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Defensive Mechanisms and Managerial Discretion

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ABSTRACT

We study a model where firms may possess free cash flow and takeovers may be disruptive. We show that the possibility of a takeover, combined with defensive mechanisms and the ability to pay greenmail, can solve the free cash flow problem in an efficient way. The payment of greenmail reveals information that generates a stock price decline that exceeds the value of the greenmail payment, even though the payment of greenmail is value maximizing. Optimal defensive measures limit takeover attempts if the target stock price is too low. We also provide cross-sectional implications of the analysis.

THE DISCRETION MANAGERS HAVE in deciding how to employ corporate resources has been the subject of considerable research and debate. On one hand it is recognized that, in the process of running the firm, managers acquire knowledge that allows them to select superior corporate activities. However, this informational advantage creates a moral hazard problem: If managers obtain private benefit from a particular activity, they may be tempted to invest in it even if the investment decreases firm value. This moral hazard has been referred to as the "free cash flow" problem.[1] It has been argued that removing discretion will increase firm value by decreasing this overinvestment. On the other hand, eliminating managerial discretion can lead to costly operating disruptions due, for example, to underinvestment. That is, eliminating discretion lowers investment and deprives the shareholders of the benefit that management's inside information may provide.

Stulz (1990) formalizes this tradeoff and shows how debt can be used to balance optimally the resulting over and underinvestment costs. Empirical studies seem to support this view, showing that leveraged buyouts increase the value of the firm, presumably because debt acts as a commitment that tempers managerial discretion.[2] Similarly, Harris and Raviv (1990) show how debt can remove discretion by forcing managers to liquidate when it is in the share-

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[1] See for example Jensen (1984) who popularized the term free cash flow.

[2] For empirical evidence, see Palepu (1990) or Smith (1990).

holders' best interest, even when the manager would prefer to continue operation.

In this article, we adopt a different perspective to study the tradeoff of disruption for discretion by focusing on the role that takeovers and takeover defenses play in disciplining management. As in the analysis of debt, we show that takeover threats coupled with defensive mechanisms can be used to restrain management's abuse of discretion without eliminating all of the benefits that discretion might bring. The imposition of debt, as in Stulz' (1990) model, is an ex ante mechanism in that it cannot be based on information that subsequently becomes available to management. In contrast, we consider defensive measures that form an ex post mechanism that can use information that management acquires. Consistent with many studies of moral hazard, we find that efficiency is increased when ex ante mechanisms are augmented with ex post mechanisms.

Our study also relates to the more general literature on corporate control. It has long been recognized that takeovers and proxy contests can be vehicles through which managers are disciplined. Despite the potential benefits of takeovers to shareholders, corporate managers have been successful in introducing various defensive mechanisms that diminish the disciplinary power of takeovers. These mechanisms can be classified into one of two types. One type consists of general mechanisms that apply to all potential acquirers. This category includes measures such as the adoption of poison pills, shareholders' rights plans, and the use of anti-takeover state laws. The other type includes raider-specific measures that are used at the discretion of management in dealing with a particular shareholder or shareholder groups. We will focus on a targeted repurchase, i.e., a greenmail payment, to illustrate this mechanism, but in fact any transfer of benefit in exchange for a standstill agreement, such as election to boards, the granting of consulting contracts, or the agreement to beneficial commercial transactions, falls into this category.

Much of the finance literature has thus far viewed these two types of mechanisms as being economically equivalent. A popular view is that both general and raider-specific defensive mechanisms are ways to entrench management so that they can continue to benefit from the discretion they have in making corporate decisions. This view has gained considerable support in the academic literature. For instance, Jensen (1984) states that "Those who propose to "protect" shareholders through the payment of greenmail hide behind emotional language designed to mislead."

However, some studies have justified greenmail or defensive measures as a value-maximizing strategy by target management. These studies focus on greenmail as a way of generating appropriate takeover bids for the firm. Shleifer and Vishny (1986) show that target management can increase the competitiveness of a takeover contest by paying greenmail to eliminate a low value bidder from the competition and encourage new potentially higher valued bidders to enter the contest. Hence, greenmail is in the target shareholders' best interest. Stulz (1988) examines the role of voting control by management as a defensive mechanism. In his model, increasing the manag-

er's shareholdings increases the price paid if a takeover occurs but decreases the probability of a takeover. Hence, an optimal managerial shareholding acts to discourage low value raiders. Similar results are obtained by Sarig and Talmor (1995), Berkovitch and Khanna (1990), Israel (1991, 1992), and Harris and Raviv (1988).

These studies look at the role of defensive measures in increasing shareholder wealth by screening bidder types or increasing the target's bargaining power. An alternative approach is to view defensive mechanisms as part of the solution to a contracting problem. For instance, De Angelo and Rice (1983) and Knoeber (1986) argue that defensive mechanisms may be part of an efficient compensation scheme. However, Borokhovich, Brunarski, and Parrino (1997) provide evidence that seems to be inconsistent with this view. They find that managers with antitakeover amendments have higher overall compensation than managers without such amendments and conclude that antitakeover amendments decrease shareholder wealth. They recognize that if defensive measures are value decreasing, then an explanation is required of why shareholders adopt such measures and why few event studies report negative market reaction to their adoption.

In this article, we provide an explanation. We show how greenmail, combined with other defensive measures, can in fact protect shareholders. In particular, we show how greenmail can be a relatively low cost way to prevent a disruptive takeover. Preventing disruption through this mechanism has two effects. First, it conveys information to the market about the firm. Second, raider-specific measures transfer wealth from the firm to the raider. This transfer provides the incentive for raiders to discipline managers but, since raiders do not internalize the potential disruption, the incentive induces raids even when total value is not increased. To prevent excessive raiding, the firm will impose a general defensive mechanism that prevents all raids. The mechanism will, at the discretion of the board, be lifted when conditions indicate a raid is value increasing.

To capture this intuition we consider a model that has two types of firms.[3] First, *cash cows* have free cash flow which managers can consume. Second, a *lean firm's* manager knows that the firm has no free cash flow, and if the raider takes control, then operations will be disrupted. An illustration is the recent conflict between Chrysler Corporation and a large shareholder, Kirk Kerkorian. While Chrysler had over $6 billion in cash, Kerkorian maintained that only $2 billion was needed for operations and that the balance should be distributed to shareholders. Chrysler management responded by stating that the money was needed to weather the next downturn in a highly cyclical industry. In exchange for a standstill agreement with Kerkorian, Chrysler's management agreed to increase shareholder payouts and provided Kerkorian with influence on the board of directors.

Whatever the type, the manager has an incentive to claim that the takeover should be blocked: cash cow managements can retain their positions and

[3] Similar insights can be obtained in a model with more types.

perquisites, and lean firm managers can avoid the cost of disruptive operating changes. While uninformed shareholders could decide to impose a change on the firm, we show instances in which allowing a takeover attempt and allowing management to respond with a raider-specific defensive measure is more efficient.

In contrast to the existing literature, our analysis focuses on the role of greenmail in the avoidance of value decreasing disruptions. In our model, the offering of greenmail by a lean firm following a takeover attempt informs the raider and other shareholders about the potential for disruption. The greenmail payment made by the lean firm to the raider must exceed the fair value of the raider's shares by at least as much as a cash cow manager's perk consumption. The lean firm is willing to pay this amount to avoid disruption costs. Even though the cash cow manager has the resources to pay greenmail, he will choose not to because the greenmail payment dissipates all the resources that the manager would otherwise consume as perks. The equilibrium greenmail payment must be large enough so that the cash cow manager's net gain from making the greenmail payment is less than the manager's share in the valuation gain from honestly revealing the firm to be a cash cow.

