THE ALLOCATIONAL ROLE OF TAKEOVER BIDS IN SITUATIONS OF ASYMMETRIC INFORMATION

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1. Introduction

It is generally accepted that takeover bids help to bring about an efficient allocation of resources. However, the following argument is often suggested by those who want the government to restrict takeover bids: The acquiring firm may have special information about the target firm's resources which indicates that the target is really worth more than its current market valuation. Hence, the acquiring firm, by paying only a small premium, is able to acquire these resources at a price below the true worth to shareholders indicated by the inside information. Thus shareholders are unable to capture the true benefits of their investments, and an inefficient amount of investment will take place. Therefore the government should restrict takeover bids.[1/]

The above argument is clearly wrong if there is competition among informed bidders for the target firm's assets. However, proponents of the argument claim that some takeover bids occur exactly because only one agent has special, inside information about the target company's resources. In this paper we show that the argument is false <u>even if there is only one bidder</u> as long as shareholders have rational expectations about the takeover bid process.

Though we think it important to point out the error in the above argument,

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this paper's main purpose is to study the informational role of takeover bids. In the process of modelling the transmission of information, we provide a theoretical model which explains among other things the empirical result that firms which are subject to an unsuccessful takeover bid are (on average) revalued upwards by the market even after the bid fails.[2/]

In this paper, we will be concerned with two general classes of takeover bids. The first type of takeover involves transferring resources from a presently inefficient use to a more efficient use. We call this an allocational takeover. An example is where one firm takes over another in order to exploit the benefits from horizontal or vertical integration. A second example is where the acquiring firm has information which permits it to make better use of the acquired firm's resources than current management. For example, current management may be so ill-informed that they think that the corporation should produce large automobiles. The acquiring firm may have special information about future gasoline prices, or about the target firm's plant, which suggests that it would be more appropriate for the firm to produce small automobiles. The essential point is that, even if the target firm's management attempts to maximize profit, i.e., to act in the shareholders' interest, a takeover may occur because the acquiring firm is able to get more efficient use out of the target firm's resources than the target's current management.

We will assume that shareholders do not know the true value of their firm under incumbent management or the potential value of their firm, i.e., the value if the firm's resources are used with maximum efficiency. The fact that shareholders are imperfectly informed about the status quo value of the firm means that in some states of nature the firm may be undervalued on the market, relative to what would occur if information was free. As a result, bidders -- who are assumed to have perfect information about both the status quo value of the firm and its potential value -- will sometimes take over firms not in order to improve them (as in an allocational takeover), but simply because they are cheap. Such bids will be called acquisitional -- this is the second class of takeover bids that we will consider.[3/]

Acquisitional takeovers, in contrast to allocational takeovers, are purely redistributive. They are socially wasteful since they do not increase a firm's efficiency but use up resources (the cost of monitoring the firm, the cost of the bid). Further, they lower the expected return to setting up a corporation and thus create a distortion which leads to underinvestment. It might be thought that the existence of acquisitional bids therefore makes it desirable for the government to restrict takeovers. However, initial shareholders who set up the corporation can write a corporate charter which encourages takeover bids to the extent which is optimal for them. As was pointed out in Grossman and Hart [1980a], this is accomplished by charter provisions which regulate the extent to which shareholders can free ride on any price appreciation caused by the takeover bid. That is, charter provisions implicitly specify the degree to which shareholders who do not tender to the bidder are excluded from sharing in any improvement of their firm caused by the takeover. In this paper we show that if shareholders choose an optimal amount of exclusion, then the existence of acquisitional takeovers does not imply that the government should discourage takeover bids; quite the reverse may be true.

Throughout our analysis, we will assume that the corporation has directors who attempt to maximize profit, but who may lack sufficient information (and sources of information), or ability, or opportunities to channel the firm's resources to their best use. By assuming that directors act in the shareholders' interest, we ignore the important role of takeover bids as a provider of the incentive for directors to so act, which we studied in a previous paper; Grossman and Hart [1980a].

The paper is organized as follows. In Section 2, we analyze takeover bids for the case where all bids are purely allocational. In Section 3, the analysis is extended to the case where there is uncertainty about the status quo value of the firm and where the possibility of acquisitional takeover bids arises. In Section 4, we study the optimal level of exclusion from the point of view both of shareholders and of society. Section 5 analyzes the way in which takeover bids affect the incentive to set up corporations. Concluding remarks are contained in Section 6, and proofs of some results are to be found in the Appendix.

2. The Model

In this section, we will develop a model of allocational takeovers. We will assume that a typical firm's profit is given by a function $q = f(\theta,\varepsilon)$ where θ is a parameter specific to the firm and ε is a parameter specific to the firm's manager.[4/] Both θ and ε will be assumed to be nonnegative real numbers which are bounded above: $0 \leq \theta \leq \bar{\theta}$, $0 \leq \varepsilon \leq \bar{\varepsilon}$. θ should be interpreted as representing factors such as the firm's location, the state of its capital stock, conditions in the markets it operates in, etc. -- in other words, factors which would be faced by any manager of the firm. On the other hand, ε represents manager-specific factors, such as the manger's competence or ability, or the quality of his information. We will assume that f is strictly increasing in θ and ε and that $f(0,0) = 0$.[5/]

