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Greenmail, white knights, and shareholders' interest

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This article develops a model in which greenmail and other forms of management resistance to takeovers can benefit shareholders. In particular, discouraging some potential acquirers may increase shareholder wealth because it encourages others to pursue a combination with the target. This occurs because the number of competing acquirers is reduced and because resistance can signal that the target does not have access to a "white knight." This signalling effect may explain why share prices decline after management resists a takeover, even when such resistance is value-maximizing in the long run.

1. Introduction

■ The surge of corporate acquisitions in the early 1980s has tested the loyalty of corporate managers to their shareholders. If managers fail to resist a takeover, they often lose their jobs, while their defeat of a lucrative offer from a corporate raider can be very costly to shareholders. In practice, managers frequently resist the sale of their firms, even when the bids substantially exceed current market value. Such behavior in the face of large premiums has often been taken as evidence that managers have served their own interests at shareholders' expense (Jensen and Ruback, 1983; Bebchuk, 1982; Kirkland, 1984). The popularity of this view has led to a range of legislative proposals designed to restrict the use of certain tactics managements use to resist takeovers.[1] These developments warrant a closer look at the effects of management resistance on shareholder welfare.

Perhaps the most prominent example of a managerial action commonly believed to be in conflict with shareholders' interest is the payment of greenmail (Boland, 1984; Kirkland, 1984). This practice permits managers to avert a takeover by repurchasing a potential acquirer's shares, usually at a substantial premium over the market price. Typically, the potential acquirer also signs a standstill agreement, which prohibits him from owning any of the target firm's shares, often for as long as five years.

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[1] Mikkelson and Ruback (1985) report that legislation pending in the 99th Congress aimed at curbing targeted share repurchases includes S286, S420, S476, and HR1003.

Greenmail is one of a range of techniques that also include antitrust litigation and the use of so-called "poison pills"[2] and that probably have the effect of keeping one or more potential acquirers from bidding for the target, in addition to entailing large direct costs. As such, these tactics appear to serve only to facilitate managerial entrenchment at shareholders' expense. For this reason, many observers oppose the use of such defenses.

In this article we investigate the claim that eliminating a bidder cannot serve the interests of the shareholders of the target firm, and find it to be false. Specifically, we assume throughout that management acts in the interest of shareholders, and show how defensive tactics, particularly the payment of greenmail, can be used to raise the expected takeover premium, and thus to promote shareholder welfare. Our analysis implies that evidence often taken to show that greenmail harms the shareholders of the firm that pays it is, in fact, consistent with the view that it helps them. Although our formal analysis focuses on the case of greenmail, our findings apply to any action that effectively eliminates a potential acquirer.

One way the target management can increase the takeover premium is by encouraging a bidding contest. Sometimes it does this by inviting uninformed potential acquirers to bid and providing them with the information necessary to realize a profit from taking over the target. At other times the target management may encourage other investors to explore the possibilities of an acquisition themselves. But potential acquirers may be reluctant to gather costly information if they anticipate a bidding war for the target. By eliminating a likely bidder, the target may induce other firms to study the possibility of taking it over. The increased likelihood of bids from these firms may be sufficient to compensate shareholders for the elimination of a potential acquirer as well as for the direct costs of discouraging him. In the specific case of greenmail, managers can increase the expected gains from a takeover by buying the stake of one potential acquirer, driving him away, and thus encouraging others to explore taking over the firm.

But this is not the only way in which eliminating one potential acquirer can encourage others. If the target resorts to elimination selectively, depending on its private information, it can credibly transmit this information to the market and thus encourage others to explore taking it over. In particular, we show that eliminating a potential acquirer may enable the target to signal that it has not yet discovered the source of gains from a takeover by a "white knight."

The term "white knight" typically refers to a potential acquirer invited by the target management to top an initial offer opposed by that management. That the white knight waits for an initial offer and for an invitation from the target to bid suggests that he needs the cooperation of the target to profit maximally from taking over. Following Jensen and Ruback (1983), we assume that the target's cooperation is necessary because it possesses private information about the source of gains from a takeover by the white knight. Moreover, we argue that the target may profit from delaying the release of that information to the relevant potential acquirer to promote information acquisition by others. In this way the target "conceals a white knight" in hopes that another bidder will surface so that the target can capture a larger share of the takeover gains.

Because potential acquirers fear a bidding contest with a white knight, the target will do what it can to make them think it is weak (i.e., without a white knight). For, if acquirers believe that there is a white knight, they will curtail or even stop their acquisition of infor-

[2] One example of swallowing a poison pill is the target's takeover of a third party for the purpose of making its own firm an unattractive takeover candidate. Such an acquisition can discourage a potential acquirer for at least two reasons. First, by acquiring a competitor of a potential acquirer, the target can create formidable antitrust obstacles to the acquirer's takeover attempt. Second, swallowing a poison pill can vastly increase the amount of debt the target holds and thus render the financing of a takeover by cash-constrained potential acquirers even more difficult. Other examples include financial restructurings, issue of "poison pill preferred" stock that substantially raises the takeover costs to an undesired acquirer, and the selloff of divisions that attract the undesired suitor.

mation about the target. On the other hand, if a target that has not found a white knight can credibly communicate this fact to the market, it can encourage information acquisition. This can be accomplished, for example, if a weak target gains from paying greenmail, but a strong target does not.

Our analysis suggests a *caveat* for those gauging the prudence of defensive maneuvers by the response of share prices to such actions. If the action taken by management reveals its private information (e.g., that it has not found a white knight), a subsequent fall in the share price may just be the market's response to learning this information, rather than a negative evaluation of the action itself. In fact, we find that in a signalling equilibrium, share prices always fall after the payment of greenmail, even when managers are maximizing the long-run value of the firm. Hence, our analysis casts doubt on the event studies that conclude that paying greenmail is not in shareholders' interest on the basis of the observation that share prices often fall immediately afterwards (Dann and DeAngelo, 1983; Bradley and Wakeman, 1983).

While our analysis shows how greenmail can benefit target shareholders, we do not claim that it is never abused. Nor do we even claim that shareholders are better off than they would be if the payment of greenmail were prohibited. For instance, shareholders of some target firms might be better off on average if a means of signalling management's private information about white knights did not exist. Thus, no clearcut welfare judgments emerge from our analysis.

2. The model

■ In this section we present a game that allows us to illustrate the proposition that elimination of potential acquirers of a firm can serve the interests of its shareholders. To this end, we shall assume throughout that management maximizes shareholder wealth, and show how the payment of greenmail can be an optimal strategy, given this objective.

The players in our game are the target management (T), atomistic target shareholders, and potential acquirers.[3] We assume that potential acquirers might have opportunities to create value by taking over the target, but that the possibility of such gains must be uncovered through costly acquisition of information.[4] Although we do not specify the sources of takeover gains, they can be either synergistic, as in the case of consolidation of R&D labs or of marketing networks, or, alternatively, arising from management improvement. In either case the target and potential acquirers know each others' identities, but must invest resources to discover the sources of gains.