Our model has a number of empirical implications, including the following:

1. General defensive measures are value enhancing. However, these measures should only remain in place if stock price is low. A sufficiently high stock price should result in the board allowing takeover bids. Hence, we argue that defensive measures do not necessarily thwart takeovers. This is consistent with the findings of Comment and Schwert (1995).
2. General defensive measures will remain in effect if the raider has too large an initial shareholding in the target.
3. Target firm stock price increases before a raid is announced.
4. Target firm stock price increases further when control is acquired by the raider.
5. The payment of greenmail causes the market to conclude that this target does not have free cash flow. Thus, after a greenmail payment the market value of the firm falls, due to an information effect, over and above the consequence of paying more than market value for the repurchased shares.

The plan of the article is as follows. Section I describes the preferences and technologies used in the model. The equilibrium to a unilateral control change, in which no information transfer occurs, is derived in Section II. In Section III we present and analyze a takeover game equilibrium in which the raider is allowed to obtain a significant transfer from the firm. In Section IV we ask whether shareholders would be better off with an alternative mechanism that provides a transfer to all shareholders instead of just the raider. We identify the conditions under which greenmail equilibrium is preferred. Section V then shows how the shareholders can employ raider-specific defensive measures by amending the corporate charter to prevent the takeover game from being played when it does not lead to an increase in firm value. Finally, Section VI

presents time series and cross-sectional empirical implications of our model and Section VII concludes.

I. The Model

We use a two period setting with dates denoted by t_0, t_1, and t_2. All agents are risk neutral and discount expected cash flows at a zero riskless rate.

A. The Firm

We assume that there are two possible firm types: a *cash cow* and a *lean firm*. It is common knowledge that both types have assets in place that will produce a cash flow of A at t_2. It is also common knowledge that the cash cow type has free cash flow of X available at t_1 while a lean firm has no free cash flow. However, we assume that the firm's type is only observable to the manager.[4]

If shareholders knew that the firm was a cash cow they would force managers to pay out X. There are costs to be paid, however, if they are mistaken about the firm's type. If the firm is lean, then forcing it to pay out X will result in a cost that depends upon who controls the firm. Since a lean firm does not have free cash flow, informed managers forced to make a payment must liquidate assets inefficiently. To characterize the inefficiency we assume that the manager of a lean firm must liquidate $\psi \geq 1$ dollars in order to pay out one dollar. Alternatively, if the payout follows replacement of the manager either through a takeover or a proxy contest, then a disruption cost of L is incurred. Reflecting the fact that the informed manager liquidates more efficiently, we assume that the value loss is $L > \psi X$. In the Chrysler example, if the cash is really needed to remain competitive (i.e., the firm is lean) but management agrees to payout X then they must liquidate assets worth $\psi X > X$. If management is replaced and an outsider pays out X, then firm value is damaged by $L > \psi X$ because of a lack of competitive flexibility.

In contrast, when the firm is a cash cow there are no costs incurred when either management or an outsider pays out cash of X or less.

B. Timing and Information

At t_0 shareholders and the manager hold diffuse priors about the likelihood of the firm being a cash cow. Also at this point, shareholders have the option of installing a defensive measure in the corporate charter. At t_1 a signal is made public that causes shareholders to revise their beliefs to $\rho = \text{pr(cash cow)}$, while the manager privately learns the firm's true type. Once sharehold-

[4] In the Chrysler example, if the cash held by Chrysler is in fact necessary to maintain the firm's competitive position, the cash is *not* free cash flow, and paying it out to shareholders would decrease firm value. Although analysts following the Chrysler conflict all agree on the amount of cash on hand, the issue is whether or not it is free cash flow. Our assumption that the free cash flow is unobservable is a simplification of the sort of disagreement underlying the Chrysler conflict.

ers receive the signal, the defensive mechanism is either maintained or lifted and, if lifted, a takeover contest may ensue. If a takeover does not occur, then shareholders can unilaterally replace managers through a proxy contest. At t_2 final cash flows are realized and paid out to shareholders.

In the next section we investigate the outcome of shareholders undertaking a *unilateral proxy contest*. In this corporate control mechanism, shareholders take control of the firm and unilaterally impose a dividend, without allowing the manager to respond in any way. This is an ex ante mechanism, similar to debt.

II. A Unilateral Proxy Contest

One strategy for shareholders to redeem the free cash flow would be to take control of the firm and pay a dividend of X at time t_1, before a cash cow management can consume the free cash flow at time t_2. We assume the shareholders could accomplish this by holding a proxy contest, winning, and unilaterally imposing the payment of a dividend. They would do so if

$$A + \rho X - (1 - \rho)L > A. \tag{1}$$

The right-hand side of equation (1) is the value of the firm if no action is taken, and the left-hand side is the expected value if shareholders take control and pay an opening dividend. The dividend would be imposed if

$$\rho \geq \frac{L}{X + L},$$

that is, the expected benefit of recouping the perks more than offsets the expected disruption cost.

The expected value of the firm under this unilateral proxy strategy is:

$$V_u(\rho) = \max\{A,\ A + \rho X - (1 - \rho)L\}. \tag{2}$$

The unilateral proxy contest is an ex ante mechanism since shareholders act before management can respond. Other examples of similar mechanisms include internal monitoring through an auditor who can be hired at a fixed cost to determine the firm's type, or through the use of debt, as in Stulz (1990). Alternatively, it might be better to attempt to learn the firm type from the manager using an ex post mechanism which allows the manager to reveal information. One mechanism to do this is the takeover game described in the next section.

III. A Takeover Game

A. *The Game Structure*

There are three parties involved in this game. The management is assumed to own a fraction γ_m of the firm's shares (there is no debt), and only the

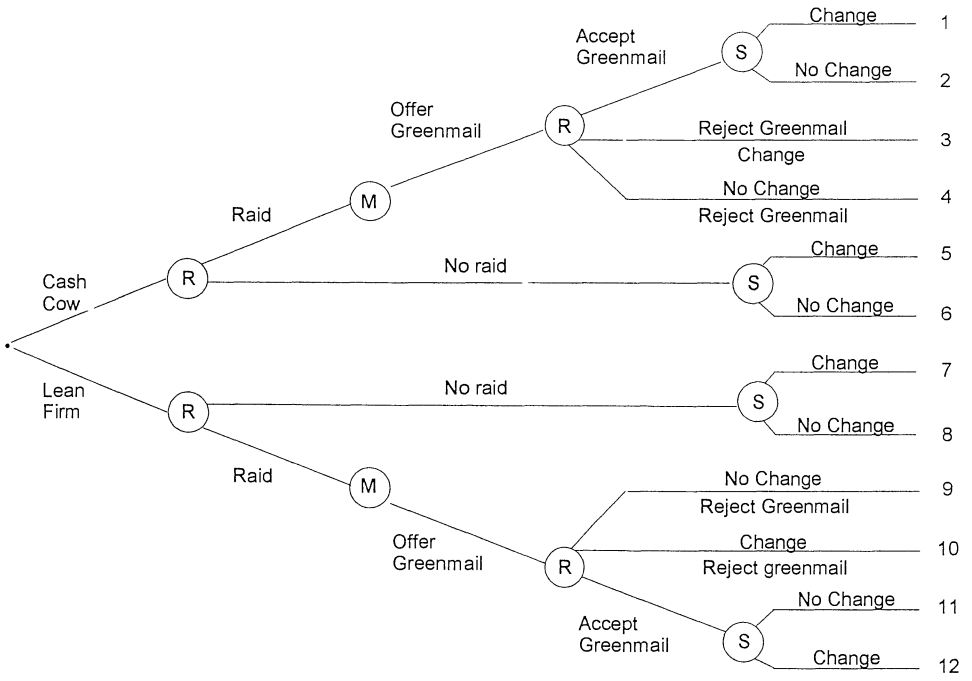

Figure 1. The game tree. R is the raider's action, M is the manager's action, and S is the shareholders' action. "Change" means the successful raider paying a dividend or shareholders forcing a dividend on existing management if there is no takeover.

management knows the firm's true type. A raider, who owns a fraction γ_r of the firm's shares, will be the shareholder who decides to make a takeover bid or not. The remainder of the firm's shares are owned by shareholders who hold, in aggregate, a fraction $\gamma_s = 1 - \gamma_r - \gamma_m$ of the shares. We assume that all shareholdings are exogenous. We will show, however, that the efficiency of the takeover mechanism will depend on the relative sizes of these shareholdings.

