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Why Hang on to Losers? Divestitures and Takeovers

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ABSTRACT

We study the divestiture decisions of managers who care about their reputations. Managers' divestiture and investment decisions are publicly observable, but managers privately observe signals with respect to the future payoff distribution of investments they have initiated. We establish that in equilibrium there is too little divestiture. These inefficiencies create the opportunity for wealth-enhancing divestiture-motivated takeovers. A key result is that only managers of targets with "middle of the road" asset specificity should consider the takeover threat credible. These findings suggest that uniqueness of assets is an important determinant of both agency costs and takeover activity. Our analysis leads to several empirical predictions.

OVERWHELMING EMPIRICAL EVIDENCE HAS documented large gains in shareholder wealth that arise from takeovers (Jarrell, Brickley, and Netter (1988), and Jensen and Ruback (1983)). The source of these gains has remained elusive, however. Although takeovers are followed by some infusion of new managerial talent, we have not witnessed the kind of profound post-takeover restructuring of the productive activities of target firms that would readily justify the documented wealth gains. A commonly observed post-takeover initiative is divestiture of some of the target's lines of business (Bhide (1989), and Bhagat, Shleifer, and Vishny (1990)). What is puzzling is that if the gains from takeovers stem from the anticipation of such divestitures, then why were these divestitures not undertaken by the target firm's management in the first place?

The purpose of this paper is to provide a possible answer to this question. Our focus is on the divergence in incentives between managers and shareholders with respect to divestitures of ongoing projects. We show that managers might rationally decide to hang on to projects that should be divested in

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the interest of value maximization. We then establish that these potentially distorted managerial incentives may be at the heart of the wealth gains from takeovers. In particular, a takeover threat may deter a manager from persisting with a suboptimal project. Thus, like Scharfstein (1988), the possibility of takeovers has a disciplinary effect on management. Moreover, we show that an actual takeover enhances shareholder wealth by enforcing the optimal divestiture decision and by ousting inefficient target management.

We pay particular attention to the *credibility* of a takeover threat. Since participation in the market for corporate control is costly, i.e., a raider faces strictly positive investigation costs prior to detecting a takeover target, a takeover threat is only credible if a raider can expect to obtain part of the wealth gains. Two factors that reduce the raider's incentive to investigate must be considered. First, the threat of a takeover has a disciplinary effect on management. This reduces the wealth gains that can arise from an actual takeover. Second, the raider may not be able to capitalize on private information about the inefficiency of the target; his bid may reveal this information to the market and invite competing bids. Both factors reduce the raider's potential to obtain rents and may discourage participation in the market for corporate control.

The reason for the divergence in interests between managers and shareholders is that a manager has private information about his own ability to identify profitable projects, and he strategically manipulates others' perceptions of his ability. As Holmstrom and Ricart i Costa (1986) have said, this leads to corporate choices that are distorted away from the shareholders' optimum. In particular, a manager is reluctant to divest because a divestiture is essentially an admission that an inappropriate project choice was made initially, and hence adversely affects perceptions of his ability.

A key result is that skilled managers generally make firm value-maximizing divestiture decisions, whereas bad (that is, unskilled) managers delay divestitures. This result indicates that bad managers are not only less able to select projects but also less willing to correct their mistakes. We establish that on average there is too little divestiture relative to the shareholders' optimum.

Our second main result is that a takeover threat can reduce managerial inefficiencies. We establish that this threat is only credible for firms that have assets that are not too firm specific nor too marketable, i.e., for firms that have "middle of the road" asset specificity. The intuition is related to the potential rents that a raider can extract from a takeover. If the target firm's assets are not firm specific (and thus are highly marketable) and if bidding is costly, competing uninformed bidders could bid away the initial bidder's potential rents, leaving him unable to recover his costs. Alternatively, the target firm's board of directors—if they are behaving independently of management to the benefit of shareholders—could free-ride on the information revealed by the takeover attempt and internalize all potential gains. I adopt the terminology that a firm that makes an inappropriate project choice ends up with an *incompatible* project. Divesting could generate substantial value if the project is sold to a high-value (i.e., a *compatible*) user. A firm with

marketable assets faces a high probability that such a compatible user can be found. Therefore, a raider has little potential to obtain rents. However, if the firm's asset specificity is high, the raider can potentially acquire private information about compatible users for the firm's incompatible assets. Uninformed bidders or the board of directors are now at a competitive disadvantage. They are uninformed about potential compatible users and face a higher probability than the raider that no compatible user can be found. The raider will try to exploit his competitive advantage and capture part of the potential wealth gains. Obviously, when the firm's assets are totally firm specific, no compatible user exists and a raider would again be unable to capture any gains. Thus, the market for corporate control imposes a threat only to firms that have "middle of the road" asset specificity. All other things being equal, our analysis suggests that human capital concerns are most detrimental for firms with either very low or very high asset specificity. This has implications for corporate governance and leads to various empirical predictions.

Our paper is organized as follows. In Section I, we present the economic setting. Section II analyzes the divestiture decision. It establishes the "too little divestiture" result and relates this to existing theoretical work. In Section III, we analyze the feasibility of a market for corporate control and how it can reduce managerial inefficiencies. Section IV lists the empirical predictions of the model and relates them to available empirical evidence. Section V is the conclusion. All proofs are in the appendix.

I. The Economic Setting and Specification of the Model

A. Investment Opportunities and Managerial Ability

We consider a three-date model. At date 0, the manager makes an investment decision. The investment decision involves a choice of project. After choosing the project, but before date 1, the manager learns privately whether the project is *compatible* with the firm. The compatibility of the project determines the distribution of payoffs that are generated at date 2. The payoff is $\overline{X}$ with probability P_i, and $\underline{X}$ with probability $1 - P_i$, where $i = c$ $(i = n)$ refers to a compatible (incompatible) project, and $P_c > P_n$. A project that is incompatible for the firm that initiated the project may still realize substantial value once divested and sold to a compatible firm.

After initiating the project, the manager receives a signal that reveals whether or not the project is compatible. This leaves him with ample time to divest the project before date 1. We will assume that the manager receives either a positive signal that reveals with probability one that the project is compatible, or he receives a negative signal that reveals with probability one that the project is incompatible. If a project is incompatible, the manager may find a compatible user for whom the project has a higher value. We assume that a compatible user is willing to pay M more for the project than an incompatible user.[1] For simplicity, we assume that the value-maximizing

[1] The analysis does not require us to explicitly model for how much the firm can sell its project.

decision is to divest *all* incompatible projects, even if no compatible user can be found.[2] The probability that the project can be divested to a compatible user depends on the marketability of the project. A natural measure of marketability is the degree of *firm specificity* or uniqueness of a project; e.g., projects that are very firm specific are not easily marketable. We let the parameter Ω equal the probability that a compatible user can be found, and interpret Ω as a firm-specificity parameter; the higher Ω, the more marketable and less firm specific the project.

A manager may be one of two types. The parameter $\tau \in \{G, B\}$ defines the type of manager, where $\tau = G$ refers to a good manager and $\tau = B$ to a bad manager. The type of manager determines the probability ϕ_τ that a compatible project will be chosen (and thus a positive signal is received). With probability $[1 - \phi_\tau]$ the project will be incompatible, and by the definition of G and B, $\phi_G > \phi_B$.

We have specified in Figure 1 the timing of the decisions regarding the project. The investment and divestiture decisions are made before date 1 and outputs are realized at date 2.

B. Information Structure, Wage Policy, and Managerial Objectives

We assume that managers are paid at each point in time their human capital value as perceived by the market. This guarantees that managers care about their short-term (date 1) and long-term (date 2) perceived human capital value. We assume that demand and supply considerations in the labor market lead to wages $\overline{W}$ for managers that are perceived to be good with probability (w.p.) one, and $\underline{W}$ for managers perceived to be bad w.p. one, with $\overline{W} > \underline{W}$. For all intermediate cases, wages are between $\overline{W}$ and $\underline{W}$ and linearly increasing in perceived ability,[3]

$$W_t = \underline{W} + q_t\left[\overline{W} - \underline{W}\right] \tag{1}$$

where, q_t is the probability at date t that a manager is perceived good, and W_t is the wage at date t. The wage structure rules out explicit precommitments to specific contingent-wage schemes which may mitigate the manager's human capital concerns.[4] Therefore, as in Holmstrom and Ricart i Costa (1986), and in Hirshleifer and Thakor (1991), career concerns will affect managerial decisions. We believe that our work is almost applicable to large publicly held corporations in which managers generally have only a small stake, and presumably do care about the implications of their decisions for their perceived human capital value.[5]

The environment is common knowledge to all agents, except that each manager is privately informed about this type τ and privately observes a

[2] Alternatively, the firm could *announce* its intention to divest, and subsequently divest only if it finds a compatible user. This formulation would not have changed our results.