A potential acquirer who finds the source of takeover gains can attempt to take over the target. Similarly, if the target discovers that another firm can profitably take it over, it can reveal the information to that potential acquirer, and invite him to bid, although it need not do so at the time of the discovery. Since early disclosure of information discourages other potential acquirers from seeking information, the target would prefer to delay an invitation to a white knight until other potential acquirers have invested in information acquisition so as to raise the likely number of bidders when it is sold in an auction.

Potential acquirers come in two types, distinguished by the size of the gains that can be obtained through their takeover of the target. Acquirers of high type produce gains Z_H if they discover useful information, while low-type acquirers can only produce gains $Z_L < Z_H$. We make the simplifying assumption that Z_L and Z_H are common knowledge

[3] We do not attempt to explain formally why one firm assumes the role of target while the other assumes the role of acquirer. One possibility is that whichever firm can appropriate more of the gains by taking over the other becomes the acquirer. Other explanations have to do with imperfect capital markets and transaction costs.

[4] These information costs are likely to include investment bankers' fees and the opportunity costs associated with not exploring other acquisitions and, more generally, not engaging in other long-term planning.

even before any information acquisition takes place. Lastly, we assume that the gains are mutually exclusive: a takeover by one potential acquirer precludes realizing a gain with another.

We consider a game with exactly two potential acquirers of the high type (called $H1$ and $H2$) and one of the low type (called L). L is the potential acquirer to whom the target pays greenmail to encourage information acquisition by $H1$ and $H2$.[5] Since greenmail discourages L's information acquisition through the removal of his stake, L starts the game owning some proportion α of the target firm's shares.[6] $H1$ and $H2$, on the other hand, are assumed to own no shares. All players are assumed to be risk-neutral and lacking time preference.

The game proceeds in three stages; its rules are described below and summarized in Table 1.

Before the game starts, it is common knowledge that the three potential acquirers have not yet identified the source of takeover gains and are not, therefore, prepared to bid for the target.[7] Two cases are of interest. In the first T has found a source of gains from a

TABLE 1 Summary of the Game

Information Structure When the Game Starts	Stage 1	Stage 2	Stage 3
The target (T) either knows how $H1$ or $H2$ (but not both) can profitably take it over (strong T) or it does not have such knowledge (weak T). Whether T is strong or weak is private information, not known to $H1$, $H2$, or L. None of $H1$, $H2$, or L knows he can profitably take over T.	T either offers L a greenmail payment R or does not make an offer. If T offers greenmail, L accepts or rejects the offer. H's either observe agreement at price R or no agreement.	The following occur simultaneously: T acquires information about possible takeover by any H that T does not already know can profitably take it over. H's and L (if he has not received greenmail) each choose how much information to acquire about the takeover of the target.	T discloses its findings to $H1$ and $H2$. T is then sold off in an auction.

[5] Our convention that the potential acquirer who is removed by greenmail is one with a low-valued gain is not essential to our argument; it merely preserves the interpretation of H's as potential white knights. Further, we have two H's instead of one to give a more accurate picture of our signalling story. In that story the target eliminates L from the bidding to signal that it has not found a source of gains from a takeover by any other potential acquirer. If there were only one H, it would obviously never be in the interest of T that has already found a source of gains from a takeover by H to eliminate L. In contrast, with two H's, T that has one H as a white knight might want to eliminate L and thus pretend it has no white knight to encourage information acquisition by the other H. If the strong T wants to pretend that it is weak at any greenmail price, then no signalling equilibrium would exist.

[6] If L did not own a stake, then he would have no incentive to acquire information about the target when he knows with probability 1 that T has a white knight (as in our separating equilibrium). But the fact that T knows that it has a white knight with probability 1 or probability 0 is a stylized feature of the model, and, in a more general framework, the existence of a separating equilibrium would not require that L have a stake in the target firm.

[7] We do not analyze payments of greenmail subsequent to a takeover bid. In practice, such instances are relatively rare. Of the 94 large block repurchases studied by Mikkelson and Ruback (1985), only five took place after a tender offer by the party from whom the block was repurchased. When a takeover by L at the beginning of the game is possible, T can send a signal to H's by its choice among three options: recommend acceptance of an offer from L, remove L as a potential bidder, or recommend rejection of L's offer but do not remove him. A model with two of these options, excluding greenmail and white knights, is presented by Baron (1983).

takeover by one of the two H's (a potential white knight),[8] in which case we call T strong. In the second case no potential white knight has been found, in which case T is weak. The prior probability that T is strong, denoted by q, is common knowledge.[9]

In the first stage of the game T can eliminate L by making an acceptable take-it-or-leave-it offer for L's stake and concluding a standstill agreement with L for the entire duration of the game. T might want to do this to encourage the H's to expend additional resources to acquire information. Whatever agreement is reached is observed by the H's.

In the second stage the target and potential acquirers (including L, if he is not eliminated) simultaneously acquire information concerning their respective sources of takeover gains. Since we focus primarily on the incentives of the H's to acquire information, we make the following convenient assumptions about the players' information acquisition technologies. A high-type H_i, for a cost $c(\mu_i)$, obtains a probability μ_i of finding the source of takeover gains. The function c is increasing and convex with $c(0) = 0$. We give H's a continuum of information acquisition levels so that we can deal only with pure-strategy equilibria that are symmetric in the information-acquisition strategies of H's. L can pay a fixed cost, c_L, to obtain a probability p_L of finding the source of gains. Finally, T's information acquisition is costless, with probabilities of finding gains with $H1$ and $H2$ independent and equal to p_T.[10] We also assume that T does not explore possibilities of a takeover by L.[11]

In the final stage of the game, T shares all his findings with potential acquirers, and the target firm is sold. The mechanics of a tender offer follow Grossman and Hart (1980), modified by the possibility of multiple bidders: First, while obtaining 50% of the target's shares is sufficient to gain control of the firm, all bidders must offer to take any of the target's shares that are tendered.[12] Second, when there are multiple bidders for the target, we have an open (English) auction. The bid that offers the highest total payment for shares not held by L wins the auction and is submitted to the target shareholders as a tender offer. Third, we assume that if the high bidder's offer is not accepted by the majority of target shareholders, no further bids are made. Fourth, all target shareholders with the exception of L are atomistic in the sense that they view the decision to tender as having no effect on the outcome of a tender offer. Finally, we consider only tender offers that would be successful even if all shareholders believed that they would be successful. This rational-expectations

[8] If T has found sources of gains from takeovers by both $H1$ and $H2$, it would disclose this information to both of them and solicit bids from both. By bidding against each other, $H1$ and $H2$ deliver to the target's shareholders the highest possible takeover premium. If T has found the source of gains from a takeover by only one H, it is in its interest to conceal this information, so that the other H is more likely to become informed.

[9] The model would be more complicated if T's access to a white knight was not the only source of asymmetric information. For example, if L has private information about the value of gains from his takeover of the target, his acceptance of greenmail might reveal some of that private information. This would be taken into account when T decides what offer (if any) to make and when H's decide how much information to acquire. In that framework it is likely that failure to reach an agreement on greenmail would still dampen information acquisition by the H's, since it would signal that L has large takeover gains.