B. Sequence of Actions in the Game

As described in Section I, a takeover game can commence if, based on the observed value of ρ, the general defensive mechanism has been lifted. Figure 1 shows the game tree and Table I contains the final payoffs. Following the revelation of ρ, the raider decides whether or not to announce an interest in acquiring a fraction γ_a of the total outstanding shares of the target. We assume that γ_a is sufficiently large for the raider to gain control of the firm. The management responds with a greenmail offer of g, which we assume is less than X.[5]

The raider revises his beliefs about the probability that the firm is a cash cow from ρ to $\hat{\rho}(g)$ and either accepts the greenmail and signs a standstill agree-

[5] In Proposition 2, we show that the takeover game is only preferred when $g < X$.

Table I

Game Payoffs

Branch numbers refer to Figure 1. The greenmail payment is g, γ_r, γ_m, and γ_s are the shareholdings of the raider, the manager and all other shareholders, A is the cash flow available to both a lean firm and a cash cow, X is the cash flow available to only the cash cow management, and L is the disruption cost incurred by the lean firm if a payout is forced following replacement of the lean firm management. γ_a is the fraction of the firm that the raider wishes to acquire. $\Omega = (\gamma_a - \gamma_r)/(1 - \gamma_r)$ is the fraction of shares tendered, at a price P, in a successful takeover. $\psi \geq 1$ is the value of assets a lean firm must sell to raise one dollar.

Branch	Raider	Manager	Shareholders
1	g	$[\gamma_m/(1 - \gamma_r)](A + X - g)$	$[\gamma_s/(1 - \gamma_r)](A + X - g)$
2	g	$X - g + [\gamma_m/(1 - \gamma_r)]A$	$[\gamma_s/(1 - \gamma_r)]A$
3	$\gamma_a(A + X) - (\gamma_a - \gamma_r)P$	$(1 - \Omega)\gamma_m(A + X) + \Omega\gamma_m P$	$(1 - \Omega)\gamma_s(A + X) + \Omega\gamma_s P$
4	$\gamma_a A - (\gamma_a - \gamma_r)P$	$X + (1 - \Omega)\gamma_m A + \Omega\gamma_m P$	$(1 - \Omega)\gamma_s A + \Omega\gamma_s P$
5	$\gamma_r(A + X)$	$\gamma_m(A + X)$	$\gamma_s(A + X)$
6	$\gamma_r A$	$X + \gamma_m A$	$\gamma_s A$
7	$\gamma_r(A - L)$	$\gamma_m(A - L)$	$\gamma_s(A - L)$
8	$\gamma_r A$	$\gamma_m A$	$\gamma_s A$
9	$\gamma_a A - (\gamma_a - \gamma_r)P$	$(1 - \Omega)\gamma_m A + \Omega\gamma_m P$	$(1 - \Omega)\gamma_s A + \Omega\gamma_s P$
10	$\gamma_a(A - L) - (\gamma_a - \gamma_r)P$	$(1 - \Omega)\gamma_m(A - L) + \Omega\gamma_m P$	$(1 - \Omega)\gamma_s(A - L) + \Omega\gamma_s P$
11	g	$[\gamma_m/(1 - \gamma_r)](A - \psi g)$	$[\gamma_s/(1 - \gamma_r)](A - \psi g)$
12	g	$[\gamma_m/(1 - \gamma_r)](A - \psi g - L)$	$[\gamma_s/(1 - \gamma_r)](A - \psi g - L)$

ment or rejects the greenmail and goes ahead with the takeover at an unconditional offer price, $P(\hat{\rho}(g))$, that insures the success of the offer. We assume that making the takeover offer is costless for the raider.

The raider then decides whether or not to impose a dividend on the firm. If greenmail is taken by the raider, or the raider does not enter at all, then shareholders must decide whether to unilaterally impose an operating change on the firm. Then, the firm is liquidated at time t_2.

We define

$$\Omega \equiv \frac{\gamma_a - \gamma_r}{1 - \gamma_r}$$

as the fraction of tendered shares that are taken up in a successful takeover. It is also assumed that management tenders its shares in a successful takeover, so that the management tenders $\Omega\gamma_m$ and thus retains $(1 - \Omega)\gamma_m$.

Branches 5 and 8 in Figure 1 are the preferred outcomes for shareholders with perfect information about firm type. Alternatively, the best outcome for the cash cow manager is branch 4: the manager consumes the perks, X, makes

no payment to the raider, $g = 0$, and tenders shares in the takeover at a value between A (the fair price) and $A + X$, since all takeover offers must lie in this range, as shown below. Branch 9 is best for the lean firm management, avoiding the disruption cost, L, and tendering shares at a minimum of A, the fair price.

Several features of our model require elaboration. First, we simplify by assuming that the raider's expression of interest and the setting of the offer price is sequential. Since the raider does not have private information in our model, the market learns nothing from the raider's announcement of interest or from the price that is set. Therefore, having the initial indication of interest include a price would not change our results.

Second, we have assumed that the raider makes an unconditional bid. Allowing a conditional bid would not alter our results. This is because, unlike many takeover models, we assume that there are no synergies and so the raider does not gain any advantage from making an offer conditional upon the fraction of shares tendered. Once the firm is revealed to be a cash cow, the shareholders can impose the change and capture X without a successful takeover. In contrast, if we assume that the raider brings a positive synergy to the takeover, then the raider could capture the synergy using a conditional offer.

Third, we assume that takeover bidding is costless. With the assumption that there is no synergy gain, costly bidding would alter our results. In our model the bid price is set to insure the success of the offer. Thus, the raider's profit comes solely from the toehold, $\gamma_r X$. If the takeover bid is costly and the firm is revealed to be a cash cow, then the raider would not go ahead with the takeover. This is because the shareholders will impose the change unilaterally, giving the raider the same gain with no bidding costs. Therefore, the raider would only be willing to incur positive bidding costs if there was a synergy gain.

Finally, we have simplified the model by assuming that, if a cash cow pays greenmail and no operating change is made (branch 2), then greenmail is paid from X. Thus every dollar of greenmail paid reduces the manager's consumption by a dollar. An alternative assumption is that greenmail is paid from A, thus only reducing the manager's wealth by the proportion γ_m. This change would not alter the qualitative nature of our results as long as we also assume that the utility the manager receives from consuming free cash flow of X is sufficiently less than X.

C. Separating Equilibrium

There are two important elements in this model that determine the form of the equilibrium. First are the "real" effects of taking control and imposing a dividend on the target. These are the perks of X, the disruption cost of L, and the dissipative cost $(\psi - 1)g$. The second element is the greenmail premium that occurs when the target management pays more in greenmail for a raider's

shares than their true market value.[6] The interaction of perks, disruption costs, and greenmail overpayment determines parameter values needed to support the following equilibrium.