[3] The linear wage schedule in (1) can be replaced with any monotonically increasing schedule.

[4] This assumption can be relaxed so long as some incomplete contingent contracting remains.

[5] For some supporting empirical evidence see Jensen and Murphy (1990).

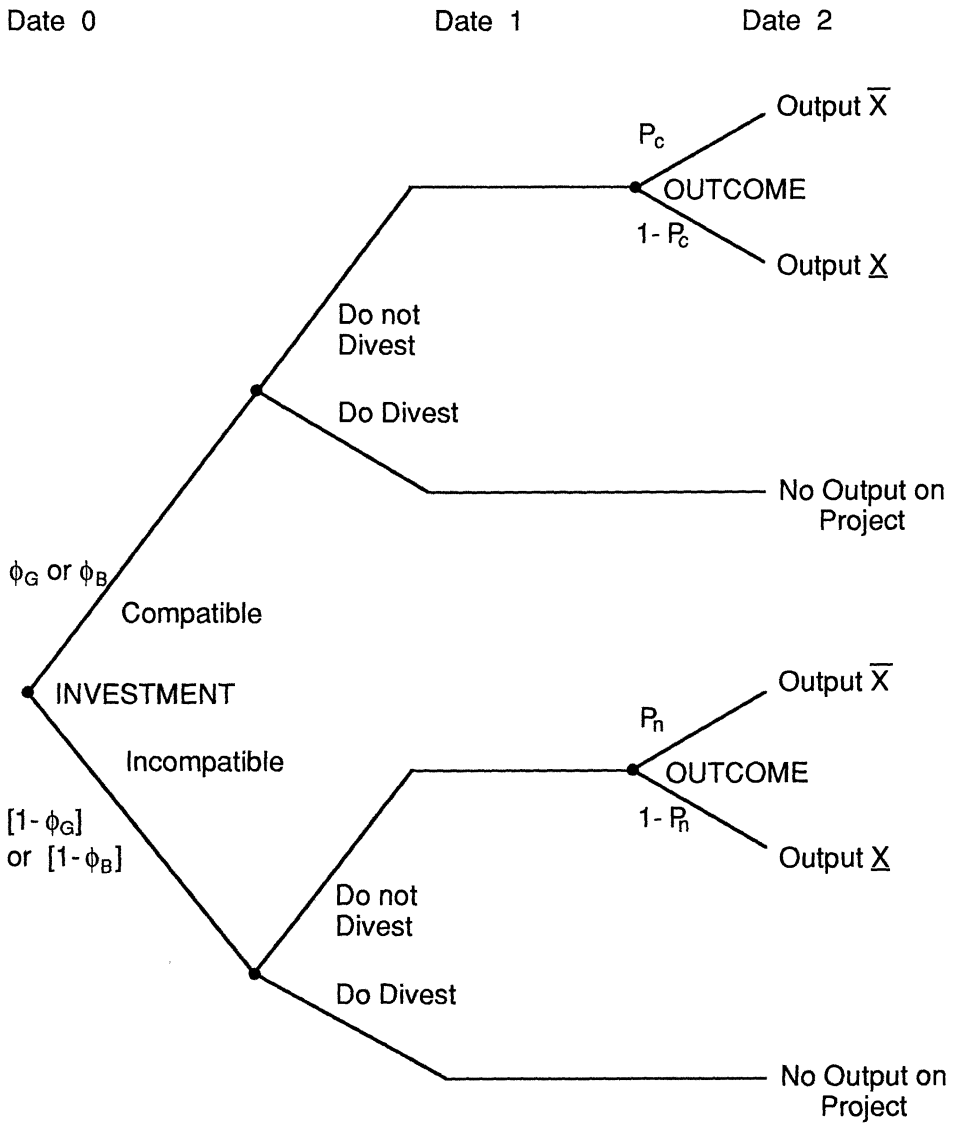

Figure 1. The timing of investment and divestiture decisions. A good (= G) manager chooses a compatible (or incompatible) project with probability ϕ_G (or $1 - \phi_G$). For a bad (= B) manager these probabilities are ϕ_B (or $1 - \phi_B$). A compatible (or incompatible) project generates an output $\overline{X}$ with probability P_c (or P_n) or $\underline{X}$ with proability $1 - P_c$ (or $1 - P_n$). At date 0, the manager undertakes a project. The manager is privately informed about his type (G or B), and immediately after initiating it, he observes a signal revealing whether the project is compatible or incompatible. Based on this information, he can decide to Divest or Not Divest before date 1. Outputs, if any, are realized at date 2.

signal about the project's payoff distribution (i.e., about its compatibility). The market's prior beliefs are embodied in the probability $\pi \in (0, 1)$ that a manager is of ability G. Hence, $q_0 = \pi$. We model this as a signaling game in which the (informed) manager moves first, choosing a specific strategy that leads to observable actions (i.e., divesting or not divesting). The market responds by offering wages that are "correct" conditional upon its perception of the manager's ability. The market observes at date 1 whether a divestiture has occurred and formulates its posterior belief $q_1 = q_1^{a(\sigma)}$ accordingly, where $a(\sigma)$ is the observed action based on the manager's strategy σ. The payoff X on a project is observed by all agents and leads to a posterior belief $q_2 = q_2^{a(\sigma)}(X)$ at date 2. Note that after the market formulates its posterior belief $q_1^{a(\sigma)}$, no further (observable) actions are undertaken by the manager. Therefore, conditioned on observing the payoff X, $q_2^{a(\sigma)}(X)$ is a deterministic Bayesian update of $q_1^{a(\sigma)}$. We can state this as follows:

$$q_2^{a(\sigma)}(X) = \frac{q_1^{a(\sigma)}\text{Prob}(X \mid G)}{q_1^{a(\sigma)}\text{Prob}(X \mid G) + \left[1 - q_1^{a(\sigma)}\right]\text{Prob}(X \mid B)} \tag{2}$$

where $\text{Prob}(X \mid \tau)$ is the probability that a type τ manager realizes output X. Note that (2) simplifies to $q_2^{a(\sigma)}(X) = q_1^{a(\sigma)}$ if the project is divested.[6]

After observing the signal, the manager can either divest or not divest, or follow a mixed strategy. The manager's problem is now to select a strategy that maximizes the present value of his wages. That is,

$$\underset{\sigma_\tau \in \Psi}{\text{maximize}}\, W_1 + E(W_2)[1 + r]^{-1} \tag{3}$$

where W_1 and W_2 depend on the market's posterior belief $q_1^{a(\sigma)}$ and $q_2^{a(\sigma)}(X)$, r is the discount rate and E is the expectation operator with respect to the payoff distribution.

II. Too Little Divestiture: Analysis and Discussion

A. *Analysis*

Recall from the earlier discussion that the value-maximizing decision rules are to divest a project if a negative signal is received, and not to divest it if a positive signal is received. We now show that reputational concerns make a manager reluctant to divest.

Intuitively, we would expect that the manager will wish to avoid divestiture because it signals to the market that the manager is more likely to be bad. This argument is incomplete, however, since divestitures are observed in

[6] We assume that the return to the firm's owners is increasing in managerial quality despite the higher wages paid to better managers. In an earlier version, we assume that managers manage the project and some existing operations that produce outputs in the far future (say date 3) that depend on ability. In this setting, good managers are optimally retained even when their ability no longer affects the project.

equilibrium. It is sufficient that a bad manager divests his incompatible project with a lower probability than a good manager. This smooths the reputational repercussions of a divestiture.

Theorem 1: *The following constellation of strategies characterizes the set of plausible Bayesian Perfect Nash Equilibria (BNE)*[7]

(*i*) *No manager ever divests after receiving a positive signal*;
(*ii*) *A good manager who receives a negative signal divests with a probability* $\gamma \in [\underline{\gamma}, 1]$, *with* $\underline{\gamma}$ *strictly positive but less than one*;
(*iii*) *A bad manager who receives a negative signal divests, given* γ, *with probability* $\varepsilon < \gamma$, *where* ε *is monotonically increasing in* γ.

Corollary to Theorem 1: *In the most efficient BNE, a good manager who receives a negative signal always divests* ($\gamma = 1$), *while a bad manager after observing a negative signal divests with probability* ε^*, *where* $0 < \varepsilon^* < 1$.