We assume that the firm's owners, i.e., its shareholders, know the distribution of θ and ε in the population of firms and managers, but do not know the value of their firm's θ or their manager's ε. An acquiring firm, on the other hand, is assumed to be able to determine both θ and ε at a cost of c_I (the cost of investigation).[6/] We will assume that takeovers become a possibility once the firm's profit under incumbent management, $q = f(\theta,\varepsilon)$, is observed. At this stage it is assumed that a single potential bidder arrives at the firm and, on the basis of the q observed, decides whether or not to incur the investigation cost, c_I. If an investigation is carried out and on the basis of it the bidger makes a successful tender offer, it is assumed that he installs management of the highest quality $\bar{\varepsilon}$ and that profits equal to $v(\theta) \overset{def}{=} f(\theta,\bar{\varepsilon})$ are realized. On the other hand, if either no investigation is carried out, or there is an investigation but no takeover bid, then it is assumed that incumbent management will retain power and that the firm's profits will equal $q = f(\theta,\varepsilon)$.7/8/

We assume that shareholders do not know θ and ε because in general information about the quality of the firm or its management will not be publicly available and will be costly to acquire. We are particularly interested in firms with a large number of shareholders, each with a small holding, in which case the marginal private benefit from acquiring extra information is likely to be very small relative to the cost. 9/ Although information collection will generally not be worthwhile for small shareholders, this will not be the case for a potentially large shareholder such as one making the takeover bid. This is because a bidder, if he uses the information he collects to improve the firm, can -- if exclusion is permitted (see later) -- make a capital gain on a large number of shares.

Note that, if there was only one source of randomness θ instead of the two sources, θ and ε, then the bidder (and also the shareholders) would be able to deduce $v(\theta)$ from observing q and there would be no need ever to investigate a firm. In the presence of two types of uncertainty, however, observations of q provide only probabilistic information about $v(\theta)$ and so investigations will in general be worthwhile (see also footnote 16).

It is important to emphasize that we assume that incumbent management has the same goal as shareholders: value maximization. Thus it may be asked: why doesn't the incumbent management, if it is inefficient, resign and replace itself by the best available management? We presume that this occasionally does happen. However, we are interested in studying the ability of the takeover bid process to facilitate the transfer of information in a world where information cannot be bought and sold like an ordinary commodity. Thus, the incumbent management may lack the information or ability to identify superior managers except, for example, by seeing their willingness to pay for the firm's resources in a takeover bids.[10] Further, if differences in managerial ability are due completely to differences in information about how to allocate the firm's resources, then moral hazard may make it impossible for incumbent management to purchase information from the acquiring firm. Instead the takeover bid process serves as a mechanism by which agents may earn a return on information collection -- analogous to the informational role of speculartive markets. If a person collects information about how to better allocate the target firm's resources, then a person earns a return on this by buying the resources, improving their allocation, and making a profit out of the resulting price appreciation of the firm's shares.

Let P be the lowest price (per 100% of the firm's shares) at which the acquirer can get control of the firm. Below we will analyze the determination of P. We assume that, if a takeover bid is carried out, the bidder, as well as incurring the investigation cost c_I, incurs an additional cost at the time of the bid, denoted by c. We will regard c as including the cost of raising the funds to finance the bid, the administrative cost of the bid itself, etc.

Let us consider under what conditions a takeover occurs. Suppose that the bidder investigates the firm. Then, given the values (θ,ε) which he discovers, he will make a bid for the firm if and only if

$$(1) \qquad f(\theta,\bar{\varepsilon}) - P - c = v(\theta) - P - c > 0 .$$

His maximum profit at this stage is therefore given by $\max(v(\theta) - P - c,0)$.[11]

Let the (objective) distribution function of (θ,ε) be given by $G(\theta,\varepsilon)$, i.e., $G(\theta,\varepsilon) = \text{Prob}[\tilde{\theta} \leq \theta,\tilde{\varepsilon} \leq \varepsilon]$. (Note that $G(\bar{\theta},\bar{\varepsilon}) = 1$.) We assume that G

is known both to the bidder and to the shareholders. We will assume that G has a density function g and that Θ and ε are independent, so that $g(\Theta,\varepsilon) = g_1(\Theta)g_2(\varepsilon)$. We also assume that $g_2(\bar{\varepsilon}) > 0$. Then at the time when the bidder has to decide whether to investigate the firm, his expected profit, given his information about the firm, i.e., given $q = f(\Theta,\varepsilon)$, is

(2) $$E[\max[v(\Theta) - P - c, 0) \mid f(\Theta,\varepsilon) = q] \quad .$$

We will assume that the bidder is risk neutral. Therefore he will investigate the firm if and only if

(3) $$E[\max(v(\Theta) - P - c, 0) \mid f(\Theta,\varepsilon) = q] > c_I \quad .$$

Let us consider now how the price P is determined. We will assume that the bidder gets control of the firm if he obtains more than 50% of the firm's shares. The bidder is assumed to acquire these shares by making an unconditional tender offer, i.e., by announcing his willingness to buy any shares tendered to him at P. We also assume that shareholders are risk neutral[12/] and that the firm's shares are widely held, so that the likelihood that any individual shareholder's tender decision ha a decisive influence over the outcome of the raider's bid is negligible. Finally, we assume as in Grossman and Hart [1980a] that the corporate charter, written by the firm's initial shareholders, permits any successful acquirer to reduce the firm's post-raid profits by a designated amount equal to ϕ, which he pays to himself. That is, shareholders who do not tender and thus free ride on the raider's improvement of the corporation are prevented from getting their pro rata share of the improved firm by an aggregate amount denoted by ϕ.[12a/]

Under the above conditions, for the bid to succeed unambiguously, the tender price P must satisfy the following two conditions:

(4) $P \geq E[v(\theta) - \phi | I]$,

(5) $P \geq q$,

where I denotes all the information shareholders have about θ at the time the bid takes place. To see this, suppose (4) is violated. Then any shareholder who thinks that the bid is going to succeed will not tender his shares since he will obtain $v(\theta) - \phi$ as a minority shareholder rather than P (by assumption his decision not to tender does not affect the outcome of the bid). Thus if (4) is violated, and shareholders believe that the bid will succeed, no shareholder tenders his shares and so the bid fails. (We are assuming that shareholders recognize that the raider will install management of the highest quality and will exclude by the amount ϕ.)