PROPOSITION 1 (Separating Equilibrium): *There are parameter values under which the following strategies form a separating equilibrium:*

- *The raider presents a takeover offer to management.*
- *Managers of a lean firm respond by offering to repurchase the raider's shares at more than market value.*
- *Managers of a cash cow do not respond to the takeover threat. The raider's offer, equal to the full information market value of the firm, is then accepted by shareholders. The raider then takes control and imposes a dividend.*
- *Shareholders of a firm that has paid greenmail are given the opportunity to take control of the firm but choose not to do so.*

Proof: See the Appendix.

We now discuss the intuition and parameter restrictions that support the separating equilibrium. The raider understands that, if the offer is not opposed by management, then the firm is a cash cow. Accordingly, the initial offer is based on the cash cow value of $A + X$.

The lean firm responds to the raider with a greenmail payment of

$$\hat{g} = (1 - \gamma_m)X + \frac{\gamma_m}{1 - \gamma_r} g^* \tag{3}$$

where $g^* \equiv \gamma_r A$ is the fair market value of the raider's shares. Greenmail is larger than the fair market value of the purchased shares because the payment must satisfy the nonmimicry condition for the cash cow

$$\hat{g} \geq (1 - \gamma_m)X + \left[\frac{\gamma_m}{1 - \gamma_r}\right] g^*. \tag{4}$$

To derive this condition, we compare the cash cow manager's payoffs from branches 2 and 3 of Figure 1,

$$\gamma_m(A + X) \geq X - \hat{g} + \left[\frac{\gamma_m}{1 - \gamma_r}\right] A.$$

Rearranging this inequality yields equation (4). The greenmail payment, $\hat{g}$, must exceed the manager's personal cost of paying fairly priced greenmail, $[\gamma_m/(1 - \gamma_r)]g^*$, by the net perks the cash cow manager would save by paying greenmail, $(1 - \gamma_m)X$.

[6] Another form of mispricing would be valuing the target's shares incorrectly in the takeover bid. Because we investigate a separating equilibrium, this element will not appear.

The condition

$$(1 - \gamma_a)L - [\hat{g} - g^* + (\psi - 1)\hat{g}] \geq (\gamma_a - \gamma_r)X \tag{5}$$

prevents the lean firm manager from mimicking the cash cow.[7] Mimicking the cash cow will lead to posttakeover disruption costs of $(1 - \gamma_a)L$, but will save the greenmail overpayment and liquidation costs paid by the lean firm in equilibrium (the terms in the square brackets in condition (5)). This net cost of mimicking the cash cow must exceed the benefit of mimicking (the right-hand side of condition (5)), which is the lean firm manager's share of the overvaluation of the target's shares in the takeover that would follow a greenmail payment of zero. As seen in condition (5), there are two costs incurred by a lean firm paying greenmail of $\hat{g}$. First, the firm pays $\hat{g}$ for shares that are worth $g^* = \gamma_r A$ for a greenmail premium of $\hat{g} - g^*$. Second, the sale of assets required to pay the greenmail generates dissipative costs of $(\psi - 1)\hat{g}$.

The raider and the market believe that a firm that offers any greenmail payment less than $\hat{g}$ is a cash cow and that any firm offering at least $\hat{g}$ is a lean firm.

For any off-equilibrium-path greenmail offer $0 < \tilde{g} < \hat{g}$, the condition

$$L \geq \psi(\hat{g} - \tilde{g}) \tag{6}$$

insures that the lean firm will not defect from the equilibrium greenmail amount, $\hat{g}$, to some smaller amount, $\tilde{g}$. If the lean firm reduces its greenmail payment, then the shareholders and raider believe it is a cash cow, and so will reject the greenmail offer and impose a dividend. Doing so imposes a disruption cost, L. However, the reduced greenmail payment means that the lean firm reduces its inefficient sale of assets to make the payment by $\psi(\hat{g} - \tilde{g})$. The disruption cost must exceed the saved sale costs.

Finally, in order to satisfy the assumption that $\hat{g} \leq X$, the raider's foothold must satisfy

$$\gamma_r \leq \frac{X}{A + X}. \tag{7}$$

This condition is satisfied if the raider's foothold is less than or equal to the fraction of the cash cow firm value that is free cash flow. As shown below, this condition leads shareholders to prefer the takeover game with greenmail to an alternative ex post mechanism.

The equilibrium discussed above generates the following expected payoffs for the raider, the shareholders and the manager, respectively:

$$R^*(\rho) = \gamma_r[A + \rho X] + (1 - \rho)(\hat{g} - g^*) \tag{8}$$

[7] All terms in condition (5) should be multiplied by γ_m to show the manager's share of these values.

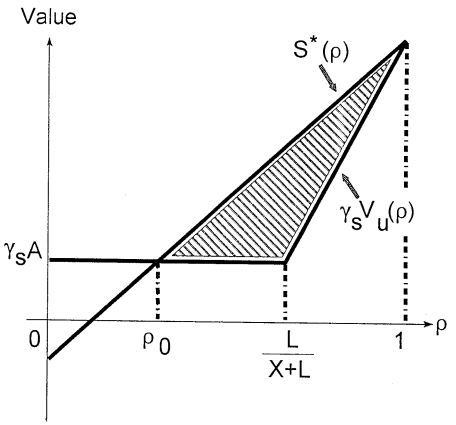

Figure 2. Shareholders' payoffs. S^* is the shareholders' payoff in the takeover game and the line segments $\gamma_s A$ and $\gamma_s V_u$ form the shareholders' payoff in a unilateral proxy contest. Shareholders prefer the takeover game to the unilateral proxy contest when $\rho > \rho_0$.

$$S^*(\rho) = \gamma_s[A + \rho X] - (1 - \rho)\left[\frac{\gamma_s}{1 - \gamma_r}\right](\hat{g} - g^* + (\psi - 1)\hat{g}) \tag{9}$$

$$M^*(\rho) = \gamma_m[A + \rho X] - (1 - \rho)\left[\frac{\gamma_m}{1 - \gamma_r}\right](\hat{g} - g^* + (\psi - 1)\hat{g}). \tag{10}$$

The total value of the game is the sum of the above expected payoffs

$$V^*(\rho) = A + \rho X - (1 - \rho)(\psi - 1)\hat{g}. \tag{11}$$

Thus, the game's expected payoff is the value of the assets in place, plus expected saved perks less the expected dissipative liquidation costs paid by the lean firm.

We note that there are values of the greenmail payment, $g > \hat{g}$, that also form sequential equilibria. These additional equilibria are qualitatively identical to the equilibrium in Proposition 1. Moreover, it can be shown that these additional equilibria fail to satisfy the intuitive criteria proposed by Cho and Kreps (1987), unlike the equilibrium in Proposition 1.

D. Incentives to Play the Takeover Game

Shareholders can calculate, before a takeover game begins, the expected value of being a shareholder, as opposed to being the raider.

Figure 2 plots the shareholders' expected game payoffs. The point where S^* intersects $\gamma_s A$ defines ρ_0:

$$\rho_0 = \frac{\hat{g} - g^* + \hat{g}(\psi - 1)}{\hat{g} - g^* + \hat{g}(\psi - 1) + (1 - \gamma_r)X}. \tag{12}$$

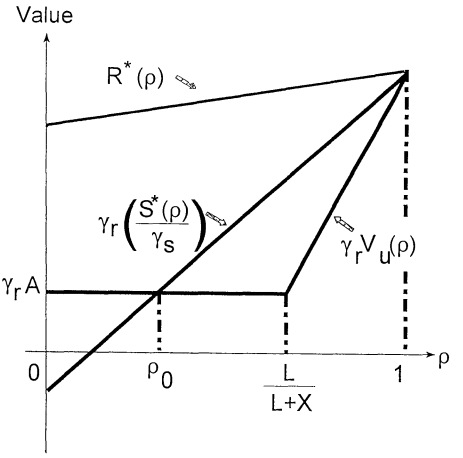

Figure 3. The raider's payoffs. R^* is the payoff to the raider in the takeover game and $\gamma_r(S^*/\gamma_s)$ is the payoff to a shareholder with the same ownership fraction as the raider. The line segments $\gamma_r A$ and $\gamma_r V_u$ are the raider's payoff in a unilateral proxy contest.