The results in Theorem 1 and its Corollary indicate that a bad manager not only causes losses because of his relative lack of ability but is also less willing to take corrective actions; i.e., he divests incompatible projects with a strictly lower probability than a good manager. Theorem 1 allows for many different combinations of γ and ε. The Corollary identifies the most efficient equilibrium. We will focus on this equilibrium, and see how a market for corporate control may reduce inefficiencies.[8]

It is worth noting that the reputational consequences of a divestiture are limited to the announcement of a divestiture. Whether the project is sold to a compatible or incompatible user affects the sales price but not the (human-capital-contingent) managerial compensation. Therefore, the results so far are independent of Ω, the probability that an incompatible project can be sold

[7] Apart from the set of BNE identified in the theorem, two other BNE exist. In this footnote, we will indicate that these are supported by quite implausible off-equilibrium path beliefs. The first is that nobody divests the project. This conjectured equilibrium can be supported by the (arbitrary) belief that a manager is bad with probability one if he divests the project. The second is that everybody divests the project (even the good project). This conjectured equilibrium can be supported by the belief that a manager is bad with probability one if he does not divest the project.

[8] This equilibrium arises as the only plausible equilibrium once we allow managers to reinvest, i.e., choose a new project, immediately after divesting the project. We have done extensive analyses (not included in this paper, but available upon request from the author) that show that this equilibrium is sequential (Kreps and Wilson (1982)) and survives all refinements, including the strategic stability concept of Kohlberg and Mertens (1986). A structure with reinvestments can be rationalized by considering that a divestiture may free funds or other scarce resources that might facilitate new investments. An explanation that is particularly appealing to us is that the manager has a limited scope; only after a divestiture can the manager initiate new investments. An application of the model with reinvestments is portfolio management. Our results suggest that portfolio managers may stick to their original portfolio choices even if this is suboptimal. See Scharfstein and Stein (1990) for a related discussion on the behavior of portfolio managers.

to a compatible user. As we will see later, what depends on Ω is the feasibility of takeovers.

B. Discussion of Related Literature

In a related work, Kanodia, Bushman, and Dickhaut (1989) show that human capital concerns may cause managers to suppress disconfirming information regarding past decisions. While Kanodia, Bushman, and Dickhaut do not focus on divestitures in particular, their arguments are consistent with suboptimal divestiture decisions as well. Apart from the fact that the objective of our analysis is to rationalize and analyze divestiture-motivated takeovers, there are several other important differences between their work and ours. First, in our model, information transmission comes from the current divestiture decision and, in contrast to the model of Kanodia, Bushman, and Dickhaut, from *future* output realizations as well. This allows us to consider managerial decisions in a dynamic perspective. Second, Kanodia, Bushman, and Dickhaut claim that managers do not know their ability. Therefore, their work suggests that inefficiencies are observed universally, while we show that generally only low ability managers avoid divestitures.

Another related paper is by Jeremy C. Stein (1989). His model is about underinvestment, but has implications for divestitures. Stein's basic message is that managerial myopia may lead to an excessive concern for current performance. This would suggest that managers may wish to *overdivest* (relative to the shareholders' optimum) because divestitures boost current cashflow. A necessary assumption for this result is that a divestiture is *not* observable to the market.[9]

Stein's result stands in direct contrast to ours for two reasons. First, in Stein's model, a divestiture *itself* does not convey any information directly (i.e., it is unobservable), but the resulting boost in earnings conveys good news. In our model, a divestiture is observable and conveys bad news. Second, unlike Stein's model, in our model divestiture decisions are identified with the managers responsible for the divestiture. Thus, the potential good news that an incompatible project is being divested is confounded with the bad news that it is *current* management that failed to successfully choose a compatible project.

Thus, the extent of divestiture relative to the socially efficient rule depends on the observability *and* on the degree of attribution of the project to current management. If a divestiture is unobservable *and* if divesting increases the value of some other variable that conveys good news, then there may be too

[9] A variety of other papers have analyzed how concerns about perceived human capital value distort investment decisions. See Narayanan (1985a, 1985b), Holmstrom and Ricart i Costa (1986), Hirshleifer and Chordia (1990), Bebchuk and Stole (1991), and Hirshleifer and Thakor (1991).

much divestiture. If a divestiture is observable and involves a project attributed to a predecessor whose ability perceptions are irrelevant to current management, then we get socially efficient divestiture. If a divestiture is observable and involves a project attributed to the present manager, then we get too little divestiture.

Our analysis and Stein's are thus complementary. The divestitures that we have in mind involve the selling off of divisions, the visible termination of projects, the reversal of an originally chosen marketing strategy (if observable), and so on. For these divestitures, lack of observability is not likely to be an issue. Stein's divestitures may relate to cutbacks in research and development or in maintenance that may not be directly observable.[10]

III. The Market for Corporate Control

A. The Takeover Game

The managers' reluctance to undertake value-maximizing divestitures suggests that corporate raiders could generate value if they could credibly threaten to take control of the firm and impose the value-maximizing decisions. For this scenario to work, the raider should expect to capture part of the wealth gains since participating in the market for corporate control is costly. We will show that the potential to extract private benefits depends on the parameter for firm specificity of assets Ω.

We assume that a raider who decides to participate in the market for corporate control identifies with some positive probability an inefficient firm *and* learns privately whether a compatible user can be found for the firm's incompatible project. This formulation captures the idea that for takeovers that are solely motivated by potentially value-enhancing divestitures, a raider seeks to obtain information about potential buyers of divested units. This information is important for the raider's assessment of the value created in the takeover.

Consider a firm with firm-specificity parameter Ω.[11] Assume that a raider identifies an inefficient firm in this industry and is also aware of a compatible user. To what extent can such a raider capitalize on his private information? Note first that he cannot capitalize on his knowledge of the inefficiency of the firm. Even if he could keep this information secret, his bid for the firm would reveal to the market that the firm is inefficiently managed. Thus others could

[10] Hirshleifer and Chordia (1990) argue that bad managers may seek to overinvest in research if that delays information transmission. Bebchuk and Stole (1991) obtain a similar result. They show that managers may overinvest if the level of investment is observable but its productivity is not.

[11] We do not distinguish between the specificity of the firm's assets in general, and that of the project. Empirical work has shown that the units divested after a takeover generally end up in the *same* industry (see Bhagat, Shleifer, and Vishny (1990)). This suggests a similarity between the specificity of the firm's assets and that of the project.

free-ride on this information; e.g., uninformed market participants could submit equally competitive bids. We therefore assume that this information becomes public whether or not the raider makes a bid.[12,13] However, the raider has valuable information about potential compatible users for a target's incompatible asset. Since a successful raider has located a compatible user whereas the target firm may locate one only with probability Ω, the raider may capture a gain.[14] This gain is bounded by $(1 - \Omega)M$, where M is the incremental value of the target's project for a compatible user vis-à-vis an incompatible user.

Observe that any takeover attempt is opposed by management because it would reveal the management's low ability. The position of the board is less clear, however. Jensen (1989) has argued that generally boards have not disciplined managers. Empirical evidence by Morck, Shleifer, and Vishny (1989) shows that Jensen's arguments are particularly true for boards of firms operating in poorly performing industries. However, Morck, Shleifer, and Vishny show that managers that perform poorly relative to the industry are more likely to be disciplined. How can we explain these apparent inefficiencies in internal control devices? One possible explanation is that management and board are not sufficiently independent. In our context, this could be so if the board has chosen management and has participated in the investment decision process. Its reputation might then be highly correlated with the reputation of management, and the board would (like management) oppose takeover attempts. This is a situation where only hostile takeovers could lead to change.

Another scenario is one where the board is reactive; i.e., the board is basically passive, but once alerted by a takeover attempt, behaves in the interest of shareholders.[15] In that case, shareholders will optimally vote against a takeover bid if more value can be generated by letting the board undertake the value-maximizing decisions. If, however, the raider could generate more value, the board would "endorse" the takeover bid, and the

[12] This simplifies the analysis a little. We now do not have to be concerned about (frivolous) bids for efficient firms; i.e, the costs of making bids in the absence of benefits rules out frivolous bids.

[13] Scharfstein (1988) analyzes a model of takeovers with synergistic gains in which *public revelation* of information at the time of the takeover may destroy its disciplinary value. In Scharfstein's analysis, the raider observes privately whether the firm's value is low due to lack of managerial effort or due to an unfavorable environment. Scharfstein shows that in this setting takeovers only have disciplinary value if the raider is privately informed about the environment. The basic argument is that if tendering shareholders make imperfect inferences about the true state of the firm, managers can reduce the likelihood that a takeover attempt is successful by increasing effort.

[14] We should interpret Ω as the probability that a search for a compatible user is successful. Assume that time does not permit information acquisition after observing a takeover bid.