[10] Assuming independence of information acquisition outcomes is not so restrictive as it sounds, since our analysis permits even an exact functional relationship between success probabilities (or information acquisition technologies) of different parties. For example, whenever the target itself is very likely to find the source of gains from a takeover by an H (p_T is high), our set-up allows the information acquisition technologies of the H's to mirror the ease of finding these gains by having $c(\mu)$ be fairly small even for μ close to 1.

[11] Neither of these assumptions about T's information acquisition is essential.

[12] Given our assumption that the bid that offers the highest total value to nonbidding target shareholders wins, we could have just as easily allowed tender offers for 51% rather than 100% of the shares. In that case bids would be evaluated not only on the basis of premiums for the controlling 51% block, but also on the value of the firm to those staying on as minority shareholders. In fact, there is strong empirical evidence that in bidding contests where two-tier offers are made, the bid that almost always wins is the one that gives shareholders the best deal averaged over both tiers of the offer. See the Securities and Exchange Commission (1984).

assumption rules out tender offers that succeed at a low price only because shareholders fear that they will fail.[13]

For a tender offer to succeed, atomistic target shareholders must be paid a tender price high enough that it is not in their interest to retain their shares and profit from the part of the gains expected to accrue to those shares. While the potential acquirer will seek to minimize the proportion of gains accruing to target shareholders, the courts will limit his ability to do so. Accordingly, we assume that the potential acquirers of high and low types can appropriate at most $(1 - \beta_H)$ and $(1 - \beta_L)$ of the total gains, respectively, $(0 \leq \beta_H, \beta_L \leq 1)$. If the takeover is aimed at replacing inefficient management,[14] β is probably close to 1, while for the case of synergy, a much smaller β is probably appropriate.[15]

Under these assumptions we can determine the outcomes of bidding for the target (the last stage of the game). If no potential acquirer has learned how profitably to take over the target, it remains unsold. If only a single potential acquirer has learned the source of takeover gains (either on his own or from being informed by T), he must pay $\beta_H Z_H$ to take over the firm if he is an H, and $\beta_L Z_L$ if he is an L. If both H's decide to bid, target shareholders receive Z_H (of which L gets a proportion α, if he still owns his shares).

If one H and one L each know how to raise value through a takeover, matters are more complicated. Recall that L holds a proportion α of the target's shares and that the bid that wins in the auction is the bid that offers the most to target shareholders *other than L*. Hence, H can win the auction if he offers to pay Z_L for 100% of the shares.[16] For, to match H's offer to other shareholders, L would have to offer $(1 - \alpha)Z_L$ for all remaining shares, and thus would make a profit αZ_L, which is exactly what he would get by tendering his shares to H. Since H must also offer other shareholders enough so that they do not try to free-ride, his required bid is max $(Z_L, \beta_H Z_H)$. Throughout, we take $Z_L > \beta_H Z_H$. If this inequality is not satisfied, the presence of L does not affect the price that the H's pay for the target. As a result, the removal of L only influences information acquisition by H's to the extent that it can serve as a signal about T's access to a white knight. We therefore assume that $Z_L > \beta_H Z_H$ to provide a more complete characterization of the possible benefits of eliminating a potential acquirer.

3. Analysis of the game

■ **Preview of the analysis and some simple examples.** To serve its shareholders T wants the H's to acquire additional information, since their discoveries raise its shareholders' payoffs. But L's participation in the bidding raises the minimum price at which an H can hope to acquire the target from $\beta_H Z_H$ to Z_L. In addition, T may be concealing a white knight. If the H's knew that T had already found a gain from a takeover by one of them, neither would acquire information. In general, the higher the probability they assign to this, the less they will spend on acquiring information.

To promote the acquisition of information by the H's, T can repurchase L's initial stake, and conclude a standstill agreement that prevents L from acquiring the target's shares for the rest of the game.[17] With L permanently removed, the H's might spend more to

[13] Shareholders will demand a lower price if they think the tender offer will fail, since if the tender offer fails, there are no gains on which to free-ride.

[14] Grossman and Hart (1980) and Shleifer and Vishny (1986) discuss this case.

[15] We assume that the tender price is independent of whether T or its potential acquirer has discovered the source of takeover gains.

[16] We do not allow L to bluff to raise H's bid for his shares. To get H to bid beyond $\beta_H Z_H$, L would have to provide the market with convincing evidence that he has discovered a takeover gain.

[17] Our analysis assumes that a buyback of L's stake coupled with a standstill agreement effectively removes L from bidding. Once the H's have acquired their information, however, T has an incentive to abrogate the

acquire information about the target firm. Even in the absence of the possibility that T has a white knight, this might justify elimination of L. The following simple numerical example illustrates this possibility.

Example 1. The structure of this example is much simpler than that of the general model. Suppose T can never acquire information about possible takeovers, so T cannot possibly have a white knight: $q = 0$. Suppose also that there is only one H and one L. The information-acquisition technology is discrete, rather than continuous as in the general model. For a price $c_H = .48$, H can acquire the probability $p_H = .5$ of discovering how a gain $Z_H = 2$ from a takeover of the target firm can actually be realized. Similarly, for a price $c_L = .12$, L can acquire a probability $p_L = .5$ of finding a way to take over the target firm and realize $Z_L = 1.2$. Suppose $\alpha = 0$: L has no initial stake. Suppose also that $\beta_H = \beta_L = .5$, so that the target's shareholders cannot free-ride on half of the gains from a takeover by H or L. We shall show that in this example eliminating L from competing for the target is necessary and sufficient to induce H to become informed, and that such elimination is desirable for the target shareholders.

Note first that $Z_H\beta_H = 1 < 1.2 = Z_L$, so the presence of L can indeed raise the price that H must pay for the target. If L acquires information, then H does not want to do so. To see this write H's gain from information acquisition when L becomes informed as $p_Hp_L(Z_H - Z_L) + p_H(1 - p_L)(1 - \beta_H)Z_H$. Thus, H earns $Z_H - Z_L$, if he competes against L in a bidding war (with probability p_Hp_L), and he earns $(1 - \beta_H)Z_H$, if he acquires the target firm without competition (with probability $p_H(1 - p_L)$). H's expected gain from information acquisition in this case equals .45, which is smaller than $c_H = .48$. Hence, H does not become informed. In contrast, L acquires information, even if H does the same, since L's net gain from information acquisition in this case is $p_L(1 - p_H)(1 - \beta_L)Z_L - c_L = .03$. The only Nash equilibrium in the second stage, then, is for L, but not H, to become informed. In this case, the target's shareholders' expected payoff is $p_L\beta_LZ_L = .3$.

On the other hand, if L is removed, H acquires information, since his gain, $p_H(1 - \beta_H)Z_H = .5$, exceeds his cost, $c_H = .48$. To buy L out, T must offer L his reservation payoff, which equals the payoff to L when he alone becomes informed, or $p_L(1 - \beta_L)Z_L - c_L = .18$. If T buys L out, its shareholders' expected payoff is $p_H\beta_HZ_H = .5$, which exceeds their expected payoff if L is not removed, .3, by more than the greenmail payment of .18. Thus, T should pay greenmail to benefit its shareholders, who now get .32 instead of .30.