For values of $\rho < \rho_0$, shareholders are strictly worse off with the takeover game than without. Thus, for $\rho < \rho_0$ shareholders would prefer not to play the takeover game. With the belief ρ_0 that the firm is a cash cow, the expected greenmail costs, if it is a lean firm, are equal to the expected perk recovery if it is a cash cow.

Assuming a diffuse prior on ρ, and assuming that a takeover game is only played when optimal for the shareholders,[8] the area in the triangle bordered by $S^*(\rho)$ and $\gamma_s V_u(\rho)$, for $\rho \geq \rho_0$ represents the value of the information revealed by the greenmail mechanism in the takeover game.

Figure 3 portrays three potential payoffs to the raider. The line labeled $\gamma_r V_u(\rho)$ is the value of the raider's shares in the unilateral proxy contest. The line $\gamma_r(S^*(\rho)/\gamma_s)$ is the takeover game payoff to a nonraider-shareholder that owns a fraction γ_r of the firm. The line labeled $R^*(\rho)$ gives the payoff to acting as the raider in the takeover game.

It is clear in Figure 3 that, for *any* value of ρ, the raider prefers to initiate the takeover game instead of being a shareholder in either the takeover game or the unilateral proxy contest. Thus, shareholders and the raider differ in their desires to have a takeover contest. When $\rho = 1$, so that everyone is sure the firm is a cash cow, the raider and shareholders capture the same benefit, that is, their proportion of the saved perks. However, as ρ decreases, making it more likely to be a lean firm, the incentives of the two parties diverge. Taking the derivative of the per-share values, R^*/γ_r and S^*/γ_s with respect to ρ shows:

$$\frac{\partial R^*/\gamma_r}{\partial \rho} = X - \frac{\hat{g} - g^*}{\gamma_r}$$

[8] We will show how general defensive measures are used to insure that a takeover occurs only when it is in the best interests of the shareholders.

and

$$\frac{\partial S^*/\gamma_s}{\partial \rho} = X + \frac{1}{1-\gamma_r}(\hat{g} - g^* + (\psi - 1)\hat{g}).$$

Since $\hat{g} \geq g^*$, that is, a raider will never accept a greenmail payment that undervalues his shares:

$$\frac{\partial R^*/\gamma_r}{\partial \rho} < \frac{\partial S^*/\gamma_s}{\partial \rho}.$$

As ρ falls, the shareholders' payoff declines since they are less likely to recover perks, and more likely to pay greenmail to the raider. The raider's payoff declines less as ρ falls because the more likely the firm is a lean firm, the more likely it is that the raider will receive greenmail.

This analysis indicates that shareholders only desire a takeover when it is sufficiently likely that the firm is a cash cow. However, the raider will initiate a raid for any probability of a cash cow. Thus, shareholders would like to find a means of preventing the raider from raiding the firm when it is unlikely to be a cash cow. In Section V we show how a general defensive mechanism, such as a poison pill can be used to accomplish this.

Before examining the optimal poison pill in Section V, Section IV will impose a restriction on the raider's initial holding, γ_r, such that the takeover game is preferred by shareholders to an alternative control mechanism, a proxy contest with management response.

IV. An Alternative Control Mechanism

There is at least one alternative mechanism to the takeover game of the previous section. In a *proxy contest with management response*, the shareholders threaten to take control from management. Unlike the unilateral proxy contest examined in Section II, here the manager is allowed to respond to this threat by paying a "special dividend," $\hat{d}$. After the special dividend is paid or not, the shareholders can take control if they choose. This mechanism has an information structure very much like the takeover game, and has a very similar separating solution shown in the following proposition.

PROPOSITION 2 (Proxy Contest with Response): *Equilibrium actions are*

- *The cash cow management pays no dividend and the lean firm management pays a dividend of*

$$\hat{d} = X. \tag{13}$$

- *Shareholders revise their beliefs as follows:*

$$\hat{\rho}(d) = \begin{cases} 1 & d < \hat{d} = X, \\ 0 & d \geq \hat{d}. \end{cases} \tag{14}$$

- *Shareholders take control of the firm if* $\hat{\rho} = 1$ *and do nothing if* $\hat{\rho} = 0$. *The ex ante expected value of the proxy contest with management response to all the players is*

$$V^p(\rho) = A + \rho X - (1 - \rho)(\psi - 1)X. \tag{15}$$

Proof: See the Appendix.

We can compare the total value of the takeover game, equation (11), with the total value of the proxy contest with management response, equation (15). The takeover game will be preferred if

$$\hat{g} \leq X.$$

Using the definition of $\hat{g}$ in equation (3) yields the necessary condition

$$\gamma_r \leq \frac{X}{A + X}. \tag{16}$$

Condition (16) shows that shareholders will prefer the takeover game to the proxy contest with management response only if the raider's foothold, which determines the raider's profit in the takeover game, is not too large. When $\psi > 1$ and if condition (16) holds, then the dissipative costs incurred by the lean firm in a takeover game, $\psi\hat{g}$, are lower than those incurred in the proxy contest with response, ψX. The relative size of $\hat{g}$ and X are determined by the non-mimicry conditions required by the two mechanisms. In addition to perk consumption, the benefit to a cash cow from mimicking a lean firm depends on the mechanism used. In the takeover game, repurchasing the raider's shares leaves the manager with a shares worth $[\gamma_m/(1 - \gamma_r)]A$. Alternatively, responding to a proxy contest with a dividend leaves the manager with a cum-dividend shareholding of $\gamma_m(A + \hat{d})$. Since $\hat{d} = X$ in equilibrium, a comparison of the benefits of mimicking shows that, if condition (16) holds, then the mimicking benefits of paying greenmail are lower than the mimicking benefits of paying $\hat{d}$. Consequently, the transfer, and therefore the dissipative costs, in the takeover game are lower than the dissipative costs of the proxy contest.

To summarize, Section III details a takeover game equilibrium that provides superior shareholder value to a unilateral proxy contest, described in Section II, because of the information content in the greenmail offer. Section IV has now provided a restriction on the raider's foothold if the takeover game is to be preferred to another control mechanism, the proxy contest with management response. Section V defines a charter condition that allows shareholders to commit to the takeover game and limit the raider's profit in the game.

V. The Optimal Poison Pill

Section III describes the takeover game and identifies the incentives that cause a raider to propose a takeover that will make other shareholders worse off. Figure 2 shows that shareholders would prefer no takeover for all values of $\rho < \rho_0$. In this section we describe the general defensive mechanism that will allow shareholders to prevent takeovers when $\rho < \rho_0$. This mechanism can be imposed through the corporate charter at time t_0, before the release of information about the target's value.

At date t_0, when all shareholders and the manager have diffuse priors about the firm's type, shareholders may install a defensive mechanism, such as a *poison pill* or *shareholders' rights* plan. For simplicity, we assume that this allows the management to fend off any raid, with certainty.

The poison pill that shareholders add to the charter at date t_0 is made contingent upon two observables: (i) stock price after the release of the public signal and (ii) the foothold of the raider. Since both of these contingencies are based upon observables,[9] management can be directed to implement the poison pill when shareholders would prefer that the takeover game not proceed. In particular, the management will be directed to drop the pill, or allow *permitted bids*, when stock price exceeds a level, shown in the proposition below, that corresponds to a value $\rho > \rho_0$ *and* the raider's foothold is less than $\gamma_r = X/(A + X)$.