[15] The empirical evidence by Morck, Shleifer, and Vishny (1989) quoted in the text indicates that boards are not completely unresponsive to poor performance, nor completely responsive to takeover threats. Hirshleifer and Thakor (1990) model a board of directors that is pro-active, and that becomes more lenient when a market for corporate control exists.

takeover would be "hostile" only to management.[16] In both scenarios, the wealth gains obtainable by the raider are limited by the competition that he faces from uninformed market participants, i.e., either competing bids or value-maximizing actions of the board.

We will now formalize the takeover game. We assume that the raider makes only *one* take-it-or-leave-it offer. After observing a firm that does not divest its project, the raider decides whether or not to investigate. If he investigates, he incurs a finite participation cost $k_1 > 0$, and, subsequently, observes a signal s. The signal is uninformative if he targets an efficient firm. If he targets an inefficient firm, then with a positive probability ω, the signal is informative and reveals that the firm is inefficient.[17] Note that conditioned on having targeted and identified an inefficient firm, the probability that the raider identifies a compatible user is increasing in Ω. We therefore assume, without loss of generality, that this probability is Ω. We label as λ the proportion of inefficient firms within the sample of firms that do not divest. Observe that the joint probability of targeting an inefficient firm and successfully identifying a compatible user is $\omega\lambda\Omega$. If the raider decides to bid for the firm and the bid succeeds, the raider incurs a (finite) transaction cost $k_2 > 0$ to facilitate the actual takeover. We now state the main theorem of this section.

Theorem 2: *The observed takeover activity is as follows*:

(*i*) *if* $k_1 \geq \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$, *no takeovers occur and no raider participates in the market for corporate control*;

(*ii*) *if* $k_1 < \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$, *then a raider does enter the market for corporate control. His bid succeeds with probability one, and he extracts* $[1 - \Omega]M$.

The results in Theorem 2 show that raiders enter the market for corporate control if the costs $\{k_1, k_2\}$ are not too high. The following qualifications should be made. We have simplified the bidding process by assuming that the raider can make a take-it-or-leave-it offer. This means that the raider can extract the total surplus $[1 - \Omega]M$. Alternative formulations are possible in which the bargaining position of the raider would be weaker, so that he would share the surplus with the target shareholders. It is also possible that several market participants may investigate firms that choose not to divest.

[16] This scenario could also lead to other resolutions. For example, the board may force management to sell off the incompatible project. If this maximizes shareholders' value, it would substitute for an actual takeover. The first scenario, with management *and* board opposed to the takeover attempt, would force the raider to bypass the board and submit a tender offer directly to the shareholders.

[17] The probability ω measures the likelihood that a manager who fails to divest an incompatible project is detected. If ω is very high, managers with firms that are subject to takeover threats will always seek to preempt takeovers; for high values of ω, part (iii) of Theorem 3 does not apply.

This raises the possibility that more than one raider "knows" a high-value user. In that case, the informed raiders would compete away their share of the surplus in Bertrand fashion. However, with any finite number of raiders, there is a positive probability that only one raider has the desired information. The qualitative results in Theorem 2 are robust to those generalizations.[18]

A critical parameter in Theorem 2 is the firm specificity of assets Ω. The role of Ω is explored in the next corollary.

Corollary to Theorem 2: *Assume* $k_1 < \omega\lambda(M - k_2)^2/4M$, *then only firms with* $\Omega \in (\underline{\Omega}, \overline{\Omega}) \subset (0, 1)$ *are potential takeover targets. If* $k_1 \geq \omega\lambda(M - k_2)^2/4M$ *no market for corporate control exists.*

This corollary implies that raiders do not expect to earn rents on firms with $\Omega < \underline{\Omega}$ and firms with $\Omega > \overline{\Omega}$, and thus these firms operate without threat from raiders.[19]

B. Interaction Between the Market for Corporate Control and the Managerial Divestiture Decision

In the previous section we took λ, the proportion of inefficient firms within the pool of firms that do not divest, as exogenously given. However, λ depends on the probability ε that bad managers divest their incompatible projects. Given the equilibrium strategies in the Corollary to Theorem 1, we can write λ as follows:

$$\lambda \equiv \lambda(\varepsilon) = \frac{[1 - \varepsilon][1 - \pi][1 - \phi_B]}{[1 - \varepsilon][1 - \pi][1 - \phi_B] + \pi\phi_G + [1 - \pi]\phi_B} \tag{4}$$

From the preceding analysis, we know that a takeover bid for a firm with an incompatible project downgrades the perceived human capital value of its manager. A manager of a target that faces this threat might be more willing to undertake the value-maximizing divestiture decision. Therefore ε increases, and from (4) we observe that λ decreases. From the Corollary to Theorem 2, it follows that this narrows the interval of Ω values for which takeovers are observed. This suggests that a firm at the periphery of the interval $(\underline{\Omega}, \overline{\Omega})$ optimally preempts the takeover threat. Since total preemption would remove the takeover threat and, as a consequence, its disciplinary

[18] As in Berkovitch and Khanna (1991), we have assumed that shareholders collude. Therefore, we can ignore the free-rider problem. In the absence of collusion and assuming a finite number of shareholders, the raider could still obtain some rents (see also Bagnoli and Lipman (1988)). However, his overall expected gains are less, and the interval of Ω value for which a market for corporate control exists narrows.

[19] We preclude the raider from secretly acquiring a substantial stake in a target, e.g., wealth constraints and limitations on secrecy may make this infeasible.

value, there will still be a positive probability of an actual takeover.[20] The following theorem characterizes the effects of a takeover threat. Recall that ε^* is the divestiture probability in the absence of a takeover threat (see Corollary to Theorem 1), and let $(\underline{\Omega}, \overline{\Omega})$ be the feasible interval for profitable takeovers implied by the choice of ε^*.[21]

Theorem 3: *The presence of a market for corporate control affects a bad manager's strategy with respect to divesting incompatible projects as follows*:

(*i*) *For a firm with* $\Omega \in [0, \underline{\Omega}] \cup [\overline{\Omega}, 1]$, *a takeover threat is not credible and the manager continues to choose* $\varepsilon = \varepsilon^*$.

(*ii*) *For a firm with* $\Omega \in (\underline{\Omega}, \underline{\Omega} + l] \cup [\overline{\Omega} - l, \overline{\Omega})$, *where* $0 < l \leq [\overline{\Omega} - \underline{\Omega}]/2$, *the manager partially preempts the takeover threat and chooses* $\varepsilon_0 \equiv \varepsilon_0(\Omega)$, *where* $\varepsilon_0 \geq \varepsilon^*$ *is implicitly defined in* $k_1 \equiv \omega\lambda(\varepsilon_0)\Omega\{[1 - \Omega]M - k_2\}$.

(*iii*) *For a firm with* $\Omega \in (\Omega + l, \overline{\Omega} - l)$, *the takeover threat is not preempted and the manager chooses* $\varepsilon = \hat{\varepsilon}$, *where* $\varepsilon^* < \hat{\varepsilon} < \varepsilon_0(\Omega)$.

Theorem 3 shows that for all firms in the interval $(\underline{\Omega}, \overline{\Omega})$ the threat of takeovers improves managerial efficiency. For firms at the periphery of $(\underline{\Omega}, \overline{\Omega})$, this improvement partially preempts the takeover threat, while for firms closer to the mean of the interval, takeovers are not preempted (i.e., without preemption, a manager knows that a raider will investigate his firm with probability one if he does not divest). However, bad managers of all these firms choose to divest more often because the possibility of an investigation by the raider makes a decision not to divest less attractive.

We illustrate Theorem 3 with a numerical example. Table I presents the parameter values and the solution. In the absence of a market for corporate control, bad managers divest their incompatible projects with probability $\varepsilon^* = 0.514$. Given this strategy, all firms with firm-specificity $\Omega \in (0.026, 0.934)$ are subject to credible takeover threats. However, bad managers of these firms anticipate the takeover threats and will behave more efficiently (i.e., choose $\varepsilon > \varepsilon^*$). Managers of firms at the periphery of $(\underline{\Omega}, \overline{\Omega})$ partially preempt these threats by choosing $\varepsilon(\Omega)$, with $\varepsilon(\Omega) \geq \varepsilon^*$. Managers of firms with $\Omega \in (0.028, 0.932)$ do not preempt and choose $\hat{\varepsilon} = 0.552$. Figure 2 graphically illustrates the numerical results.