On the other hand, if (5) is violated, then any shareholder who believes that the bid will fail will prefer to hold on to his shares (they will be worth q) rather than to tender them at a price less than q. Hence if (5) is violated, then the bid will fail if it is expected to fail.

We see then that for the bid to succeed both when it is expected to succeed and when it is expected to fail -- this is what we mean by a bid being unambiguously successful -- both (4) and (5) must be satisfied. (For a more detailed discussion of these issues, see Grossman and Hart [1980a,c]. The latter paper also contains an analysis of a rational expectations equilibrium where the success or failure of the bid is stochastic.)

We will confine our attention to bids which are unambiguously successful in this paper. We see then that the lowest price at which the bidder can get control is given by the smallest P satisfying (4) and (5). Denote this price by $\hat{P}$.[13] In order to solve for $\hat{P}$, we must know what determines I. First it is clear that since the shareholders, like the bidder, have observed $q = f(\theta,\varepsilon)$, they will use this information in order to make deductions about θ. However, this is not the only information which the shareholders possess. In particular, they know also that the raider has investigated the firm and, on the basis of the θ and ε discovered, finds it profitable to make a bid at price P. In other words, the shareholders know that

$$(6) \qquad v(\theta) - P - c > 0 \; .$$

Putting the shareholders' two pieces of information together, we see that

$$(7) \qquad I = \{(\theta,\varepsilon) \mid f(\theta,\varepsilon) = q \text{ and } v(\theta) - P - c > 0\} \; .$$

In particular, it is clear that the fact that a bid takes place at price P will in general signal information to the shareholders which they would otherwise not be aware of.[14]

The condition that shareholders have rational expectations about the raider's tender price has very strong implications. It implies in particular that raids can only occur if the dilution factor, ϕ, exceeds c. For if $\phi \leq c$, then $E[v(\theta) - \phi \mid I] \geq E[v(\theta) - c \mid I] > P$ by the definition of I in equation (7). Hence (4) can never be satisfied however high P is. That is, as the tender price is raised, the expected return from not tendering goes up sufficiently fast relative to P -- because of the information about the maximized value of the firm contained in P -- so as to keep $E[v(\theta) - \phi \mid I] > P$. This occurs because, when $\phi \geq c$, the worth to a shareholder from not tendering, $v(\theta) - \phi$, is always greater than the worth to the bidder of the acquired firm, $v(\theta) - c$. However, each shareholder knows that the raider must value the firm by more than P (or else why would he be willing to pay P). Thus each shareholder knows that $v(\theta) - \phi > P$.

We seen then how important exclusion is, i.e., how important it is to have $\phi \gg 0$. If there is no exclusion, there will (in our model) be no takeover bids since there is no price at which the bidder can get control of the firm. In fact, for bids to take place we must have $\phi > c$. We will see below, however, that while $\phi > c$ is a necessary condition for bids to take place it is not a sufficient one.[15]

Consider now the case where $\phi > c$. Then for P sufficiently large, the RHS of (4) < P. (For example, take P slightly below $v(\bar{\theta}) - c$, i.e., $P = v(\bar{\theta}) - c - \delta$, where $\delta > 0$ and small. Then $E[v(\theta) - \phi | v(\theta) - P - c > 0, f(\theta,\varepsilon) = q] \leq v(\bar{\theta}) - \phi < P$.) It follows that when $\phi > c$, two possibilities can arise. The first is where $P = q$ satisfies (4). This is illustrated in Figure 1a. In this case $\hat{P} = q$. The second possibility occurs when the RHS of (4) evaluated at $P = q$ exceeds q. In this case the graph of the RHS of (4) as a function of P is as in Figure 1b. (Note that the RHS of (4) is a continuous function, since (θ,ε) has a continuous distribution.)

Figure 1a

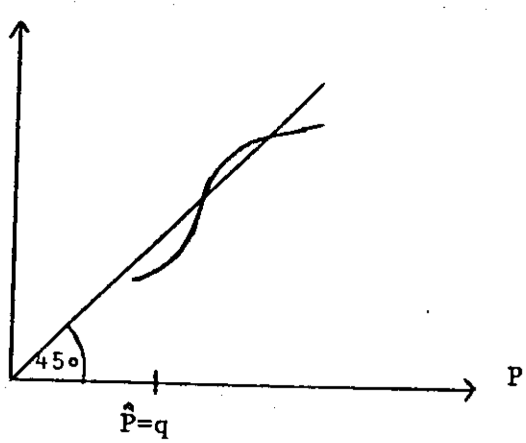
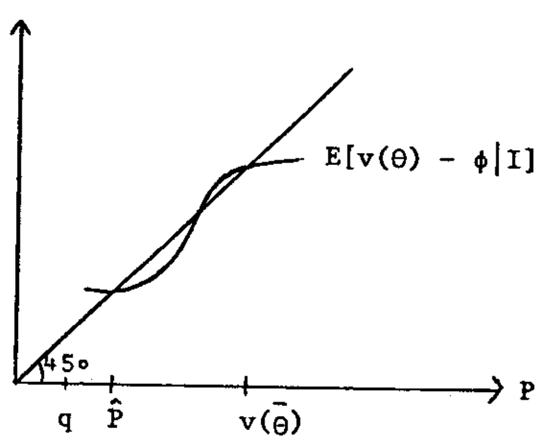


Figure 1b



In particular, there is in this case at least one intersection between $E[v(\theta) - \phi | I]$ and the 45° line. $\hat{P}$ is then given by the smallest P at which such an intersection occurs.