The following proposition describes the optimal charter condition.

PROPOSITION 3 (The Optimal Poison Pill): *The raider would like to initiate a takeover game for any value of* ρ *that is observed at time* t_1. *However, the poison pill installed at date* t_0 *by the shareholders will prevent takeovers for any observed* $\rho < \rho_0$. *Management can be directed to allow permitted bids whenever the raider's foothold satisfies the condition*

$$\gamma_r < \frac{X}{A + X} \tag{17}$$

and the observed stock price exceeds a critical value, $V^*(\rho = \rho_0)$, *defined as*

$$V^*(\rho = \rho_0) = A + \rho_0 X - (1 - \rho_0)(\psi - 1)\hat{g}. \tag{18}$$

At $\rho = \rho_0$ *shareholders receive the same payoffs in a unilateral proxy contest as they do in the takeover game.*

Assuming condition (17) is satisfied, the effect of the poison pill is to alter the shareholders' payoff, as a function of ρ to

$$\max\{\gamma_s V_u(\rho),\ S^*(\rho)\}$$

[9] Securities laws in North America require ownership disclosure by anyone acquiring some minimum amount of stock, such as 5 percent.

from either $\gamma_s V_u(\rho)$ in the unilateral proxy contest or $S^*(\rho)$ in the takeover game.

The removal of the pill when $\rho \geq \rho_0$ and the raider's incentives to always initiate a takeover provide the shareholders with a better payoff than the unilateral proxy contest. The same superior payoffs could be achieved by shareholders outlawing greenmail whenever $V^*(\rho) < V^*(\rho = \rho_0)$.

This result also provides insight on when shareholders will use the market for corporate control instead of hiring a monitor to control the manager's use of free cash flow. By allowing a raider to threaten the firm, shareholders recognize that they will experience a transfer due to the overpayment of greenmail. This overpayment places an upper bound on the amount that the firm would be willing to pay for an internal control mechanism that accomplishes the same end. By equation (3) we know that this upper bound is increasing in the size of the free cash flow. Thus, firms with potentially large free cash flow may prefer the use of a monitor.

VI. Empirical Implications

Our model provides specific, empirically refutable implications of two forms. First, there are *announcement effects* that occur at different points in time as information is released to the market. These points in time are defined by when actions occur. At the earliest date, when all parties have diffuse priors about firm type, firms put defensive measures into their charter. Next, shareholders receive a signal about firm value that causes their beliefs that the firm is a cash cow to change to ρ, which may generate a takeover attempt. Lastly, if a takeover is attempted, management may respond with a greenmail payment. The following *announcement effects* result from our model:

1. When the market has diffuse priors, value enhancing defensive measures are put in place by all firms potentially involved in control contests. Since the installation of these measures does not reveal any information, no price reaction results. Ryngaert (1988) examines a sample of firms that adopt poison pills. He finds that the majority of these firms are not subject to an active takeover threat. For these firms the announcement of the adoption led to an insignificant +.08 percent stock price reaction. Similarly, Comment and Schwert (1995) find that, on average, the adoption of poison pills has little price impact.
   - Defensive measures will be used to prevent takeovers from raiders with footholds greater than a specified level.
   - Defensive measures only remain in place if stock price is low. A sufficiently high stock price results in the elimination of the defensive measures. In practice this can be accomplished in the following manner. If the firm is likely to be a cash cow so that its market value is high, the manager, shareholders and the raider know that a takeover bid will be deemed to be a permitted bid. Hence, the manager and raider will transact as if the poison pill is not in place. When it is likely that the

firm is lean, shareholders know that greenmail, while providing information, is more costly than the value of the information. Hence takeover bids will not be permitted.

2. Target firm stock price increases before a raid is announced. This is consistent with Mikkelson and Ruback (1991). Bids will only be permitted when high values of ρ are revealed, leading to a high stock price.
3. The payment of greenmail of $\hat{g}$ informs the market that the firm is lean, resulting in a price drop of

$$\Gamma \equiv \rho[X + (\psi - 1)\hat{g}] + \hat{g}$$

which is larger than the greenmail payment of $\hat{g}$ for any $\psi \geq 1$. To see this, note that the value of the firm prior to a management response to a takeover attempt is obtained by adding all the payoffs on branches 3 and 11 in Figure 1, and provides

$$\rho(A + X) + (1 - \rho)[A - \psi\hat{g} + \hat{g}]. \tag{19}$$

After the payment of greenmail, the firm is known to be lean, and the value of the firm is the sum of the payoffs to the manager and the shareholders on branch 11 in Figure 1:

$$A - \psi\hat{g}. \tag{20}$$

Subtracting the value after the greenmail payment from the value before defines the price *drop* on the announcement of greenmail, shown above, which is strictly greater than $\hat{g}$ for all $\psi \geq 1$. The announcement of greenmail causes a price decline larger than the value of the payment itself, $\hat{g}$, due to two factors. First, dissipative costs of $(\psi - 1)\hat{g}$ become certain to be incurred, and, second, shareholders lower their valuation of the target since they now know they will not recapture perks, X, because the firm is not a cash cow. Bradley and Wakeman (1983), Dann and DeAngelo (1983), and Mikkelson and Ruback (1991) identify this price drop empirically. Our model indicates that information transmission, rather than managerial entrenchment, could lead to this drop.

The second type of empirical implication that follows from our model is *cross-sectional*. For instance, according to our analysis, general defensive measures are beneficial in that they provide the board with an option that can be used in managing a control challenge. As a result, the removal of such defensive measures would be harmful and managers and shareholders would resist such an action. This is consistent with recent evidence presented by Smith (1996) in a study of firm and market responses to shareholder activism by CalPERS. Smith finds that CalPERS was successful with only one of the 24 resolutions calling for redemption of previously implemented poison pills.[10] In

[10] Success is defined as either the adoption of the resolution or the introduction of sufficient changes to warrant a settlement with CalPERS.

contrast, CalPERS was successful on 20 of 36 performance-related resolutions. Moreover, announcements of takeover related resolutions were met with a significantly negative average stock market reaction in contrast to a significantly positive average response to performance-related targets.

Other cross-sectional implications follow from a comparative statics analysis of the greenmail equilibrium. We have identified two critical endogenous variables, the greenmail payment and the price drop at the time of payment of greenmail:

$$\hat{g} = (1 - \gamma_m)X + \frac{\gamma_m \gamma_r}{1 - \gamma_r} A \tag{21}$$

$$\Gamma \equiv \hat{g} + \rho X + \rho(\psi - 1)\hat{g}. \tag{22}$$

We can also define the price rise when a successful takeover is observed. When the market first learns of the information that leads to the assessment ρ, firm value is $A + \rho X - (1 - \rho)(\psi - 1)\hat{g}$, and this value changes to $A + X$ when the takeover is successful. Thus, the price *gain* upon a successful takeover is

$$\Phi \equiv (1 - \rho)[X + (\psi - 1)\hat{g}] > 0. \tag{23}$$

It is clear in equations (21), (22), and (23) that these endogenous variables are functions of the potential free cash flow, which we normalize as the ratio

$$\chi \equiv X/A.$$

The parameter X represents the free cash flow that could be paid to shareholders if the firm is a cash cow. We assume that this is common knowledge. That is, investors do not know if the firm is a cash cow, but they do know that if it is, then its free cash flow is X. Hence, X is the potential free cash flow. The difficulty in empirically testing our model is in measuring this potential free cash flow. In some cases, this is relatively straight forward. For instance, in the Chrysler example referred to earlier, all agents seem to agree that if Chrysler is a cash cow, then \$4 billion of the \$6 billion in corporate cash is free cash flow. Kerkorian and the management, however, disagree on whether Chrysler is a cash cow or a lean firm. In other cases, potential free cash flow may be more difficult to measure. Empirical proxies for potential free cash flow include Tobin's q and measures of R&D expenditures.