This example illustrates the removal motive for paying greenmail, which may justify the payment of greenmail, even when there is no need to signal the absence of a white knight. Signalling that T is weak is another motive for greenmail. For if it pays T to buy L out when T is weak, but it does not pay T to do so when T is strong, the payment of greenmail can convince H's that T is not concealing a white knight. In this case, H's spend more on acquiring information.

To analyze the possibility of signalling, we study pure-strategy, perfect Bayesian equilibria of the greenmail game. Such equilibria are defined as a collection of players' beliefs at each node and of actions at each information set such that beliefs are confirmed by actions via the Bayes rule, and actions are optimal, given beliefs.

In a Bayesian equilibrium each player's information-acquisition strategy maximizes his expected payoff, given others' strategies and his belief π_i that T is strong. The posterior

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agreement and to invite L to become informed. If the H's know that L will eventually bid despite the agreement, the payment of greenmail is ineffective. As a result, we assume that greenmail does exclude L from bidding. Generally, greenmail ensures that, for a fairly long period of time, L will be unable to accumulate shares or pursue an acquisition, while T is encouraging other potential suitors. We maintain that, faced with such a situation, most corporate raiders are likely to pursue opportunities elsewhere.

π_L depends on whether L receives a greenmail offer, and, if so, how large, while π_H is based on the observation by the H's of the greenmail price or of the absence of an agreement. We write $\pi_L(N)$ and $\pi_L(R)$ for L's posterior beliefs that T has a white knight, given that L has observed no offer or an offer at price R. Similarly, $\pi_H(N)$ and $\pi_H(R)$ stand for the beliefs of the H's when they observe no agreement or an agreement at a price R. We impose the unanimity restriction that players with the same information hold the same beliefs. This implies that the H's hold the same beliefs and that, for any offer R that L accepts, $\pi_L(R) = \pi_H(R)$.

An equilibrium in which T pays greenmail when it has not found a white knight and does not when it has found one is called separating. In such an equilibrium the payment of greenmail convinces potential acquirers that T is weak. The following example (also slightly simplified from our general model) illustrates the signalling of weakness through paying greenmail.

Example 2. We assume that L has already found a source of gains from taking over the target worth $Z_L = .4$. There are two H's with gains $Z_H = 1$. For a cost $c_H = .1$, each H can obtain a probability $p_H = .7$ of finding a way to realize Z_H by taking over the target. Also suppose that $\beta_L = \beta_H = p_T = 0$. That is, the target has no bargaining power without an auction and no prospect of finding a white knight, if it does not have one already. T must decide whether to eliminate L from the bidding by paying him his profit from rejecting a take-it-or-leave-it offer.

For the proposed parameter values, a separating equilibrium exists. One set of beliefs that supports this equilibrium is $\pi_H(N) = \pi_L(N) = 1$, $\pi_H(R_{sep}) = \pi_L(R_{sep}) = 0$, $\pi_H(R) = 1$ for all $R < R_{sep}$, and $\pi_H(R) = 0$ for all $R > R_{sep}$. R_{sep} in this case is equal to $Z_L = .4$. If H's do not observe an agreement at R_{sep} or above, they do not acquire information. Since $p_T = \beta_L = 0$, when $\pi_L = 0$, L expects to appropriate the entire gain Z_L if he rejects an offer. If the target removes L at the price R_{sep}, H's believe $\pi(R_{sep}) = 0$ and choose to become informed, since $p_H(1 - p_H)Z_H - c_H = (.7)(.3)1 - .1 = .11 > 0$.

The removal decision of the weak target is easy: If it does not remove L, it gets no takeover premium, since H's do not get informed and $p_T = \beta_L = 0$. If it removes L at the price $R_{sep} = .4$, a weak T gets an expected takeover premium of $p_H^2 Z_H = .49$, which renders the removal of L profitable.

On the other hand, the strong target gets a takeover premium of $Z_L = .4$, even if it does not remove L and H's do not get informed. If it does remove L, it gets an expected takeover premium of $p_H Z_H = .7$. On net, the strong target gains .3, which is not enough to make paying $R_{sep} = Z_L = .4$ worthwhile.

This example illustrates that strong and weak targets have systematically different net gains from removing L and causing H's to revise their beliefs. In this case the payoff to the strong target from the certain auction between L and the white knight is sufficiently large than the target is unwilling to pay greenmail to remove L and promote a bidding contest between the H's. On the other hand, the weak target receives no takeover premium unless it removes L. This makes the prospect of even a .49 probability of an auction between H's attractive enough to justify the payment of Z_L. It is this discrepancy between the gains from eliminating L for the two types of targets that makes signalling possible.

Separating equilibria are not the only possible outcomes of the greenmail game. In a *standstill pooling* equilibrium, T pays greenmail regardless of whether it has found a white knight. Thus, its type remains hidden from the market, even after elimination of L. Finally, in a *no-standstill pooling* equilibrium, T does not make a greenmail offer regardless of its type. Below, we shall analyze the conditions for the existence of equilibria of various types.

□ **Equilibria of the game.** To characterize possible equilibria, we proceed in three steps. First, we analyze simultaneous information acquisition decisions of H's and L. We then calculate the price that L will accept for his shares. Lastly, we examine T's choice.

Consider the choice of an H first. When L is not paid greenmail and the H's correctly believe that L is acquiring information about the target, H_i chooses his information acquisition intensity μ_i, interpreted here as the probability of finding a source of takeover gains, to

$$\underset{\mu_i}{\text{Max}}\ (1-\pi_H)(1-p_T)^2(1-\mu_j)\mu_i[p_L(Z_H-Z_L)+(1-p_L)(1-\beta_H)Z_H]-c(\mu_i). \tag{1}$$

The four factors multiplying the expression in brackets represent the probability of the joint event that H_i finds the source of gains from taking over the target, that the target itself does not find the source of those gains, and that information leading to the gain Z_H from the acquisition of the target by H_j is not discovered. This is the only set of circumstances in which H_i profits from acquiring information. The expression in brackets is the payoff to H_i from the two good outcomes. If L discovers useful information, then H_i must bid Z_L for the firm and earns $Z_H - Z_L$. If L does not enter the bidding, H_i makes $(1 - \beta_H)Z_H$. Throughout, we look only at symmetric strategies for H_1 and H_2, i.e., $\mu_1 = \mu_2$. The information acquisition intensity $\mu(\pi_H, L)$ that gives such a symmetric solution to (1) is given implicitly by

$$(1-\pi_H)(1-p_T)^2(1-\mu(\pi_H,L))[p_L(Z_H-Z_L)+(1-p_L)(1-\beta_H)Z_H]-c'(\mu(\pi_H,L))=0. \tag{2}$$

Analogously, we obtain an H's information acquisition intensity $\mu(\pi_H, -L)$ when greenmail is paid. From the problem,

$$\underset{\mu_i}{\text{Max}}\ (1-\pi_H)(1-p_T)^2\mu_i(1-\mu_j)(1-\beta_H)Z_H-c(\mu_i), \tag{3}$$

we get the first-order condition,

$$(1-\pi_H)(1-p_T)^2(1-\mu(\pi_H,-L))(1-\beta_H)Z_H-c'(\mu(\pi_H,-L))=0. \tag{4}$$

It is clear from (2), (4), and our assumption that $c' > 0$ and $c'' > 0$ that the information acquisition intensities of the H's are decreasing in π_H and are higher for the same π_H when L is not getting informed (since $\beta_H Z_H < Z_L$). To preserve the interpretation of μ as a probability, we constrain it to lie between 0 and 1 when (2) or (4) is not satisfied with equality. For example, when $\pi_H = 1$, we have $\mu = 0$.