[20] The intuition is as follows. Assume that the raider is convinced that a bad manager of a firm at the periphery of the interval $(\underline{\Omega}, \overline{\Omega})$ has chosen a high value of ε such that takeovers are no longer profitable. He then optimally decides not to enter the market for corporate control. As a result, the manager realizes that he no longer faces a takeover threat, but then he will deviate from his high-preemptive choice of ε. The solution is simple. Let the manager choose the high ε. At the resulting low value of $\lambda(\varepsilon)$, the raider is *indifferent* between investigating and not investigating. Therefore, the raider is willing to randomize between investigating and not investigating. The randomization can be set such that it is no longer optimal for the manager to deviate from his high choice of ε.

[21] As in the Corollary to Theorem 2, we continue to assume that $k_1 < \lambda(\varepsilon^*)[M - k_2]^2/4M$, otherwise the interval $(\underline{\Omega}, \overline{\Omega})$ is empty.

Table I

A Numerical Example Illustrating the Interaction Between the Market for Corporate Control and a Bad Manager's Divestiture Strategy

The parameter π denotes the prior probability that a manager is good. The time discount rate is r. ϕ_G (ϕ_B) is the probability that a good (or bad) manager chooses a compatible project. A compatible (or incompatible) project has a high output ($\overline{X}$) with probability P_c (P_n), and a low output ($\underline{X}$) with probability $1 - P_c$ ($1 - P_n$). k_1 is the participation cost of the raider; k_2 is the additional cost to the raider of an actual takeover. M is the incremental revenue obtained if the project is sold to a compatible user instead of to an incompatible user. ω is the probability that a raider who investigates an inefficient firm discovers its true type (i.e., the type of the manager). ε^* is the probability that a bad manager divests an incompatible project in absence of a takeover threat. Ω is the asset-specificity parameter. $(\underline{\Omega}, \overline{\Omega})$ is the interval of firms that face takeover threats if incompatible projects are retained. Bad managers of firms with $\Omega \in (\underline{\Omega}, \underline{\Omega} + l] \cup [\overline{\Omega} - l, \overline{\Omega})$ divest incompatible projects with probability $\varepsilon(\Omega) \geq \varepsilon^*$ and partially preempt takeovers. $(\underline{\Omega} + l, \overline{\Omega} - l)$ is the interval of firms that do not choose to partially preempt takeovers; bad managers of these firms choose to divest with probability $\hat{\varepsilon}$. The results follow from Theorem 3 and are illustrated in Figure 2.

Parameters	$\pi = 0.50$	$\phi_G = 0.75$	$P_n = 0.50$	$k_1 = 0.001$	$M = 5.00$
	$r = 0.10$	$\phi_B = 0.50$	$P_c = 0.75$	$k_2 = 0.20$	$\omega = 0.05$
Equilibrium values	$\underline{\Omega} = 0.026$		$\varepsilon^* = 0.514$		$\underline{\Omega} + l = 0.028$
	$\overline{\Omega} = 0.934$		$\hat{\varepsilon} = 0.552$		$\overline{\Omega} - l = 0.932$

IV. Empirical Content of the Model

Our analysis has a number of empirical implications which we will now discuss and relate to the empirical evidence.

A. Divestitures as Potential Motivation for Takeovers

Bhide (1989), Ravenscraft and Scherer (1989), and Bhagat, Shleifer, and Vishny (1990) all provide evidence suggesting that hostile takeovers are commonly followed by divestitures. Indeed, the takeovers that we have rationalized are motivated by value-enhancing subsequent divestitures. Also, takeovers in our model have a disciplinary effect on management and as such are best characterized as hostile.

Bhagat, Shleifer, and Vishny find that divested assets generally remain in the same industry. We feel that our notion of compatibility is consistent with this finding.[22] Bhagat, Shleifer, and Vishny conclude that takeovers lead "not so much to improvements of targets as stand alone entities," and that raiders are basically brokers who reallocate assets. This is consistent with the role that we have allocated to raiders.

[22] Bhagat, Shleifer, and Vishny's findings are difficult to reconcile with Bhide's contention that divestitures following hostile takeovers can be described as "divestitures of unrelated businesses."

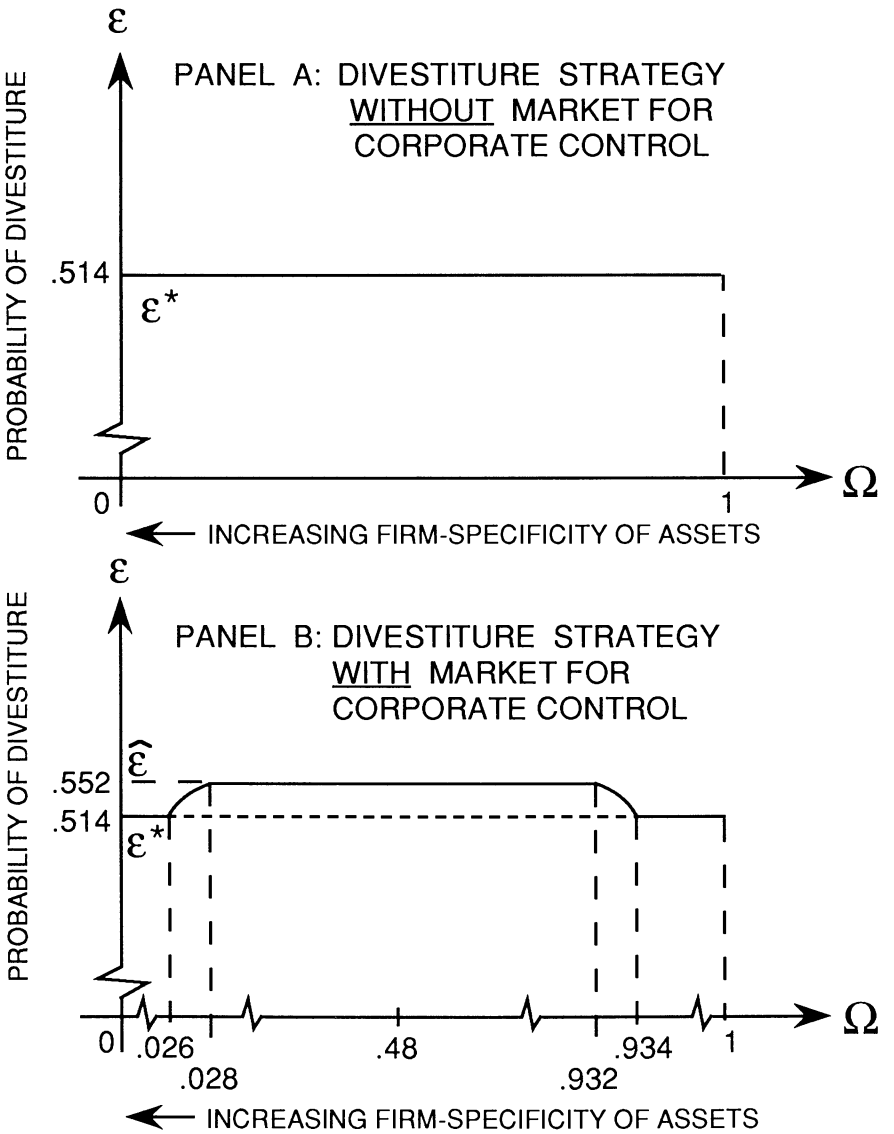

Figure 2. Divestiture strategy of a bad manager without (Panel A) or with (Panel B) market for corporate control. This figure graphically illustrates the numerical results reported in Table I. The parameter Ω is a measure of firm specificity of assets; i.e., the higher Ω the less firm specific (or more marketable) the assets of the firm. ε is the probability that a bad manager divests incompatible projects. Panel A shows that in the absence of a market for corporate control, a bad manager's divestiture strategy is independent of the firm specificity of the assets; bad managers choose to divest incompatible projects with probability $\varepsilon^* = 0.514$. Panel B shows that the possibility of takeovers improves managerial efficiency for all firms with $\Omega \in (0.026, 0.934)$. A bad manager of a firm at the periphery of this interval partially preempts the threat of a takeover (i.e., a raider will in equilibrium *not* always investigate the firm if the manager does not divest). A bad manager of a firm with $\Omega \in (0.028, 0.932)$ chooses $\hat{\varepsilon} = 0.552 > \varepsilon^*$, but does not preempt the threat of a takeover (i.e., the manager always faces an investigation if he does not divest).

B. Replacement of Management

My analysis implies that low-quality managers appear reluctant to undertake value-maximizing divestiture decisions. As such, the model predicts that successful hostile takeovers are followed by management changes and that these generally involve removal of low-quality management. There is ample empirical support for these implications. Bhide finds that hostile takeovers "do not appear to have displaced good managers," and various other authors document the high incidence of management change after successful takeovers (e.g., Martin and McConnell (1989), and Bhide (1989)).