The value of assets in place is only important *relative to* the amount of perks available to the manager. How the manager acts, either as a shareholder or as an entrenched manager, depends upon this ratio. Dividing through the above equations by A yields:

$$\frac{\hat{g}}{A} = (1 - \gamma_m)\chi + \frac{\gamma_m \gamma_r}{1 - \gamma_r} \tag{24}$$

$$\frac{\Gamma}{A} = \rho\chi + [1 + \rho(\psi - 1)]\frac{\hat{g}}{A}. \tag{25}$$

$$\frac{\Phi}{A} = (1 - \rho)\left[\chi + (\psi - 1)\frac{\hat{g}}{A}\right]. \tag{26}$$

There are three exogenous variables of interest in the model, normalized potential free cash flow, χ, the manager's shareholding, γ_m, and the raider's foothold, γ_r. The parameters γ_m and γ_r are directly observable. As mentioned above, normalized potential free cash flow may be difficult to measure empirically.

Taking the appropriate derivatives shows:

1. Targets with larger normalized potential free cash flow, χ, will:
   - require a larger relative greenmail payment, $\hat{g}/A$
   - exhibit a bigger relative price drop upon the payment of greenmail, Γ/A
   - exhibit a bigger relative price increase upon a successful takeover, Φ/A.

   If the relative perks are large, the raider will require a higher greenmail payment to prevent him from taking over the firm to recapture the perks. Thus, the information effect of either the greenmail payment (it is a lean firm) or a successful takeover (it is a cash cow) results in a larger price adjustment.

2. Targets in which the manager has a larger stake, γ_m, will:
   - require the same or smaller relative greenmail payment, $\hat{g}/A$
   - exhibit the same or smaller relative price drop upon the payment of greenmail, Γ/A
   - exhibit the same or smaller relative price increase upon a successful takeover, Φ/A.

   All three of these comparative statics are multiplicatively related to

$$-\left(\chi - \frac{\gamma_r}{1 - \gamma_r}\right)$$

   which is negative or zero depending upon the inequality

$$\gamma_r \leq \frac{X}{A + X}.$$

   When $\gamma_r = X/(A + X)$, the raider is capturing all the expected perks in the takeover game, and the manager and shareholders receive no benefit. In this case, changing the manager's shareholding has no effect on the endogenous variables. If the raider holds less than the maximum foothold, then increasing γ_m means that the manager's *net perk*, $(1 - \gamma_m)X$, is smaller, meaning the manager's interests align more with the shareholders, and the required greenmail payment is smaller, leading to smaller price adjustments as well.

3. Targets in which the raider has a larger foothold, γ_r, will:
   - require a greater relative greenmail payment
   - exhibit a greater price drop upon the payment of greenmail
   - exhibit no change in price (if $\psi = 1$) or a larger price increase (if $\psi > 1$) on a successful takeover announcement.

   A larger foothold increases the raider's payoff in the takeover gain, and so a larger greenmail payment is required to discourage the raider. This causes a bigger price drop on the payment of greenmail. The price gain on a successful takeover (which involves a cash cow firm) reflects the saved perk, X, and the saved dissipative cost, $\psi > 1$. A higher greenmail payment means more saved dissipative costs, leading to a higher positive response to a successful takeover.

VII. Conclusion

Management actions that result in stock price reductions, such as greenmail, are sometimes offered as evidence that management is entrenched and acting in its own best interest at the expense of shareholders. The first point of our study is to show that this interpretation may be incorrect. In our model, greenmail is offered in response to a takeover attempt in order to convince the raider that a takeover would be excessively disruptive. In equilibrium, the greenmail payment exceeds the fair value of the raider's shares by more than the perks available to an entrenched manager.

However, greenmail provides an incentive to raid the firm even when such a raid is not in the best interest of all shareholders. Our second point is to show how ex ante defensive mechanisms, such as poison pills, can be used to manage the occurrence of the raid. Hence, our model suggests that optimal defensive measures should include both poison pills and the allowance of greenmail payments.

Our third point is that a combination of ex ante and ex post defensive mechanisms can be more efficient than a simple ex ante disciplinary mechanism. The ex ante measure that we consider is a unilateral proxy contest, but our basic insight extends to others such as debt structure as in Stulz (1990), or the hiring of a third party monitor to discover the true status of the firm. The use of an ex ante measure, such as hiring a monitor, involves precommitting to an action that is independent of management's response. In contrast, an ex post mechanism, such as allowing the manager to pay greenmail, makes the discipline contingent on the manager's information and hence is more efficient.

Finally, our analysis provides empirical implications consistent with evidence from takeover contests. For instance, on average greenmail results in a loss to shareholders that is larger than the value of the payment made to the raider. This occurs in our model because the payment of greenmail tells the market that the firm does not have free cash flow. We also know that defensive measures are widely adopted by firms with little shareholder dissent, despite the protection these measures might offer an "entrenched" management. In our model, these ex ante defensive measures insure that a takeover only occurs

when preferred by shareholders, offsetting the incentives for a raider to initiate a raid even when it is not in the shareholders' best interest.

Appendix

Proof of Proposition 1: We derive a separating equilibrium in which:

- the cash cow offers no greenmail
- the lean firm offers greenmail of $\hat{g} = (1 - \gamma_m)X + [\gamma_m/(1 - \gamma_r)]g^*$, where $g^* = \gamma_r A$
- if no greenmail is offered, the raider successfully takes over the firm with a takeover offer of $P = A + X$, and the raider then imposes a dividend
- if greenmail is offered, the raider accepts and the shareholders do not impose a dividend on the firm.

We derive the equilibrium actions, payoffs, and necessary conditions by working backward through the tree in Figure 1.

If greenmail of $\hat{g}$ has been offered and accepted by the raider, shareholders believe it is a lean firm for certain, and so no dividend is imposed (branch 11 is superior to branch 12). If greenmail has not been offered, the raider (and shareholders) believe it is a cash cow for certain. The raider therefore imposes a dividend after the successful takeover (branch 3 is superior to branch 4 for the raider).

If no greenmail is offered, the raider must set a takeover price. To eliminate the free-rider problem and insure success of the takeover offer, the raider will set a bid price, P, equal to the expected value of the shares after the takeover succeeds. Since a takeover is only successful when the target is a cash cow, a dividend will be imposed, and the true firm value is:

$$P(\hat{\rho} = 1) = A + X.$$

We identify three necessary conditions for the separating equilibrium. The first two are nonmimicry conditions for each manager type not to mimic the other. The third restriction comes from preventing the lean firm management from defecting from the equilibrium by offering some greenmail amount $\tilde{g} < \hat{g}$.

The Nonmimicry Conditions

The cash cow management compares: (i) choose $g = 0$, leading to branch 3, with $P = A + X$ and (ii) choose $g = \hat{g}$ leading to branch 2. The cash cow management will weakly prefer $g = 0$ if

$$\gamma_m(A + X) \geq X - \hat{g} + \left[\frac{\gamma_m}{1 - \gamma_r}\right]A$$

or

$$\hat{g} \geq (1 - \gamma_m)X + \left[\frac{\gamma_m}{1 - \gamma_r}\right]g^* \tag{A1}$$

where $g^* = \gamma_r A$ is the greenmail payment if the repurchased shares are correctly priced. Note that, in order to have $\hat{g} \leq X$, equation (A1) implies that $\gamma_r \leq X/(A + X)$. To discourage the cash cow from paying greenmail, it must be large enough to offset the cash cow management's net perk consumption, $(1 - \gamma_m)X$ and the inflation in the manager's portion of a fair greenmail transfer due to the raider's shares being retired.