We may summarize the analysis of this section as follows. For each q and each value of the exclusion factor ϕ, let $\hat{P} = \hat{P}(\phi,q)$ be the smallest P satisfying (4) and (5) (if $\phi \leq c$, write $\hat{P}(\phi,q) = \infty$). Then, given ϕ, the bidder will investigate the firm if and only if

(8) $$E[\max(v(\Theta) - \hat{P}(\phi,q) - c, 0) \mid f(\Theta,\varepsilon) = q] > c_I \quad .$$

If (8) is satisfied, bids actually take place when

(9) $$v(\Theta) - \hat{P}(\phi,q) - c > 0 \quad .$$

Note that (9) is satisfied in some events (Θ,ε) and not in others, i.e., whether a bid occurs or not is a probabilistic event as far as the bidder and shareholders are concerned. If (8) is not satisfied, bids will never occur.[16/]

It should be clear why $\phi > c$ is a necessary but not a sufficient condition for bids to take place. $\phi > c$ guarantees that $\hat{P}(\phi,q)$ is finite, but it does not guarantee that (8) is satisfied. For (8) to be satisfied, ϕ must be substantially in excess of c if c_I is large.[17/]

3. Acquisitional Takeover Bids

In the last section, we considered bids which transfer resources from those whose productivity is low (inefficient managers) to those whose productivity is high (bidders). We now introduce a second type of bid, where a bidder takes over not to improve management, but because the firm is undervalued at its current price -- we call such a bid acquisitional.

Acquisitional bids can be modelled by generalizing the model of Section 2 to the case where the firm's profits are uncertain. Assume that profit is now given by

(10) $$\tilde{y} = q\tilde{t}$$

where $\tilde{t}$ is a random variable representing the state of the world and $q = f(\theta,\varepsilon)$ as before. We will assume that q is known to shareholders (as in Section 2), but that the realization of $\tilde{t}$ is not. This assumption can be justified in the following way. Suppose that $\tilde{t}$ represents current economic conditions faced by the firm and that the realizations of $\tilde{t}$'s at different dates are independent. If shareholders have had experience of the performance of this manager-firm combination in the past under different economic conditions then they can observe the mean of $\tilde{y}$. If shareholders also know the mean of $\tilde{t}$, this will allow them to compute q. On the other hand, there is no reason for shareholders to know the current realization of $\tilde{t}$.

The sorts of current uncertainty which might be represented by $\tilde{t}$ include whether the firm is about to discover oil, whether the firm is likely to win a lucrative export contract, etc.

A bidder who becomes informed about the firm will be assumed to find out the value of $\tilde{t}$ at the same time as he discovers θ (and ε). The value of the firm to him is then given by

(11) $$v(\theta)t \quad .$$

We will assume that $\tilde{t}$ is a nonnegative, continuous random variable defined on $[0,\bar{t}]$ with mean 1 and that $\tilde{t}$, $\tilde{\varepsilon}$ and $\tilde{\theta}$ are independently distributed. The purely allocational model is then a special case of the present model in which $\tilde{t} = 1$ with certainty.

How much must an informed bidder pay to get control of the firm? In the previous section we have argued that the bid price, P, must be no less than the value of the firm under status quo management, since otherwise shareholders who believe that the raid will fail will not tender their shares and the raid will indeed fail. In the present model, the value under current management is a random variable, $q\tilde{t}$. It might be thought that it is appropriate to take the expected value of this random variable and write the above condition as

(12) $$P \geq E[q\tilde{t}] = q \quad .$$

However, shareholders who use q as an estimate of the expected value of the firm's profit under current management are ignoring an important piece of information: in particular, that a bid is taking place at price P. For the fact that a bid is taking place at price P tells shareholders that

(13) $$v(\theta)t - P - c > 0 \quad .$$

Hence the best estimate of the firm's profit under current management is given by

(14) $$E[q\tilde{t} \,|\, v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \quad .$$

We see then that the condition that shareholders tender their shares even if they think that the bid will fail must be written as

(15) $$\begin{aligned} P &\geq E[q\tilde{t} \,|\, v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \\ &= qE[\tilde{t} \,|\, v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \quad . \end{aligned}$$

In deriving (15), we have assumed that shareholders have considerable foresight and knowledge about the takeover bid process -- in particular, that they know the distributions of $\tilde{t}$, $\tilde{\theta}$ and $\tilde{\varepsilon}$. There is another justification of (15) which does not rely on such a high degree of shareholder intelligence. Suppose that the bid price P violates (15). For the bid to succeed, the price of the firm's shares on the open market cannot exceed P after the bid is announced (otherwise people will sell on the market rather than tendering to the bidder). But this means that it will pay a wealthy individual (a competing bidder possibly) to buy large numbers of shares on the open market. For if such an individual can get at lest 50% of the shares, so that the bid is prevented from succeeding, then <u>by adopting a policy of leaving management unchanged</u>, he can make an expected profit proportional to

$$q E[\tilde{t} \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = \bar{q}] - P \quad .$$ 18/

(15) tells us that a revision of the value of the status quo production plan occurs when a bid takes place. Before a bidder appears, the expected value of this plan is given by $E[q\tilde{t}] = \bar{q}$. On the announcement of a bid at price P, however, the value is revised to equal

(16) $$q E[\tilde{t} \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \quad .$$

One would expect that this revision would be in an upwards direction. This is indeed the case.

<u>Proposition 1</u>: $q E[\tilde{t} \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] > \bar{q}$.

Proposition 1 is proved in the Appendix.

It is interesting to note that the upward revision in the status quo value of the firm can be empirically quite substational. Dodd and Ruback [1977], Table 3 p. 368, found that target firms subject to <u>unsuccessful</u> bids had a permanent increase in value of about 15% due to the tender offer.