We would also expect that divestitures are more likely after a change of management, which is consistent with the empirical results of Ravenscraft and Scherer (1989), and Scherer (1988). Similarly, we would expect a high management turnover after a failed takeover attempt. This is in line with the theoretical results of Hirshleifer and Thakor (1990), and the empirical evidence of Klein and Rosenfeld (1988).

C. Price Reactions to Takeovers and Divestitures

Our model suggests that a takeover bid is informative for two reasons. First, it informs the market about the inefficiency. Second, the market learns that the raider has identified a high-value user for the target's incompatible asset. These effects have mixed implications for the target's share price. Observe, however, that in general, information about the inefficiency of the firm will reach the market before the takeover bid.[23] Therefore, the information signaled by an actual takeover bid is the existence of a raider with knowledge about high value users for the target's asset. This is obviously positive news. These observations are consistent with the empirical evidence; i.e., targets generally underperform *before* a hostile takeover (see Palepu (1986), Morck, Shleifer, and Vishny (1988, 1989), and Lang, Stulz, and Walking (1989)),[24] and takeover bids increase the target's share price substantially (see Jarrell, Brickley, and Netter (1988)).

The analysis in this paper has implications for empirical studies of divestitures. The announcement of an unanticipated divestiture, one that did not follow a takeover, signals to the market that a mistake had been made previously. This is clearly bad news. However, the announcement of the

[23] In accord with our analysis, this information transmission is more likely the more intense the scrutiny from the market for corporate control.

[24] Lang, Stulz, and Walking (1989) find that the target's q drops sharply in the years prior to a takeover, which suggests poor performance. Similarly, Morck, Shleifer, and Vishny (1989) show that the q of targets of hostile takeovers is substantially below their industry's average. However, Morck, Shleifer, and Vishny show that the link between performance of the target and the likelihood of observing a hostile takeover is ambiguous if, instead of q, abnormal returns are used as the performance measure.

actual divestiture may not convey bad news. The reason is that one should distinguish the announcement of an *intention* to divest (which is bad news because it signals management's error) from the announcement of an *actual* divestiture (which is good news because it indicates the presence of a compatible user). A study by Alexander, Benson, and Kampmeyer (1984) provides indirect support for this interpretation. It shows that the announcement of an actual divestiture is met with a positive price reaction, but is preceded by a period of generally negative returns during which management's intention to divest may have become known (see also Jain (1985)).[25] Thus, the timing of measurement is key to a meaningful interpretation of valuation effects of divestitures.[26]

D. Firm Specificity of Assets

We have shown that only for firms with intermediate asset specificity, a takeover threat is credible. This has several implications. The implications are most clear for firms with either a high or low level of firm specificity of assets. Examples of the former include high-tech companies. The assets of these firms are highly firm specific, so that our analysis predicts no divestiture-motivated takeovers of these firms. Thus, these firms are likely to face relatively low pressure from the market for corporate control, and, *ceteris paribus*, human capital concerns will lead to severe inefficiencies in these firms. This would be an argument against public (widely held) ownership for these firms. We would expect these firms to be closely held such that management has a substantial ownership stake and human capital concerns are mitigated.

At the other extreme are firms with very marketable assets (Ω is high) such as closed-end mutual funds. Takeovers of these funds are rarely observed despite the substantial discounts to intrinsic value at which closed-end funds have been trading (Lee, Shleifer, and Thaler (1990)). Our theory suggests that the raiders' inability to obtain valuable *private* information about alternative users of a fund's assets prevent them from earning rents. This would lead to a lack of pressure from the market for corporate control, and may explain their discounts.

[25] A study by Hite, Owers, and Rogers (1987) refines the Alexander, Benson, and Kampmeyer study. It distinguishes between announcements of divestitures (i.e., initial bids) that were ultimately successful, and those that were not. The negative returns prior to the announcement are associated with initial bids that were ultimately not successful. Hite, Owers, and Rogers also report on abnormal returns observed around liquidations. These are consistently positive. They contend that this suggests that the market considered liquidation the higher-valued alternative but that it anticipated continued reluctance from management.

[26] Another potentially important consideration is the ownership structure of the firm. For example, we have analyzed divestitures in an environment where managers are concerned about their perceived human capital value. This seems to apply most to firms without (substantial) managerial ownership. Hirschey and Zaima (1989) have shown that for these firms the price effects of divestitures are weaker than for the overall sample.

V. Conclusion

The potential divergence in incentives between managers and shareholders has been the subject of extensive academic scrutiny. However, the attention has been on distortions in investment decisions, while divestiture decisions have largely been ignored. Divestiture decisions have been the focus of this paper. The motivation for this is that much of the wealth gains for shareholders from takeovers may be related to managerial resistance to divestitures of incompatible projects.

We have shown that a manager may choose to avoid a value-maximizing divestiture because a divestiture is essentially an admission that an inappropriate project choice was initially made which may adversely affect perceptions of his ability. Our analysis suggests that firm specificity of assets is an important determinant of the presence of credible takeover threats, as well as the degree of distortion in managerial divestiture decisions. In particular, we have shown that only managers of firms with "middle of the road" asset specificity are subject to credible takeover threats. As a consequence, the presence of a market for corporate control guarantees that these managers behave more efficiently. While these efficiency gains make actual takeovers less lucrative, we have shown that divestiture-motivated takeovers are observed in equilibrium.

Related work by Shleifer and Vishny (1989) shows that managers may entrench themselves by investing in management-specific assets that makes replacing these managers costly. In their model, asset-specificity is endogenous and a *source* of agency costs, while we view asset specificity as industry specific, and a *determinant* of agency costs.

Our results draw further attention to the importance of cross-sectional differences of asset specificity in corporate finance. Earlier studies have linked asset specificity to capital structure choice and debt capacity (see Titman and Wessels (1988), and Shleifer and Vishny (1992)). This study has shown its importance for the existence of a market for corporate control, and for the degree of managerial inefficiencies.

Appendix

Proof of Theorem 1: Definition: A pair of strategies and market beliefs, $[\sigma_\tau, \forall\tau; q_1^{a(\sigma)}, q_2^{a(\sigma)}(X), \forall\sigma \in \Psi]$, constitutes a BNE if (i) a manager of type τ chooses σ_τ optimally according to (3), anticipating the beliefs $q_1^{a(\sigma)}$; (ii) $q_2^{a(\sigma)}(X)$ is related to $q_1^{a(\sigma)}$ according to (2); (iii) $q_1^{a(\sigma)}$ and $q_2^{a(\sigma)}(X)$ (beliefs), and W_1 and W_2 (responses), are related by (1); (iv) market belief q_1^{σ} following an equilibrium move is a Bayesian posterior of π, given σ_τ.

We first show that the conjectured set of equilibria is BNE. Assume that no manager divests after receiving a positive signal, while a proportion γ of good managers with negative signals, and ε of bad managers with negative signals divest, with $\gamma \in [0, 1]$ and $\varepsilon \in [0, 1]$. The market's updated beliefs

follow from Bayes' rule (the superscript *ND* (or *D*) indicates no divestiture (or divestiture)).

$$q_1^{ND} = \frac{\pi\phi_G + [1-\gamma]\pi[1-\phi_G]}{\pi\phi_G + [1-\gamma]\pi[1-\phi_G] + [1-\pi]\phi_B + [1-\varepsilon][1-\pi][1-\phi_B]} \tag{A1}$$

$$q_1^{D} = \frac{\gamma\pi[1-\phi_G]}{\gamma\pi[1-\phi_G] + \varepsilon[1-\pi][1-\phi_B]} \tag{A2}$$

At date 2, the market updates its beliefs if an output is realized. Thus,

$$q_2^{ND}(\bar{X}) = \frac{\pi\phi_G P_c + [1-\gamma]\pi[1-\phi_G]P_n}{\pi\phi_G P_c + [1-\gamma]\pi[1-\phi_G]P_n + [1-\pi]\phi_B P_c + [1-\varepsilon][1-\pi][1-\phi_B]P_n} \tag{A3}$$

$$q_2^{ND}(\underline{X}) = \frac{\pi\phi_G[1-P_c] + [1-\gamma]\pi[1-\phi_G][1-P_n]}{\pi\phi_G[1-P_c] + [1-\gamma]\pi[1-\phi_G][1-P_n] + [1-\pi]\phi_B[1-P_c] + [1-\varepsilon][1-\pi][1-\phi_B][1-P_n]} \tag{A4}$$

Use (A3) and (A4) to calculate the *expected* beliefs of the market at date 2, i.e., q_{2E}^{ND} and q_{2E}^{D}, for a manager with negative signal, with the expectation taken *before* the output realization, but *after* the signal is received.

$$q_{2E}^{ND} = P_n q_2^{ND}(\bar{X}) + [1-P_n] q_2^{ND}(\underline{X}), \quad \text{and} \tag{A5}$$

$$q_{2E}^{D} = q_1^{D} \tag{A6}$$

A manager with negative signal divests (or does not divest) if (see (1) and (3))

$$q_1^{D} + q_{2E}^{D}[1+r]^{-1} > (<) q_1^{ND} + q_{2E}^{ND}[1+r]^{-1} \tag{A7}$$

In the conjectured equilibrium, (A7) holds as an equality. We first state a useful result.