Turning next to L, one can show that his gain from acquiring information, for a given π_L and μ, can be written as:

$$\begin{aligned}\Delta(\pi_L,\mu,\alpha)=\alpha p_L(Z_L-\beta_H Z_H)[\pi_L(1-p_T)(1-\mu)+2(1-\pi_L)(1-\mu)(1-p_T)(\mu+(1-\mu)p_T)]\\ +p_L[(1-\beta_L)Z_L+\alpha\beta_L Z_L](1-\pi_L)(1-p_T)^2(1-\mu)^2-c_L.\end{aligned} \tag{5}$$

This expression reveals that L's gain from information acquisition consists of getting Z_L, rather than $\beta_H Z_H$, for his own shares when one H and L bid and of getting both $\alpha\beta_L Z_L$ on his own shares and all of $(1 - \beta_L)Z_L$ when neither H bids. Thus, L chooses to acquire information when Δ is positive. In pure-strategy equilibria, either $\Delta > 0$ when evaluated at $\mu(\pi_H, L)$ from (2), or $\Delta \leqslant 0$ when evaluated at $\mu(\pi_H, -L)$ from (4).

As we specified the game, T makes an offer of the standstill price, and L can either accept or reject it. To determine the minimum offer L will accept, we need to calculate his profit if he declines an offer. Included in this reservation profit are the expected payoff to L if he ends up tendering his stake α to an H who takes over, and his expectation of $\alpha\beta_L Z_L + (1 - \beta_L)Z_L$ if he himself takes over. The likelihoods of these various outcomes are determined in part by $\pi_L(R)$—the probability that L attaches to T's being strong once T has made the offer R—and by information acquisition decisions of L and of H's if L were to decline the offer. These decisions are based on the probability $\pi_H(N)$ that T, which has not paid greenmail, is strong, and on the assumption that L is becoming informed. Thus, from (2) we get $\mu(\pi_H(N), L)$.

Overall, L's reservation price is

$$\bar{R}(\pi_L(R), \mu, \alpha) = \alpha Z_H[\pi_L(p_T + (1-p_T)\mu) + (1-\pi_L)(p_T^2 + 2p_T(1-p_T)\mu + (1-p_T)^2\mu^2)]$$
$$+ [\alpha p_L Z_L + \alpha\beta_H Z_H(1-p_L)][\pi_L(1-p_T)(1-\mu)$$
$$+ 2(1-\pi_L)(1-p_T)(1-\mu)(\mu + (1-\mu)p_T)]$$
$$+ [(1-\beta_L)Z_L + \alpha\beta_L Z_L][(1-\pi_L)p_L(1-p_T)^2(1-\mu)^2] - c_L, \quad (6)$$

where $\mu = \mu(\pi_H(N), L)$ is the information acquisition intensity chosen by H's when L is not paid greenmail. For example, when a separating equilibrium is played, failure to use greenmail leads to the belief that T is strong with probability 1, that is, $\pi_H(N) = 1$. In this case the H's do not acquire information at all, i.e., $\mu(\pi_H(N) = 1, L) = 0$. Further, upon seeing any separating greenmail offer, L and H's must believe that T is weak with probability 1. Any acceptable separating offer must therefore exceed $\bar{R}(\pi_L = 0, \mu(1, L) = 0, \alpha)$.[18]

Now that we know what kind of information acquisition T's actions induce, and how much greenmail can cost it, we are ready to analyze the choices of strong and weak targets. We start with expressions for T's payoff functions exclusive of payments to L (subscripts indicate T's type):

$$V_w(\mu(\pi_H, -L), -L) = [p_T^2 + 2p_T(1-p_T)\mu + (1-p_T)^2\mu^2]Z_H$$
$$+ [2(1-p_T)(1-\mu)(\mu + (1-\mu)p_T)]\beta_H Z_H; \quad (7)$$

$$V_w(\mu(\pi_H, L), L) = [p_T^2 + 2p_T(1-p_T)\mu + (1-p_T)^2\mu^2]Z_H(1-\alpha)$$
$$+ [2(1-p_T)(1-\mu)(\mu + (1-\mu)p_T)][p_L Z_L + (1-p_L)\beta_H Z_H](1-\alpha)$$
$$+ [(1-p_T)^2(1-\mu)^2 p_L]\beta_L Z_L(1-\alpha); \quad (8)$$

$$V_s(\mu(\pi_H, -L), -L) = [p_T + (1-p_T)\mu]Z_H + [(1-p_T)(1-\mu)]\beta_H Z_H; \quad (9)$$

$$V_s(\mu(\pi_H, L), L) = [p_T + (1-p_T)\mu]Z_H(1-\alpha)$$
$$+ [(1-p_T)(1-\mu)][p_L Z_L + (1-p_L)\beta_H Z_H](1-\alpha). \quad (10)$$

Recall that an equilibrium consists of T's choice of an action, depending on its type, of beliefs about T's type that any feasible action of T generates for L and H's, and of their corresponding responses. The only restriction on potential acquirers' beliefs is that they be consistent with Bayes' rule, and where Bayes' rule does not apply, be held unanimously by players with the same information.

Before describing equilibria, we state the following proposition.

Proposition 1. If in equilibrium the strong target concludes an agreement with L at price R, then the weak target concludes an agreement at price R in that equilibrium.

We show that if the weak target does not conclude an agreement at price R, then the strong target would prefer not paying greenmail at all to making an acceptable offer at price R. By taking a different action from that of the weak target, the strong target reveals its type and stops all information acquisition by the H's. In addition, by signing a standstill agreement the strong target keeps L from becoming informed. Hence, by concluding an agreement at price R, the strong target induces a level of information acquisition by potential acquirers that is strictly lower than the level induced by not paying greenmail. The only way in which paying R in greenmail could yield a higher payoff to nonbidding target shareholders is if L accepts a price strictly less than the value of his stake in the strong target (based on no information acquisition by either L or the H's). But, given that the strong target's action

[18] Having to pay at least $\bar{R}$ may not, however, be a binding constraint for the weak T. As we show in an example, a weak T may have to pay strictly more than $\bar{R}$ to separate itself from the strong T.

reveals its type, L would never accept such an offer. We conclude that the strong target would never pay R in greenmail if this action reveals its type.

From Proposition 1 we conclude that there are only three types of equilibria. Proposition 2 classifies the possible types.