We see then that if acquisitional bids are permitted, (5) must be replaced by (15). On the other hand, (4) becomes:

(17) $$\begin{aligned} P &\geq E[v(\theta)\tilde{t} - \phi \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \\ &= E[v(\theta)\tilde{t} \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] - \phi \quad . \end{aligned}$$

So if a bid is to succeed both when it is expected to succeed and when it is expected to fail, (15) and (17) must both be satisfied.

Consider conditions (15) and (17). If the set of P's satisfying these conditions is non-empty, let $\hat{P}$ be the smallest element of this set (a minimum exists since the RHS of (15) and (17) are continuous functions of P). As before, we write $\hat{P} = \hat{P}(\phi,q)$. On the other hand, if there is no solution to (15) and (17), write $\hat{P}(\phi,q) = \infty$. (A diagramatic analysis of (15) and (17) can be carried out as in Section 2.)

Given the above, we may now determine when a bid will take place. As before, two conditions must be satisfied. First:

(18) $$\pi(\phi,q) = E \max[(v(\theta)\tilde{t} - \hat{P}(\phi,q) - c, 0) \mid f(\theta,\varepsilon) = q] - c_I > 0 ,$$

where now the expectation is taken with respect to $\tilde{\theta}$, $\tilde{\varepsilon}$ and $\tilde{t}$. (18) simply says that it must pay a potential bidder to become informed about the firm. Secondly, having become informed, he must want to proceed with a takeover bid:

(19) $$v(\theta)\tilde{t} - \hat{P}(\phi,q) - c > 0 .$$

It is interesting to try to provide a formal distinction between an allocational bid and its antithesis, an acquisitional bid.

<u>Definition</u>: Consider a bid which takes place in event (θ,ε,t), i.e., when $\tilde{\theta} = \theta$, $\tilde{\varepsilon} = \varepsilon$, and $\tilde{t} = t$, given q and ϕ. We will say that this bid is:

(a) <u>Purely acquisitional</u> if $v(\theta)t - c - qt \leq 0$;

(b) <u>Purely allocational</u> if $\hat{P}(\phi,q) \geq qt$;

(c) <u>Partly acquisitional</u> if $\hat{P}(\phi,q) < qt$;

(d) <u>Partly allocational</u> if $v(\theta)t - c - qt > 0$.

Of course, in all cases $v(\theta)t - c - \hat{P}(\phi,q) > 0$, since otherwise the bid would not take place.

Let us interpret these definitions. A purely acquisitional bid is one that would not take place if the bidder had to pay the true value of the firm under current management to get control, i.e., $P = qt$. In contrast, a purely allocational bid is one which takes place even though the bidder has to pay at least this true value. A partly acquisitional (resp. allocational) bid is one that is not purely allocational (resp. acquisitional).

It should be clear that any bid must fall into at least one of the above categories. Furthermore, the following are exhaustive and mutually exclusive possibilities: (1) the bid is purely acquisitional; (2) the bid is purely allocational; (3) the bid is partly acquisitional and partly allocational.

It cannot be that all takeover bids are purely acquisitional if shareholders have rational expectations. For if all takeover bids were acquisitional, then for a given bid (i.e., a given realization of $\tilde{\theta},\tilde{\varepsilon},\tilde{t}$) all shareholders would know that the firm is worth no more to the bidder then to the shareholders under current management. This implies that the only reason that the bidder is willing to pay P dollars for the firm is that it's worth more than P dollars <u>under current management</u>. But then, of course, shareholders will not tender. Formally we can prove:

<u>Proposition 2</u>: Assume that bids take place with positive probability. Then they cannot all be purely acquisitional.

<u>Proof</u>: Suppose that they are. Then:

(20) $$v(\theta)t - c - \hat{P}(\phi,q) > 0 \Longrightarrow v(\theta)t - c - qt \leq 0$$

with probability one. Therefore (15) implies that

$$\begin{aligned}\hat{P}(\phi,q) &\geq E[q\tilde{t} \mid v(\theta)\tilde{t} - c - \hat{P}(\phi,q) > 0,\ f(\theta,\varepsilon) = q] \\ &\geq E[v(\theta)\tilde{t} - c \mid v(\theta)\tilde{t} - c - \hat{P}(\phi,q) > 0,\ f(\theta,\varepsilon) = q] \quad \text{by (20)} \\ &> \hat{P}(\phi,q)\ .\end{aligned}$$

In other words, there is no solution to (15). Hence $\hat{P}(\phi,q) = \infty$ and no bids take place. Contradication. Q.E.D.

We see then that to get a satisfactory theory of acquisitional bids, there must be at least one other motive for takeovers, such as the allocational motive. That is, it is false to claim that all bids take place because the bidder has inside information which indicates that the market has undervalued the target firm. In particular, when acquisitional bids take place it is because shareholders cannot distinguish an acquisitional bid from an allocational one. It is for this reason that it is impossible for shareholders to restrict <u>only</u> acquisitional bids.

4. The Optimal Exclusion Factor

In the last two sections we analyzed under what conditions takeover bids will occur. We saw that a crucial determinant of the likelihood of bids is the exclusion factor ϕ, since this has a direct influence on $\hat{P}$, the price the bidder has to pay to get control of the firm. In this section, we consider what is the optimal choice of ϕ, both from the point of view of the shareholders and of society. We study the optimal choice of ϕ both for the acquisitional model where $\tilde{t}$ is a continuous random variable and for the allocational model in which $\tilde{t} \equiv 1$.