Result A: q_1^{ND} and q_{2E}^{ND} are monotonically increasing (or decreasing) in ε (γ). q_1^{D} and q_2^{DE} are monotonically decreasing (or increasing) in ε (γ). For all $\gamma \in (0, 1]$ and $\varepsilon \in [0, 1]$, or $\{\gamma = 0, \varepsilon > 0\}$, q_1^{D}, q_{2E}^{D}, q_1^{ND} and q_{2E}^{ND} are continuous in ε and γ.

The proof for Result A follows directly from (A1) through (A6). We now prove by contradiction that in the conjectured equilibrium $\gamma \neq \varepsilon$. Suppose counter factually that $\gamma = \varepsilon$. From (A1) and (A2) we get $q_1^{ND} > q_1^{D}$, and from (A3) through (A6), $q_{2E}^{ND} > q_{2E}^{D}$ (since, $q_2^{ND}(\bar{X}) > q_2^{ND}(\underline{X}) > q_{2E}^{D}$). Then (A7) shows that not divesting is strictly strictly preferred. This contradicts the optimality of $\gamma = \varepsilon$. From Result A, we see that $\varepsilon < \gamma$ is necessary for equality in (A7), and that, ε is monotonically increasing in γ. We show next that for $\gamma = 1$ and ε sufficiently small divesting is strictly preferred. Note that $\lim_{\varepsilon \downarrow 0} q_1^{D}|_{\gamma=1} = 1$, and that $q_{2E}^{D} = q_1^{D}$, whereas both q_1^{ND} and q_{2E}^{ND} are

strictly less than one. Thus, by (A7), divesting is strictly preferred. Result A establishes $\exists \varepsilon \in (0, \gamma)$ for which (A7) holds as equality.

For a manager who receives a positive signal note that $\tilde{q}_{2E}^{ND} = P_c q_2^{ND}(\overline{X}) + [1 - P_c] q_2^{ND}(\underline{X})$ which strictly exceeds q_{2E}^{ND} as given in (A5). All other beliefs are given in (A1), (A2), and (A6). Thus, if a manager who received a bad signal is indifferent, the manager with a positive signal prefers not to divest. This shows that the equilibria are Nash. Bayesian Perfect Nash follows since there are no out-of-equilibrium moves.

Two other BNE can be identified. These involve either every manager divesting or every manager not divesting. (See Footnote 7 for the implausible beliefs needed to sustain these equilibria). □

Proof of Corollary to Theorem 1: Observe from Theorem 1 that the equilibrium identified in the corollary is BNE. The corollary identifies the most efficient BNE since the good and bad managers' divestiture strategies are closer to first best than in any of the other BNE's in Theorem 1. □

Proof of Theorem 2: Assume that the raider has chosen to participate, and has obtained the desired information. We allow the raider to make at most *one* bid. Let ν be a strictly positive scalar. Consider the following two possibilities, (a) the raider bids to extract $\Xi = [1 - \Omega]M + \nu$; the (uninformed) board, in the interest of shareholders, optimally dismisses this bid. Alternatively, an uninformed competing bidder could improve on the bid Ξ and still obtain a positive expected payoff. In both cases the raider is left with nothing. Thus, any bid $\Xi > [1 - \Omega]M$ is not optimal; (b) the raider bids $\Xi = [1 - \Omega]M - \nu$. Since $\Xi < [1 - \Omega]M$, no uninformed bidder can match this bid (nor can the board), and the shareholders accept this bid with probability one. However, the raider can do strictly better by offering $\Xi = [1 - \Omega]M - \tilde{\nu}$, for any $\tilde{\nu} \in (0, \nu)$, and still be guaranteed acceptance of the offer. In the limit, $\lim_{\tilde{\nu} \downarrow 0} \Xi = [1 - \Omega]M$. From (a) and (b), we have that the raider extracts (almost) $[1 - \Omega]M$, and acceptance of the bid is guaranteed. Given these rents, it is obvious that the raider will only participate if $k_1 < \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$. (We have implicitly assumed that the competing uninformed bidders face a negligible transactions cost; the raider could extract a little more than $[1 - \Omega]M$ if uninformed bidders faced a transactions cost.) □

Proof of Corollary to Theorem 2: For targets with specificity of assets $\underline{\Omega}$ and $\overline{\Omega}$, a raider faces zero expected rents. Thus, $\Omega \in \{\underline{\Omega}, \overline{\Omega}\}$ solved $k_1 = \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$. This gives $\underline{\Omega} = [M - k_2]/2M - \{\sqrt{(M - k_2)^2 - 4Mk_1/\lambda\omega}\}/2M$ and $\overline{\Omega} = [M - k_2]/2M + \{\sqrt{(M - k_2)^2 - 4Mk_1/\lambda\omega}\}/2M$. Only if $k_1 \leq \omega\lambda(M - k_2)^2/4M$, a real solution exists. Since $M > k_2$, we can show that $0 < \underline{\Omega} < \overline{\Omega} < 1$. For $\Omega \in (\underline{\Omega}, \overline{\Omega})$, $k_1 < \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$, and a raider can expect to earn positive rents. □

Proof of Theorem 3: For firms with $\Omega \in [0, \underline{\Omega}] \cup [\overline{\Omega}, 1]$, $k_1 \geq \omega\lambda\Omega\{[1 - \Omega]M - k_2\}$, and no takeover threat exists. Thus, Theorem 1's corollary con-

tinues to be an equilibrium. This proves part (i). For $\Omega \in (\underline{\Omega}, \overline{\Omega})$, $k_1 < \omega\lambda\Omega\{[1-\Omega]M - k_2\}$, and the equilibrium cannot be sustained; i.e., a takeover threat exists. An inefficient firm (i.e., a firm with a bad manager who received a negative signal and did not divest) is then detected with probability ω, and this becomes publicly known. Thus, the market's expected beliefs change accordingly (hats indicate the new values), $\hat{q}_1^{ND} = [1-\omega]q_1^{ND}$, $\hat{q}_{2E}^{ND} = [1-\omega]q_{2E}^{ND}$, $\hat{q}_1^D = q_1^D$ and $\hat{q}_{2E}^D = q_{2E}^D$. With these beliefs, a bad manager with a negative signal now strictly prefers to divest at $\varepsilon = \varepsilon^*$, i.e., equality in (A7) breaks down and $\varepsilon = \varepsilon^*$ is no longer an equilibrium. Result A shows that the equality can be restored by increasing ε. Its new value, say $\hat{\varepsilon}$, provides equality in

$$q_1^D + q_{2E}^D/[1+r] = \hat{q}_1^{ND} + \hat{q}_{2E}^{ND}/[1+r] \tag{A8}$$

Observe that $\hat{\varepsilon}$ is the bad manager's choice of divestiture strategy conditioned on a (credible) threat of a takeover. It follows that $\hat{\varepsilon} > \varepsilon^*$, thus, a takeover threat improves efficiency. However, increasing ε, reduces $\lambda = \lambda(\varepsilon)$ (see (4)) and, thus, the incentive for a takeover. At the periphery of $(\underline{\Omega}, \overline{\Omega})$, the discrete jump $\hat{\varepsilon} - \varepsilon^*$ in ε (and the corresponding reduction in $\lambda(\varepsilon)$) preempts takeovers, i.e., $k_1 > \omega\lambda(\hat{\varepsilon})\Omega\{[1-\Omega]M - k_2\}$. For these values of Ω, $\varepsilon = \hat{\varepsilon}$ is unnecessarily high, and $\varepsilon = \varepsilon_0 \in (\varepsilon^*, \hat{\varepsilon})$, which solves $k_1 \equiv \omega\lambda(\varepsilon_0)\Omega\{[1-\Omega]M - k_2\}$, is sufficient to preempt takeovers. For more interior Ω's, the choice of ε that preempts takeovers, ε_0 $(= \varepsilon_0(\Omega))$ exceeds $\hat{\varepsilon}$. The closer a firm's Ω is to the mean value $[\underline{\Omega} + \overline{\Omega}]/2$, the higher $\varepsilon_0(\Omega)$ and the more costly it is to preempt takeovers. A global condition determines whether firms that are relatively close to the mean value will optimally choose $\varepsilon_0(\Omega)$ to preempt takeovers, or optimally "accept" the possibility of takeovers and choose $\hat{\varepsilon}$ instead. This can be stated as follows. Choose $\varepsilon_0 \equiv \varepsilon_0(\Omega)$, and preempt takeovers, if (define $t \equiv [1+r]^{-1}$)