□ **Proposition 2.** (a) For any parameter values[19] there exists a no-standstill pooling equilibrium supported by beliefs $\pi_L(N) = \pi_H(N) = q$, $\pi_L(R) = \pi_H(R) = 1$ for all $R \geqslant 0$. Then, for any $R \geqslant \bar{R}(\pi_L(R) = 1, \mu(\pi_H(N) = q, L), \alpha)$ the following are satisfied:

$$V_w(\mu(\pi_H(R), -L), -L) - R < V_w(\mu(\pi_H(N) = q, L), L)$$

and

$$V_s(\mu(\pi_H(R), -L), -L) - R < V_s(\mu(\pi_H(N) = q, L), L).$$

More generally, a no-standstill pooling equilibrium may be supported by beliefs $\pi_L(N) = \pi_H(N) = q$, $\pi_H(R)$ and $\pi_L(R)$ for all $R \geqslant 0$, if for any R such that $R \geqslant \bar{R}(\pi_L(R), \mu(q, L), \alpha)$ we have

$$V_w(\mu(\pi_H(R), -L), -L) - R < V_w(\mu(q, L), L)$$

and

$$V_s(\mu(\pi_H(R), -L), -L) - R < V_s(\mu(q, L), L).$$

(b) A pooling standstill equilibrium in which both target types buy out L exists for some parameter values and beliefs. An equilibrium of this type is given by a price R_P and beliefs $\pi_H(R_P) = \pi_L(R_P) = q$, $\pi_H(N)$, $\pi_L(N)$, and $\pi_H(R)$, $\pi_L(R)$ for all $R \neq R_P$ satisfying:

(i) $R_P \geqslant \bar{R}(q, \mu(\pi_H(N), L), \alpha)$;
(ii) For any $R \neq R_P$ satisfying $R \geqslant \bar{R}(\pi_L(R), \mu(\pi_H(N), L), \alpha)$ the following hold:

$$V_w(\mu(\pi_H(R), -L), -L) - R < V_w(\mu(q, -L), -L) - R_P,$$

$$V_s(\mu(\pi_H(R), -L), -L) - R < V_s(\mu(q, -L), -L) - R_P;$$

(iii) $V_w(\mu(\pi_H(N), L), L) < V_w(\mu(q, -L), -L) - R_P$,
$V_s(\mu(\pi_H(N), L), L) < V_s(\mu(q, -L), -L) - R_P$.

(c) A separating equilibrium in which only the weak target pays greenmail exists for some parameter values and beliefs. An equilibrium of this type is given by a price R_{sep} and beliefs $\pi_H(R_{sep}) = \pi_L(R_{sep}) = 0$, $\pi_H(N) = \pi_L(N) = 1$, $\pi_L(R)$, $\pi_H(R)$ for any $R \neq R_{sep}$, satisfying:

(i) $R_{sep} \geqslant \bar{R}(\pi_L = 0, \mu(1, L) = 0, \alpha)$;
(ii) For any $R \neq R_{sep}$ satisfying $R \geqslant \bar{R}(\pi_L(R), \mu(1, L) = 0, \alpha)$:

$$V_w(\mu(\pi_H(R), -L), -L) - R < V_w(\mu(0, -L), -L) - R_{sep},$$

$$V_s(\mu(\pi_H(R), -L), -L) - R < V_s(\mu(1, L) = 0, L);$$

(iii) $V_w(\mu(1, L) = 0, L) < V_w(\mu(0, -L), -L) - R_{sep}$,
$V_s(\mu(0, -L), -L) - R_{sep} < V_s(\mu(1, L) = 0, L)$.

Remarks.

(1) Off-the-equilibrium-path beliefs are very important for supporting equilibria in that potential acquirers' interpretations of off-the-equilibrium-path actions must keep T from taking them. The simplest route is to set $\pi_H(R) = 1$ for every off-the-equilibrium-path standstill price. Because these beliefs are least favorable to T, they push him toward equilibrium choices. This simple device accounts for the existence of a no-standstill pooling

[19] That is, for any parameter values for which L searches with a stake α and does not search without a stake.

equilibrium for all parameter values. In a similar way, one can sometimes make standstill pooling equilibria more likely by setting $\pi_H(N) = 1$. But this does not always work, since raising $\pi_H(N)$ can also increase L's expected profit from rejecting an offer, and hence his reservation standstill price. This reveals an interesting feature of standstill pooling equilibria, namely, that players' actual equilibrium payoffs depend directly on the off-the-equilibrium-path belief, $\pi_H(N)$. As a result, we can have multiple standstill pooling equilibria, supported by a segment of values of $\pi_H(N)$ that yield different payoffs.

(2) If for the same set of parameter values but different beliefs, the separating and the standstill pooling equilibria coexist, we must have $R_{sep} > R_P$ for any separating price R_{sep} and any pooling price R_P. The reason for $R_{sep} > R_P$ is as follows. Because the strong target's wish to remove L at the price R_P is based on $\pi_H(N) \leqslant 1$ and $\pi_H(R_P) = q$ in the pooling equilibrium, the strong target must also want to remove L at the price R_P when the beliefs of H's are $\pi_H(N) = 1$ and $\pi_H(R_P) = 0$. Hence, if removing L is to be unattractive to the strong target in the separating equilibrium, we must have a higher price $R_{sep} > R_P$.

□ **Some restrictions on the set of equilibria.** We now justify our focusing on only a subset of the potentially large set of sequential equilibria described in Proposition 2. To this end we make some intuitive arguments related to the work of Kreps (1984), Grossman and Perry (1984), and Cho (1985). The basic structure of these authors' arguments is as follows. Many sequential equilibria are intuitively unappealing because they are only supportable by threats induced by off-the-equilibrium-path beliefs that are not "credible." Grossman and Perry (1984) and Cho (1985) use the terminology "incredible beliefs" to refer to beliefs that can only be maintained by a player who disregards the signal being sent by his opponent when that opponent makes an off-the-equilibrium-path move. Disregarding such a signal is tantamount to throwing away valuable information, which a player cannot commit to doing. The refinements proposed by the above authors all amount to focusing only on sequential equilibria supported by credible beliefs.

In effect, all of the above authors would require that players listen to intuitive speeches that accompany the off-the-equilibrium-path moves of their opponents, such as the following:

> This move should convince you that I am the weak target. For, as you can deduce from your knowledge of the structure of the game, I would not have moved here if I were the strong target no matter what I thought you would believe. On the other hand, as the weak target, I am better off making this move than I am playing my proposed equilibrium strategy, as long as I can convince you that I am the weak target.

While this speech is not explicitly considered as part of the game, players are not allowed to hold beliefs that are inconsistent with the content of any persuasive speech that is *implicitly* contained in an opponent's action.

First, we apply these intuitive arguments to the set of separating equilibria. Let $\hat{R}_{sep}$ be the minimum R serving as the standstill price for some separating equilibrium.[20] We argue that $\hat{R}_{sep}$ is the only separating price that can be supported by credible beliefs. A separating equilibrium at any other price $R_{sep} > \hat{R}_{sep}$ must be supported by off-the-equilibrium-path beliefs $\pi_L(\hat{R}_{sep}) > 0$ or $\pi_H(\hat{R}_{sep}) > 0$. For, if $\pi_H(\hat{R}_{sep}) = \pi_L(\hat{R}_{sep}) = 0$, T would surely choose to offer $\hat{R}_{sep}$ instead of R_{sep}, since this would cost it less to get the same outcome. But it is not credible for the potential acquirers to believe anything other than $\pi(\hat{R}_{sep}) = 0$, since a weak target would always like to choose $\hat{R}_{sep}$ if this price conveyed that it is weak, whereas a strong target would never choose greenmail at $\hat{R}_{sep}$, regardless of what the potential acquirers believe. We conclude that $\pi_L(\hat{R}_{sep}) = \pi_H(\hat{R}_{sep}) = 0$, and $\hat{R}_{sep}$ is the only separating price that can be supported by credible beliefs.

