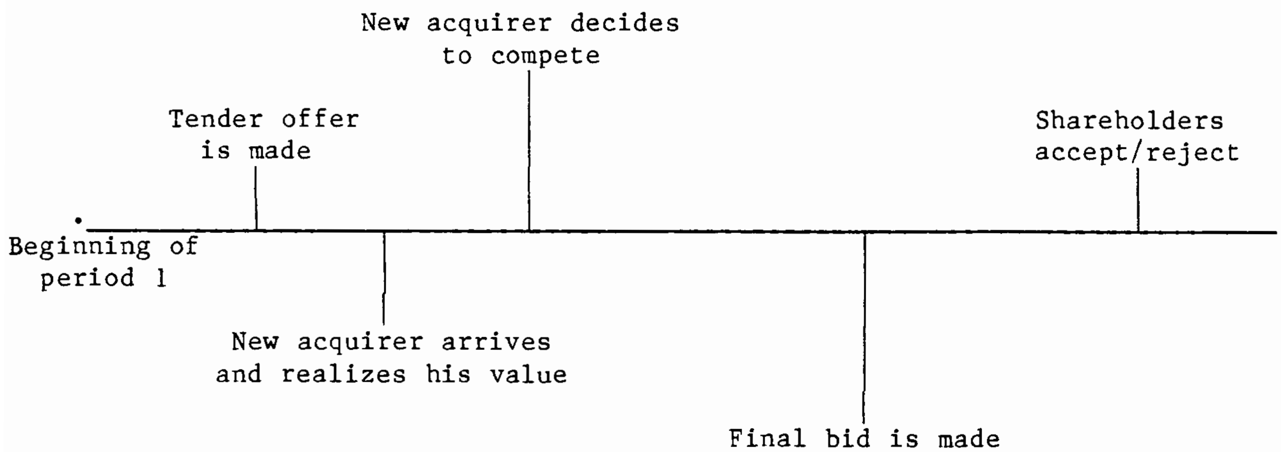


Figure 2

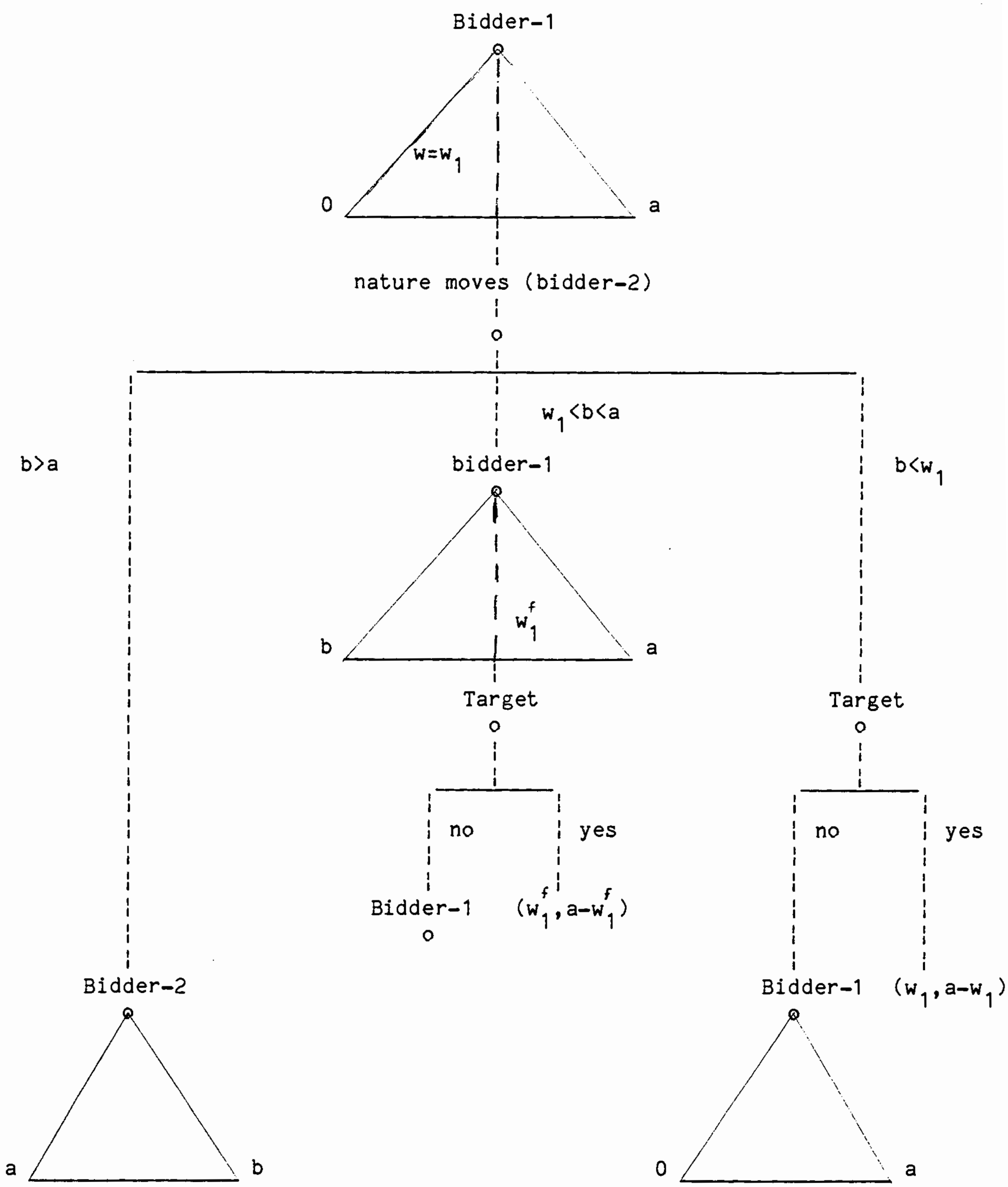
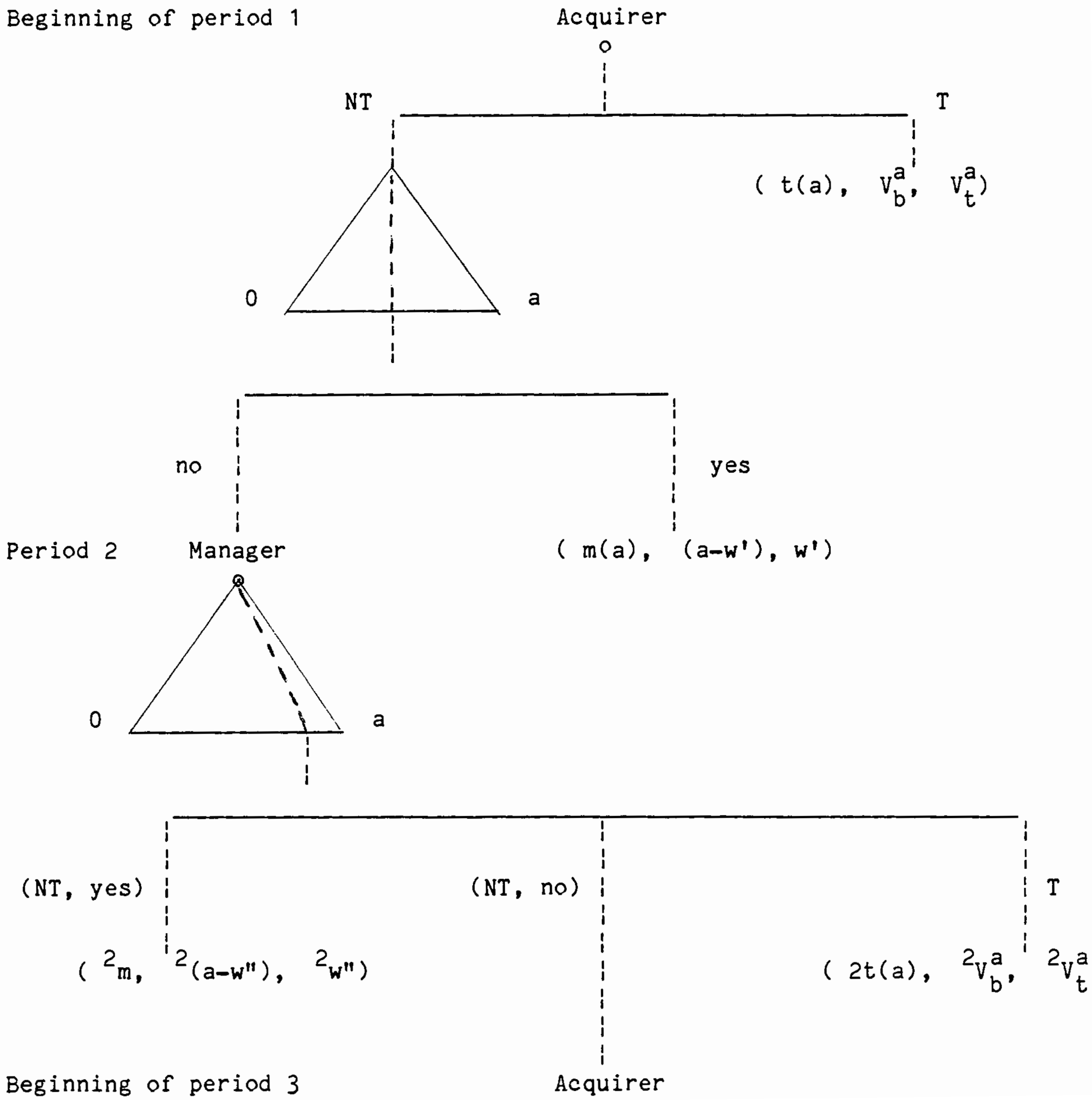

Bidder-1
w=w1
0
a
nature moves (bidder-2)
b>a
w1<b<a
b<w1
bidder-1
w1f
b
a
Target
Target
no
yes
no
yes
Bidder-1
(w1f, a-w1f)
Bidder-2
Bidder-1
(w1, a-w1)
a
b
0
a

Figure 3


Beginning of period 1
Acquirer
NT
T
(t(a), V_b^a, V_t^a)
0
a
no
yes
Period 2
Manager
(m(a), (a-w'), w')
0
a
(NT, yes)
(NT, no)
T
(^2m, $^2(a-w'')$, $^2w''$)
(2t(a), $^2V_b^a$, $^2V_t^a$)
Beginning of period 3
Acquirer