We would expect that the higher are the permitted deductions which the raider can make, i.e., the higher ϕ is, the lower will be $\hat{P}$. In fact this is clear from (17). For if $\phi' > \phi$, then

$$(21) \qquad E[v(\theta)\tilde{t} \mid \hat{I}] - \phi > E[v(\theta)\tilde{t} \mid \hat{I}] - \phi' \quad ,$$

where $\hat{I} = \{(\theta,\varepsilon,t) \mid v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q\}$, and so if P satisfies (15) and (17) for some level of ϕ, then it also satisfies them for any higher level of ϕ. This proves

Lemma 1. $\hat{P}(\phi,q)$ is decreasing in ϕ.[19/]

It follows from (8) that the raider's expected profits, given by

$$(22) \qquad \pi(\phi,q) = E[\max(v(\Theta)\tilde{t} - \hat{P}(\phi,q) - c,0) \mid f(\Theta,\varepsilon) = q] - c_I \quad ,$$

are increasing in ϕ.

We will assume that the exclusion factor must be chosen before any information about the firm is known, in particular before $q = f(\Theta,\varepsilon)$ is observed. Consider first the position of the firm's initial shareholders, who write the corporate charter. Since by assumption shareholders are risk neutral, they would like to maximize the expected return from investing in the firm. In order to calculate this, consider the position once the status quo profit of the firm $q = f(\Theta,\varepsilon)$ is known. Then the shareholders' expected return given the particular realization q is

$$(23) \qquad \begin{cases} q\tilde{t} & \text{if there is no bid} \\ \hat{P}(\phi,q) & \text{if there is a bid} \end{cases} \quad .$$

A takeover bid occurs in the event that $v(\Theta)\tilde{t} - \hat{P}(\phi,q) > c$. We denote such an event by $B(\phi,q)$. The occurence of such an event gives shareholders information about $\tilde{t}$. We denote the complement of such events (i.e., no bid) by $NB(\phi,q)$.

The shareholders' expected return, given that they observe q, is

$$(24) \qquad r(\phi,q) = \begin{cases} E[q\tilde{t}] = q & \text{if } \pi(\phi,q) \leq 0 \\ qE[\tilde{t} \mid NB(\phi,q),q]\text{Prob}(NB(\phi,q) \mid q) & \\ \quad + \hat{P}(\phi,q)\text{Prob}(B(\phi,q) \mid q) & \text{if } \pi(\phi,q) > 0 \end{cases} \quad .$$

This is because if there is no bid, the market value of the firm equals the firm's profit which equals $q\tilde{t}$; while if there is a bid the market value of the initial shareholders' shares equals the tender price which equals $\hat{P}(\phi,q)$.[20/] Moreover, we have seen that a bid takes place if and only if

(25) $$\pi(\phi,q) > 0 \quad \text{and} \quad v(\Theta)\tilde{t} - \hat{P}(\phi,q) - c > 0 \ .$$

Note that, as well as being the expected return accruing to initial shareholders, $r(\phi,q)$ is also the price at which the firm's shares in the market sell after q is discovered but before it is known whether or not a takeover bid is going to occur (we are assuming here that the market knows c and c_I and hence can deduce $\hat{P}(\phi,q)$).

It is now an easy matter to compute the expected return from investing in the firm before q is observed. This is just

(26) $$r(\phi) = E_q\, r(\phi,q) = \int r(\phi,f(\Theta,\varepsilon))g_1(\Theta)g_2(\varepsilon)d\Theta d\varepsilon \ .$$

One result which follows immediately from (15), (24), and (26) is that shareholders cannot be made worse off <u>on average</u> by the occurence of bids.

<u>Proposition 3</u>: For all values of ϕ, $r(\phi) \geq Eq$, where the latter is the expected return to shareholders in the absence of bids.

<u>Proof</u>: It suffices to show that $r(\phi,q) \geq q$. But this follows immediately from the definition of $r(\phi,q)$ given in (24) and the fact that, by (15),

$$\hat{P}(\phi,q) \geq qE[\tilde{t}\,|\ v(\Theta)\tilde{t} - \hat{P}(\phi,q) - c > 0,q] \ . \qquad \text{Q.E.D.}$$

In other words, the fact that the tender price must be no less than the value of the firm under current management, <u>given the information implicit in the fact that a bid is occuring</u>, is sufficient to ensure that shareholders do not suffer on average from bids, whatever the value of ϕ may be. Note that Proposition 3 does not imply that shareholders do not lose out from particular bids -- in fact, any bid which is partly acquisitional will make shareholders worse off, i.e., if such bids could be identified, the shareholders would vote that they not be allowed to take place (this follows from the fact that $\hat{P}(\phi,q) < qt$ in the case of a partly acquisitional bid).

Let us return to an analysis of the optimal choice of ϕ for the shareholders. As ϕ increases, $\hat{P}(\phi,q)$ decreases by Lemma 1 and $\pi(\phi,q)$ and $\text{Prob}[v(\theta)\tilde{t} - \hat{P}(\phi,q) - c > 0|q]$ both increase. Hence the probability of a bid unambiguously rises. On the other hand, the amount that shareholders get out of a bid, $\hat{P}(\phi,q)$, declines.

Ceteris paribus, shareholders would like to encourage bids since they benefit from them (this follows from the fact that $\hat{P}(\phi,q) \geq E[q\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,q]$ by (15)). However, the only way they can do this is by reducing the bid premium, and this leads to a fall in the gain they get from any particular bid.

When $\phi = \infty$, $\hat{P}(\phi,q) = qE[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,q]$ and so, by (24), $r(\phi,q) = q$ and $r(\phi) = Eq$.[21/] On the other hand, if $\phi \leq c$, we saw in Section 2 that no bids occur and so $r(\phi)$ again equals Eq. In general, $r(\phi)$ will achieve a maximum for some $c < \phi < \infty$. Furthermore, this maximum will generally have the property that $\hat{P}(\phi,q) > qE[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,q]$ with positive probability.