[20] We get around any openness problems related to the existence of such a minimum by assuming that a strong target that is indifferent between greenmail and no greenmail chooses the latter.

We can carry such reasoning further. Consider a no-standstill pooling equilibrium. Suppose that there exists a (deviation) price R_{dev} such that: (a) the weak T gets a higher payoff by paying greenmail of R_{dev} than it gets in the no-standstill pooling equilibrium as long as the H's believe upon seeing R_{dev} that it is weak; and (b) the strong T is better off in the no-standstill pooling equilibrium than it is paying greenmail of R_{dev}, regardless of what the H's believe upon seeing R_{dev}. Finally, suppose that

$$R_{dev} \geqslant \bar{R}(\pi_L = 0, \mu(\pi_H(N) = q, L), \alpha).$$

That is, L will accept the offer R_{dev} if he believes $\pi_L = 0$ and if the information acquisition of the H's is based on the no-standstill pooling beliefs $\pi_H(N) = q$. We want to argue that the beliefs supporting the no-standstill pooling equilibrium are not credible.

To support the no-standstill pooling equilibrium in this case, we must have beliefs $\pi_L(N) = \pi_H(N) = q$ and either $\pi_L(R_{dev}) > 0$ or $\pi_H(R_{dev}) > 0$. For, by assumption, with $\pi_H(N) = q$ and $\pi_H(R_{dev}) = \pi_L(R_{dev}) = 0$, L will accept T's offer of R_{dev}, and weak T will be better off making that offer. Hence, not making an offer could not be an equilibrium action for the weak T. We show next that the beliefs $\pi_L(R_{dev}) > 0$ and $\pi_H(R_{dev}) > 0$ are not credible when $\pi_H(N) = q$.

Suppose that T offers R_{dev}. Again, by our assumption, if the weak T can get L and H's to believe that it is weak, it prefers greenmail at R_{dev} to no greenmail and no-standstill pooling beliefs (i.e., $\pi_H(N) = q$). Also, by assumption, the strong target would not choose to pay greenmail at R_{dev}, regardless of what H's believe. It will therefore be clear to the potential acquirers that an offer of R_{dev} must be coming from a weak T's trying to convince them that it is weak. That is, we must have $\pi_L(R_{dev}) = \pi_H(R_{dev}) = 0$. With these beliefs, L will accept the offer and the weak T is better off deviating to R_{dev} than it is choosing N. The no-standstill pooling equilibrium can only be supported by beliefs that are not credible.

An interesting special case occurs when, for the same parameter values, a separating and a no-standstill pooling equilibrium both exist and $R_{dev} = R_{sep}$. In fact, whenever there is a separating equilibrium with greenmail price R_{sep} in which the weak T is better off than it is in the no-standstill pooling equilibrium and $R_{sep} \geqslant \bar{R}(\pi_L = 0, \mu(\pi_H(N) = q, L), \alpha)$, it will be the case that the no-standstill pooling equilibrium is not supportable by credible beliefs. All we have to check is that the strong target would never want to deviate to R_{sep} from its equilibrium strategy in the no-standstill pooling equilibrium, regardless of what the H's believe upon seeing R_{sep}. But this basically follows from the definition of a separating equilibrium, since we have

$$V_s(\mu(\pi_H(R_{sep}), -L), -L) - R_{sep} \leqslant V_s(\mu(\pi_H = 0, -L), -L) - R_{sep}$$
$$< V_s(\mu(\pi_H = 1, L), L) \leqslant V_s(\mu(\pi_H(N), L), L)$$

for any $\pi_H(N)$ and $\pi_H(R_{sep})$.

A similar argument can be made to show that a standstill pooling equilibrium is not supportable by credible beliefs, if the weak target prefers a separating equilibrium and $R_{sep} \geqslant \bar{R}(\pi_L = 0, \mu(\pi_H(N), L), \alpha)$, where $\pi_H(N)$ supports the standstill pooling equilibrium. More generally, one can argue that the existence of a standstill pooling equilibrium relies on off-the-equilibrium-path beliefs that are not credible whenever one can find a deviation price R_{dev} as above.

The following numerical example illustrates the nature of the separating equilibrium. Specifically, it exhibits a separating equilibrium that is preferred by the weak target to the no-standstill pooling equilibrium (which always exists). Standstill pooling equilibria do not exist. We maintain, therefore, that, in this example, the separating equilibrium is the only focal equilibrium in the sense described earlier.

Example 3. Parameters of this example are presented in Table 2. For a separating equilibrium, we have $\pi_H(R_{sep}) = \pi_L(R_{sep}) = 0$ and $\pi_H(N) = \pi_L(N) = 1$. A variety of off-the-equilibrium-

TABLE 2 Parameters

q	p_L	β_L	β_H	α	Z_H	Z_L	c_L	p_T	$c(\mu)$
.9	1	.4	0	.15	1	.6	.05	.4	$.036\mu^2 + .0576\mu$

path beliefs can support the separating equilibrium, including $\pi_H(R) = 1$ for all $R < R_{sep}$ and $\pi_H(R) = 0$ for all $R > R_{sep}$.

When L does not have a stake and beliefs are $\pi_L = \pi_H = 0$, the equilibrium configuration of information acquisition choices between L and H's has L not becoming informed and H's choosing $\mu = .7$. The H's do not acquire information when L is not removed, since $\pi_H(N) = 1$. When L does have a stake and $\mu = 0$, he acquires information regardless of his beliefs.

To get L to accept its offer, T must pay at least

$$\bar{R}(\pi_L = 0, \mu(1, L) = 0, \alpha = .15) = .15976.$$

That price, however, is not high enough to make it unprofitable for the strong target to imitate the weak target. In fact, the minimum separating price is .174, and L gets some surplus. At that price the strong target (weakly) prefers not to remove L. After L is removed, nonbidding shareholders of a strong target own a firm worth .82 (based on no information acquisition by L and $\mu = .7$) instead of owning $(1 - \alpha) = .85$ of a firm worth .76, or .646 (based on L's getting informed and $\mu = 0$). The net gain is equal to .174, the minimum separating price.

With L removed, nonbidding shareholders of the weak target own a firm worth .6724 (based on $\mu = .7$ and no information acquisition by L) instead of owning .85 of a firm worth .5344, or .45424. The net gain to the weak target shareholders before paying greenmail is thus .21816, which exceeds the proposed minimum separating price of .174. Hence, we have a separating equilibrium at the price .174.