$$\begin{aligned}\varepsilon_0\{q_1^D + tq_{2E}^D \mid \varepsilon = \varepsilon_0\} + [1-\varepsilon_0]\{q_1^{ND} + tq_{2E}^{ND} \mid \varepsilon = \varepsilon_0\} \\ > \hat{\varepsilon}\{q_1^D + tq_{2E}^D \mid \varepsilon = \hat{\varepsilon}\} + [1-\hat{\varepsilon}]\{\hat{q}_1^{ND} + t\hat{q}_{2E}^{ND} \mid \varepsilon = \hat{\varepsilon}\},\end{aligned} \tag{A9}$$

otherwise choose $\varepsilon = \hat{\varepsilon}$.

This discussion so far ignores the following strategic consideration (see also footnote 20). If the manager would preempt takeovers by choosing ε_0 (and thus would no longer face a threat of a takeover), he has an incentive ex post to (secretly) switch back to ε^*. Thus, (total) preemption is not credible. Indeed the results so far implicitly assume that a manager chooses ε_0 whenever optimal and does not deviate from this strategy ex post. The equilibrium with this strategic consideration can be described as follows. First observe that any choice of ε, say $\tilde{\varepsilon}$, exceeding $\hat{\varepsilon}$ is not feasible. To see this, note that either (i) $\tilde{\varepsilon}$ (totally) preempts takeovers but then the manager will switch to ε^* $(< \hat{\varepsilon})$, or (ii) it does not preempt takeovers at all but then the manager will choose $\hat{\varepsilon}$, or (iii) it partially preempts takeovers, i.e., the raider follows a mixed strategy and investigates with probability η, $\eta \in (0, 1]$,

but then the manager will choose $\varepsilon \in (\varepsilon^*, \hat{\varepsilon})$. It now follows immediately that for interior values of Ω for which $\varepsilon_0 > \hat{\varepsilon}$, preemption is impossible and therefore $\hat{\varepsilon}$ is optimal. For Ω's for which $\varepsilon_0 \in (\varepsilon^*, \hat{\varepsilon}]$, *partial* preemption is possible, i.e,. the raider investigates a firm that does not divest with probability η, such that the manager chooses ε_0 and has no incentive ex post to choose ε^*. Observe that the manager's optimal choice of ε is increasing in η for $\varepsilon \leq \hat{\varepsilon}$. The raider is willing to follow this mixed strategy because at $\varepsilon = \varepsilon_0$ he is indifferent between participating and not participating. □

REFERENCES

Alexander, Gordon J., P. George Benson, and Joan M. Kampmeyer, 1984, Investigating the valuation effects of announcements of voluntary corporate selloffs, *Journal of Finance* 39, 503–517.

Bagnoli, Mark and Barton L. Lipman, 1988, Successful takeovers without exclusion, *Review of Financial Studies* 1, 89–110.

Bebchuk, Lucian A. and Lars A. Stole, 1991, Do short-term objectives lead to under- or overinvestment in long-term projects?, Working paper, Harvard University.

Berkovitch, Elazar and Naveen Khanna, 1991, A theory of acquisition markets: Mergers versus tender offers and golden parachutes, *Review of Financial Studies* 4, 149–174.

Bhagat, Sanjai, Andrei Shleifer, and Robert W. Vishny, 1990, The aftermath of hostile takeovers, Working paper, University of Chicago.

Bhide, Amar, 1989, The causes and consequences of hostile takeovers, *Journal of Applied Corporate Finance* 2, 36–59.

Hirschey, Mark and Janis K. Zaima, 1989, Insider trading, ownership structure, and the market assessment of corporate sell-offs, *Journal of Finance* 46, 971–980.

Hirshleifer, David and Tarun Chordia, 1990, Resolution preference and project choice, Working paper, University of California, Los Angeles.

——— and Anjan V. Thakor, 1990, Board dismissals, takeovers and managerial performance, Working paper, University of California, Los Angeles.

———, 1991, Managerial conservatism, project choice and debt, Working paper, University of California, Los Angeles.

Hite, Gailen L., James E. Owers, and Ronald C. Rogers, 1987, The market for interfirm asset sales: Partial sell-offs and total liquidations, *Journal of Financial Economics* 18, 229–252.

Holmstrom, Bengt and Joan Ricart i Costa, 1986, Managerial incentives and capital management, *Quarterly Journal of Economics* 101, 835–860.

Jain, Prem C., 1985, The effects of voluntary sell-off announcements on shareholder wealth, *Journal of Finance* 40, 209–224.

Jarrell, Gregg A., James A. Brickley, and Jeffrey M. Netter, 1988, The market for corporate control: The empirical evidence since 1980, *Journal of Economic Perspectives* 2, 49–68.

Jensen, Michael C., 1989, Eclipse of the public corporation, *Harvard Business Review* 67, 61–74.

——— and Kevin J. Murphy, 1990, Performance pay and top-management incentives, *Journal of Political Economy* 98, 225–264.

Jensen, Michael C. and Richard S. Ruback, 1983, The market for corporate control: The scientific evidence, *Journal of Financial Economics* 11, 5–50.

Kanodia, Chandra, Robert Bushman, and John Dickhaut, 1989, Escalation errors and the sunk cost effect: An explanation based on reputation and information asymmetries, *Journal of Accounting Research* 27, 59–77.

Klein, April and James Rosenfeld, 1988, Targeted share repurchases and top management changes, *Journal of Financial Economics* 20, 493–506.

Kohlberg, Elon and Jean-François Mertens, 1986, On the strategic stability of equilibrium, *Econometrica* 54, 1003–1037.

Kreps, David M. and Robert Wilson, 1982, Sequential equilibria, *Econometrica* 50, 863–894.

Lang, Larry H. P., René M. Stulz, and Ralph A. Walking, 1989, Managerial performance, Tobin's q, and the gains from successful tender offers, *Journal of Financial Economics* 24, 137–154.

Lee, Charles M. C., Andrei Shleifer, and Richard H. Thaler, 1990, Anomalies: Closed-end mutual funds, *Journal of Economic Perspective* 4, 153–164.

Martin, Kenneth J. and John J. McConnell, 1989, Corporate performance, corporate takeovers and management turnover, *Journal of Finance* 46, 671–687.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, Characteristics of hostile and friendly takeover targets, in Alan J. Auerbach, ed.: *Corporate Takeovers: Causes and Consequences* (University of Chicago Press, Chicago).

———, 1989, Alternative mechanisms for corporate control, *American Economic Review* 79, 842–852.

Narayanan, M. P., 1985a, Observability and the payback criterion, *Journal of Business* 45, 31–48.

———, 1985b, Managerial incentives for short-term results, *Journal of Finance* 40, 1469–1484.

Palepu, Krishna G., 1986, Predicting takeover targets: A methodological and empirical analysis, *Journal of Accounting and Economics* 8, 3–25.

Ravenscraft, David and F. M. Scherer, 1989, Divisional sell-off: A hazard function analysis, Working paper, University of North Carolina.

Scharfstein, David, 1988, The disciplinary role of takeovers, *Review of Economic Studies* 55, 185–199.

——— and Jeremy C. Stein, 1990, Herd behavior and investment, *American Economic Review* 80, 465–479.

Scherer, F. M., 1988, Corporate takeovers: The efficiency arguments, *Journal of Economic Perspectives* 2-1, 69–82.

Shleifer, Andrei and Robert W. Vishny, 1989, Managerial entrenchment: The case of manager specific investments, *Journal of Financial Economics* 25, 123–140.

———, 1992, Liquidation values and debt capacity: A market equilibrium approach, *Journal of Finance* 47, 1343–1366.

Stein, Jeremy C., 1989, Efficient capital markets, inefficient firms: A model of myopic corporate behavior, *Quarterly Journal of Economics* 104, 655–669.

Titman, Sheridan and Roberto Wessels, 1988, The determinants of capital structure choice, *Journal of Finance* 43, 1–20.