We turn now to a consideration of the social return from the firm's activities. In evaluating this return, we will make some assumptions also used in Grossman and Hart [1980a]. First, we will ignore distributional effects (equivalently we assume that lump sum taxes and transfers are possible). Secondly, we assume that perfectly competitive conditions prevail in the firm's product market(s), so that the social benefit from the firm's activities is represented by its profit (to put it another way, profits are pure rents). This latter assumption is obviously a strong one; it means that we are ruling out the case where one of the reasons for the takeover is to exploit monopoly power by restricting competition. Finally, we ignore any divergence between the private costs of becoming informed (c_I) and of taking over the firm (c) and the corresponding social costs.

Given q, the social return from the firm's activities equals

$$(27) \quad \begin{cases} q\tilde{t} & \text{if the bidder does not become informed} \\ q\tilde{t} - c_I & \text{if there is an informed bidder but no bid} \\ v(\theta)\tilde{t} - c - c_I & \text{if there is a bid} \end{cases} .$$

Therefore the expected social return given q is

$$(28) \quad R(\phi,q) = \begin{cases} q \quad \text{if} \quad \pi(\phi,q) \leq 0 \\ qE[\tilde{t} \mid NB,q]\text{Prob}(NB \mid q) + E[v(\tilde{\theta})t - \tilde{c} \mid B,q]\text{Prob}(B \mid q) \\ \quad - c_I \quad \text{if} \quad \pi(\phi,q) > 0 \end{cases} .$$

This is because if there is no bid, the return from the firm is simply its status quo profit q; while, if there is a bid, the return is the firm's post-takeover profit net of the cost of the bid, c. Whenever a potential bidder becomes informed, the cost of information, c_I, must be deducted from this gross return to get the net return.

It is now easy to calculate the expected social return from the firm's activities before q is known. This is simply

$$(29) \quad R(\phi) = E_q R(\phi,q) = \int R(\phi, f(\theta,\varepsilon)) g_1(\theta) g_2(\varepsilon) d\theta d\varepsilon \quad .$$

Consider the relationship between $R(\phi,q)$ and $r(\phi,q)$. Obviously

$$(30) \quad R(\phi,q) = r(\phi,q) \quad \text{if} \quad \pi(\phi,q) \leq 0 \quad .$$

If $\pi(\phi,q) > 0$,

$$R(\phi,q) = qE[\tilde{t}|\ NB,q]\text{Prob}[NB|\ q] + E[v(\theta)\tilde{t} - c|\ B,q]\text{Prob}[B|\ q] - c_I$$

$$= qE[\tilde{t}|\ NB,q]\text{Prob}[NB|\ q] + \hat{P}(\phi,q) \times \text{Prob}[B,q] + E[v(\theta)\tilde{t} - \hat{P}(\phi,q) - c|\ B,q]\text{Prob}[B|\ q] - c_I$$

$$= r(\phi,q) + \pi(\phi,q) \quad .$$

(30) and (31) imply that the social return always equals the private return plus the bidder's net profit (if $\pi(\phi,q) \leq 0$, the potential bidder does not investigate the firm and his net profit is zero). It follows that the social return from the firm's activities is always at least as great as the private return:

Lemma 2: $R(\phi) \geq r(\phi)$.

Note that if there were competing bidders (rather than one bidder as we assume), then the bidder's profit would be zero and we would have $R(\phi) = r(\phi)$.

We have seen that $r(\phi)$ is not everywhere increasing in ϕ. The reason for this is that, as noted above, an increase in ϕ increases the probability of a raid but reduces the tender price $\hat{P}$. This reduction in the tender price has no effect on $R(\phi)$, however, since it simply involves a redistribution of income from the shareholders to the bidder.

On the other hand, the increase in the number of bids which results from an increase in ϕ will tend to raise $R(\phi)$ in so far as bids take place for allocational reasons and to lower $R(\phi)$ in so far as bids take place for acquisitional reasons. To see this, note that, by the definition given in Section 3, in a purely allocational bid:

$$v(\theta)t - c > \hat{P}(\phi,q) \geq qt \quad ,$$

which implies that the profit the bidder obtains from running the firm exceeds the profit under current management. But, given that competitive conditions prevail in the product market, this is a sufficient condition for a transfer of control to be socially desirable. Furthermore, an increase in ϕ which lowers $\hat{P}(\phi,q)$ will reduce the divergence between $\hat{P}(\phi,q)$ and qt, thus permitting more of these socially desirable allocational bids to take place. (The exact argument is a bit more complicated since the cost of information c_I must be accounted for. As a result of this cost, some new bids which occur when ϕ is increased will reduce social welfare: those for which $v(\theta)t - c - qt - c_I < 0$. However, it can be shown that these bids are outweighed by those increasing social welfare.)

In contrast, purely acquisitional bids (those for which $v(\theta)t - c < qt$) reduce social welfare since the net value of the firm under the bidder is less than under current management. An increase in ϕ, by reducing $\hat{P}(\phi,q)$, will tend to increase the number of these undesirable bids. In fact, it is not difficult to construct examples where the decrease in social welfare caused by the greater number of acquisitional bids outweighs the increase in social welfare caused by the greater number of allocational bids, i.e., an increase in ϕ <u>reduces</u> $R(\phi)$.

If we are prepared to make an additional assumption, however, then we can be sure that the good effect of extra allocational bids will dominate the bad effect of extra acquisitional bids, so that $R(\phi)$ is increasing in ϕ.