Regarding the possibility of a standstill pooling equilibrium, note that when $\pi_H = q = .9$, the H's do not acquire information regardless of what L does, since $(1 - \pi_H)(1 - p_T)^2 Z_H = .036 < c'(0) = .0576$. But also, without a stake, L does not acquire information either. By removing L, the target halts L's information acquisition without increasing that of the H's. Furthermore, the repurchase of L's stake α results in an additional loss, at least for the weak target. This can be seen as follows. L's reservation profit at $\pi_L = q$ must be greater than or equal to the weighted average $q\alpha V_s(\mu = 0, -L) + (1 - q)\alpha V_w(\mu = 0, -L)$. If L rejects the offer, he is guaranteed this last value, even without either the surplus from his own information acquisition or the nonnegative benefit from H's choosing $\mu(\pi_H(N), L) \geqslant \mu(q, L) = 0$. Since this weighted average is greater than $\alpha V_w(\mu = 0, -L)$, L's reservation profit must also exceed $\alpha V_w(\mu = 0, -L)$, which is the highest price a weak target would ever pay for L's shares. Overall, the weak target is strictly worse off paying greenmail, and thus a standstill pooling equilibrium does not exist.

On the other hand, a no-standstill pooling equilibrium always exists with $\pi_L(N) = \pi_H(N) = q$ supported by off-the-equilibrium-path beliefs $\pi_H(R) = 1$ for any $R \geqslant 0$. But we have already shown that $\mu = 0$ when $\pi = q$, so the weak target is no better off in the no-standstill pooling equilibrium than it is after choosing not to remove L when $\pi_H(N) = 1$ in the separating equilibrium. Also, by definition, the weak target prefers the payoff from removing L in the separating equilibrium to the payoff from not removing L (by the amount $.21816 - .174 = .04416$). Hence, the weak target is better off in the separating equilibrium than in the no-standstill pooling equilibrium. Also, since $\mu(1, L) = \mu(q, L) = 0$, we have $R_{sep} \geqslant \bar{R}(\pi_L = 0, \mu(\pi_H(N) = q, L), \alpha)$. We conclude that the separating equilibrium is the only equilibrium that can be supported by credible beliefs.

4. Welfare implications

■ Many recent contributors to the takeover literature have been suspicious of bidder elimination tactics. For example, Jensen and Ruback (1983, p. 36) write:

> It is difficult to argue that actions that eliminate a potential bidder are in stockholders' best interests. Actions that eliminate a takeover bid include cancellation of a merger proposal by target management without referral to shareholders, initiation of antitrust complaints, standstill agreements, or premium repurchases of the target's stock held by the bidder.

The legal writers also appear to have formed a consensus that management should be barred from obstructing tender offers (Bebchuk, 1982, p. 23). Though prescriptions for optimal managerial behavior vary, a well-known proposal by Easterbrook and Fischel (1981) advocates almost total managerial passivity in the takeover process.

Although we are sympathetic to some scepticism about the wisdom of bidder elimination techniques, our work cautions against clear-cut judgments. On the one hand, one can ask whether target shareholders gain if management pays greenmail, given that it is an available option (i.e., there is no prohibition against it in the law or in the corporate charter). Alternatively, one can ask whether shareholders of some potential targets would be better off if management did not have the option of paying greenmail. As our article clearly shows, the payment of greenmail sometimes benefits shareholders. At the same time, it may be argued that even when paying greenmail is better than doing nothing, some other forms of agreement between the target and potential acquirers may dominate greenmail, in the sense of making all firms involved better off. With a very small number of potential acquirers, a lock-up contract, which gives a potential acquirer an option to buy the target at a prespecified price, regardless of whether other bidders surface, may be preferable to the payment of greenmail. With a larger number of potential acquirers, however, the contracts needed to dominate greenmail may not be feasible.

Even when there are no feasible alternatives to greenmail, shareholders who prefer that management sometimes pay greenmail may also prefer that this option be eliminated. Take the case of a firm deciding on an antigreenmail charter provision before any takeover opportunities have arisen. That is, suppose that initially T has no private information about the probability it will have a white knight at some future date. It may prefer to restrain itself so that it will be unable to signal at some future date when it has some private information. For, when such a signalling mechanism exists, failure to use it can arrest all information acquisition by H's. T may prefer a constant level of information acquisition corresponding to $\pi = q$ to a high level (for $\pi_H = 0$) when it is weak and none (for $\pi_H = 1$) when it is strong. In this case the welfare effects of banning greenmail depend on the availability of other signalling mechanisms.

In addition, the assumption of symmetric information at the time an antigreenmail charter provision is passed may not hold. In that case prohibiting the payment of greenmail may not help, since such a ban would reveal that the target has retained a white knight anyway. It therefore makes a big difference whether the government bans greenmail or charter provisions are put through firm by firm.

When a separating equilibrium does not exist, it is perhaps more likely that the ability of management to remove a potential bidder will be of positive value to target shareholders. In fact, in our first numerical example, shareholders of all firms involved (i.e., including the potential acquirers) are made at least as well off by the availability of the greenmail option.

Of course, all this assumes that management acts in the interest of its shareholders. Shareholders may want to ban the payment of greenmail if they think that self-serving managers may thwart profitable takeovers. At the same time, it should be noted that our list of possible good uses of greenmail is far from exhaustive. For example, greenmail might also be used as a means of compensating potential acquirers who do not initially know the size of the gain that their takeover of the target entails. To get such acquirers to become informed, it may be desirable to let them buy a stake, but then to buy that stake back should their presence become a deterrent to other desirable acquirers. In this way greenmail may help pay for information acquisition. But firms never intending to attempt a takeover may acquire positions in the target and extort money from it. If this problem is sufficiently severe, the legal obligation never to pay greenmail may again be desirable.

So far we have concentrated our discussion on the welfare of shareholders of target firms. To determine the optimal greenmail policy from the viewpoint of society is more difficult. To begin with, society never wants an H to spend resources on information acquisition, if T has already found a source of takeover gains for it or another H (as in the case where T conceals a white knight). Thus, the society might be better off if strong targets were exposed in separating equilibria. But this argument ignores the role of T's incentives to acquire information. In our model, we give the target zero costs of information acquisition to highlight other issues. But if T has such costs and is unable to conceal a white knight, it might be less inclined to acquire information in the first place. In general, social optimality will depend on whether firms that are good at acquiring useful information (i.e., have low costs and high probabilities of finding) can (on the basis of legal and institutional factors) appropriate a significant portion of the gains from their efforts.

5. Conclusion

■ The common finding of recent empirical studies of greenmail, which include Dann and De Angelo (1983), Bradley and Wakeman (1983), and Mikkelson and Ruback (1985), is that share prices of target firms fall after the payment of greenmail. Some writers, notably Jensen and Ruback (1983, pp. 36–39), have used this evidence as support for the hypothesis that bidder elimination tactics are used primarily to perpetuate the reign of self-serving managers.

In this regard we observe that, in our separating equilibrium, share prices *always* decline when greenmail is paid, despite the fact that target management is acting in the interest of its shareholders. The reason is that in our model the making of a standstill offer by a weak target is perfectly anticipated in equilibrium, and the only effect of the standstill is to inform the market that the target is weak. This is clearly bad news, and the share price falls. Because the management of the target has private information that it transmits to the market, managerial actions that lead to price declines are perfectly compatible with the interest of long-term shareholders.[21]

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[21] To replicate in our model the empirical regularity that greenmail almost always brings L more than the market price of his shares may require giving L some surplus.

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