The lean firm management chooses between: (i) setting $g = \hat{g}$, which leads to branch 11 and (ii) setting $g = 0$ which leads to branch 10 with $P = A + X$. The lean firm management will prefer the greenmail payment if

$$\left[\frac{\gamma_m}{1 - \gamma_r}\right](A - \psi\hat{g}) > (1 - \Omega)\gamma_m(A - L) + \Omega\gamma_m(A + X)$$

or

$$(1 - \gamma_a)L - [\hat{g} - g^* + (\psi - 1)\hat{g}] \geq (\gamma_a - \gamma_r)X. \tag{A2}$$

The lean firm will pay the greenmail if the saved disruption costs, net of the costs of paying greenmail, exceed the overvaluation of the shares that would be tendered in a takeover.

The two nonmimicry conditions are satisfied by the value of g at which (A1) is an equality:

$$\hat{g} = (1 - \gamma_m)X + \left[\frac{\gamma_m}{1 - \gamma_r}\right]g^*. \tag{A3}$$

The Condition to Prevent a Lean Firm Defection

The raider and the market believe that a firm that offers any greenmail payment less than $\hat{g}$ is a cash cow and that any firm offering at least $\hat{g}$ is a lean firm. The raider revises his beliefs about the likelihood that the firm is a cash cow as follows:

$$\hat{\rho}(g) = \begin{cases} 1 & g < \hat{g}, \\ 0 & g \geq \hat{g}. \end{cases} \tag{A4}$$

Given this belief structure, we check the incentives for each type to offer some greenmail payment different from the equilibrium.

First, the cash cow will not offer more than $\hat{g}$. Doing so would save the perk, X, but mean paying an even higher greenmail payment.

Second, the cash cow will not offer some payment between zero and $\hat{g}$. If such a greenmail offer is made, the raider and shareholders believe it is a cash cow. The raider can either accept the greenmail (and let the shareholders make the control change), or reject the greenmail, do the takeover, and impose a control change. If the greenmail payment, $\tilde{g}$, is big enough to induce the raider to accept the greenmail, then paying that greenmail leaves the cash cow worse off than in the equilibrium since they pay $\tilde{g}$ but lose perks. If the greenmail payment is insufficient to have the raider accept, the raider will go ahead with the control change. Since this is what happens in equilibrium to the cash cow, it is indifferent to this result or the equilibrium outcome.

Third, the lean firm will not offer greenmail of more than $\hat{g}$, since the shareholders believe it is a lean firm, as in equilibrium, but the lean firm is paying more in greenmail than is necessary.

The final case is the lean firm defecting by offering greenmail of $\tilde{g} < \hat{g}$. Shareholders and the raider believe such an offer is from a cash cow. If the greenmail payment is small enough so that the raider rejects it, then the raider will impose a dividend. The payoffs that result in this case are identical to those found in the nonmimicry condition for the lean firm, and so the lean firm will not defect. For a larger greenmail payment, the raider will accept, but the shareholders will then impose a control change. In this case, the benefit to the lean firm of defecting is the reduced dividend (grossed up by the cost of selling assets), $\psi(\hat{g} - \tilde{g})$, while the cost to the lean firm is the disruption cost incurred, L. For no defection, the following condition must hold:

$$L > \psi(\hat{g} - \tilde{g})$$

or

$$L > \psi\left(\frac{1 - \gamma_m - \gamma_r}{1 - \gamma_r}\right)[(1 - \gamma_r)X - \gamma_r A]. \tag{A5}$$

It is easy to show that the right-hand side of equation (A5) is increasing as γ_r decreases. At $\gamma_r = X/(A + X)$, the right-hand side is zero, and so equation (A5) holds. At $\gamma_r = 0$, equation (A5) becomes:

$$L > \psi(1 - \gamma_m)X.$$

Having assumed that $L > \psi X$, this inequality is satisfied for all $\gamma_m \leq 1$.

The Value of the Takeover Game

Using the payoffs on the equilibrium branches 3 and 11, we calculate the expected value of the game to each of the three players:

$$R^*(\rho) = \rho\gamma_r(A + X) + (1 - \rho)\hat{g}$$

or (A6)

$$R^*(\rho) = \gamma_r(A + \rho X) + (1 - \rho)(\hat{g} - g^*)$$

$$S^*(\rho) = \rho\gamma_s(A + X) + (1 - \rho)\left[\frac{\gamma_s}{1 - \gamma_r}(A - \psi\hat{g})\right]$$

or (A7)

$$S^*(\rho) = \gamma_s(A + \rho X) - (1 - \rho)\frac{\gamma_s}{1 - \gamma_r}(\hat{g} - g^* + \hat{g}\ (\psi - 1))$$

$$M^*(\rho) = \rho\gamma_m(A + X) + (1 - \rho)\left[\frac{\gamma_m}{1 - \gamma_r}\ (A - \psi\hat{g})\right]$$

or (A8)

$$M^*(\rho) = \gamma_m(A + \rho X) - (1 - \rho)\frac{\gamma_m}{1 - \gamma_r}\ (\hat{g} - g^* + \hat{g}(\psi - 1))$$

and

$$\begin{aligned} V^*(\rho) &= R^* + S^* + M^* \\ V^*(\rho) &= A + \rho X - (1 - \rho)(\psi - 1)\hat{g}. \end{aligned} \tag{A9}$$

Proof of Proposition 2: In the *proxy threat with management response*, there are two players, the manager, with a proportion γ_m of firm shares, and the shareholders, who hold the remaining fraction, $\gamma_s = 1 - \gamma_m$. The sequence of events is: shareholders threaten the management with unilaterally taking control and imposing a dividend. The manager is allowed to respond to this threat by paying a "special dividend," d. After management's dividend is paid or not, the shareholders can take control and impose a dividend if they choose.

The payoffs to this game parallel those in the takeover game, with the special dividend playing the role of greenmail; the only difference here is that the special dividend goes to all shareholders, not just the raider, as in the takeover game. For example, if the shareholders threaten a cash cow manager, who then pays a special dividend of d and shareholders respond by not taking control, then the payoffs to the manager and shareholder are, respectively,

$$X - d + \gamma_m(A + d)$$

and

$$\gamma_s(A + d).$$

These payoffs correspond to branch 2 in Figure 1.

We derive a separating solution in which the cash cow management pays no special dividend and shareholders respond by taking control. The lean firm management pays a special dividend of $\hat{d} = X$ and shareholders do not take control.

Shareholders use beliefs consistent with a separating solution: if a dividend of $d \geq \hat{d}$ is paid, the shareholders believe it is a lean firm and do nothing. If $d < \hat{d}$, then shareholders believe it is a cash cow and will take control and impose a dividend.

If the cash cow management pays a special dividend it will receive $X - d + \gamma_m(A + d)$, while paying no dividend will yield $\gamma_m(A + X)$. The cash cow will prefer not paying a special dividend if $d \geq \hat{d} = X$. To minimize dissipative costs, we choose the minimum special dividend:

$$\hat{d} = X.$$

If the lean firm pays a special dividend of d it receives $\gamma_m(A - \psi d) + \gamma_m d$, while paying no dividend will provide $\gamma_m(A - L)$. For the lean firm to prefer making the special dividend it must be that

$$L > \hat{d}(\psi - 1) = X(\psi - 1).$$

The ex ante expected value of the proxy contest with management response to all the players is

$$V^p = A + \rho X - (1 - \rho)(\psi - 1)X.$$

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