<u>Proposition 4</u>: Assume that $E[\tilde{t} | v(\theta)\tilde{t} - P - c > 0, f(\theta,\varepsilon) = q]$ is an increasing function of P. Then $R(\phi)$ is increasing in ϕ. In particular, it is socially optimal to set $\phi = \infty$.

<u>Proof</u>: See Appendix.

The assumption that $E[\tilde{t} | v(\theta)\tilde{t} - P - c > 0, f(\theta,\varepsilon) = q]$ is increasing in P says that increases in $v(\theta)\tilde{t}$ go together on average with increases in $\tilde{t}$.

While this seems reasonable if θ and $\tilde{t}$ are independent, there are cases where it is violated. One case where the assumption of Proposition 4 clearly holds is when status quo profit is nonrandom, i.e., $\tilde{t} = 1$ with certainty -- this is the model of Section 2. Proposition 4 tells us that $\phi = \infty$ is socially optimal in this case.

Proposition 4 implies that, if $E[\tilde{t} | v(\theta)\tilde{t} - P - c > 0, f(\theta,\varepsilon) = q]$ is increasing in P, then the privately optimal level of exclusion $\phi_p \leq$ the socially optimal level of exclusion $\phi_s = \infty$. That is, there is a divergence between what is privately optimal and what is socially optimal, with shareholders desiring to restrict bids more than is socially desirable by limiting exclusion in order to obtain premia.[22/] It is not at all surprising that there is a divergence, since we assumed that the bidder is always a monopsonist. If bidders competed for the firm's shares, then the shareholders would find it optimal to set $\phi = \infty$. This follows because a large ϕ does not reduce the tender price if bidders compete for the shares, since the firm is worth $v(\theta)t - c$ to all the (presumably) identical bidders. Note, however, that competition among bidders may be inconsistent with any of them earning a return on the information cost, c_I. Thus, in situations where c_I is large, the case where the bidder is a monopsonist may be empirically more relevant than the case where there are competing bidders.[23/] In any case, our goal was not to show that a lack of competition leads to some distortion (that is obvious), but rather to point out the direction of the distortion. In this case the direction of the distortion is such that the government should encourage takeover bids more than the private sector, if it does anything at all.

5. Takeover Bids and the Incentive to Invest in Corporations

As we noted in the introduction, it is sometimes argued (often by incumbent directors!) that the government should restrict takeover bids because they reduce the incentive to invest in corporations. That is, initial shareholders who set up the corporation anticipate that (acquisitional) bids will take place in states of nature when the market undervalues the firm relative to what inside information indicates. In these states of nature, the bidder's tender price will not reflect the inside information, because there may be only one bidder who possesses this information. Hence, it is argued, the expected return to setting up the firm is lower than it would be in the absence of bids and this leads to underinvestment in the corporate sector by initial shareholders. To correct this distortion, it is argued that the government should discourage takeover bids.

In this section, we extend the results of the previous sections and show that monopsony in the takeover market implies that the government should <u>encourage</u> takeovers rather than discourage them. To model the possibility of distortion in investment, assume that shareholders possess an alternative investment with constant and exogenous rate of return given by s. Assume that if the aggregate amount of investment or capital, k, is forthcoming, then it is possible to set up $g(k)$ distinct corporate units, each with production function as in Sections 2 and 3. Here g is a function with $g' > 0$ and $g'' < 0$, the concavity of g indicating that there are decreasing returns to scale in the setting up of new corporations. If $r(\phi)$ is the private rate of return per corporate unit, then the private rate of return from investing in corporations is given by

(32) $$g(k)r(\phi) - sk \quad .$$

Let ϕ_p be the optimal level of exclusion chosen by initial shareholders, i.e., ϕ_p maximizes $r(\phi)$. Then, in the absence of government intervention, investment will occur until

(33) $$g'(k)r(\phi_p) = s \quad .$$

Socially, the return per corporate unit is given by $R(\phi)$ rather than $r(\phi)$, as described in the last section. Thus social efficiency involves the maximization of $g(k)R(\phi) - sk$. The particular government intervention we will consider is the following. We will assume that the government can encourage or discourage takeover bids by dictating ϕ, but that the market is free to choose k. (Note that dictating ϕ is equivalent to regulating the ease of takeover bids in terms of the cost to the raider.) That is, let $k(\phi)$ be the maximizer of $g(k)r(\phi) - sk$ for a given ϕ. Then $k(\phi)$ is the investment which would take place if ϕ was dictated by the government.

The government chooses ϕ to maximize $S(\phi) \equiv g(k(\phi))R(\phi) - sk(\phi)$. Let ϕ_s denote the maximizer of $S(\phi)$. Then it can be shown that $\phi_s \geq \phi_p$. That is, the government will want to choose a charter which allows more (no less) exclusion and thus encourages more takeovers than the private sector. We have already shown that ignoring the investment effect of this section, we have $\phi_s \geq \phi_p$. We have argued that the government wants ϕ large to encourage bids because on average bids improve the allocation of resources. In the previous sections the government didn't care that making ϕ large reduces the return to initial shareholders, $r(\phi)$, by lowering the tender price. However, when private investment, $k(\phi)$, is sensitive to the expected rate of return on investment, $r(\phi)$, the government will want initial shareholders to share more than previously in the improvements of the corporation so that the right amount of investment is encouraged.

However, it is easy to see that the investment effect does not change our basic result that initial shareholders want to get more out of any improvement than is optimal from an efficiency standpoint. To see this, consider equation (33), which gives k as a function of ϕ. Differentiate both sides with respect to ϕ_p to get $g''k'(\phi_p)\, r(\phi_p) + g'r'(\phi_p) = 0$. But if ϕ_p is chosen optimally by shareholders then $r'(\phi_p) = 0$. Hence $k'(\phi_p) = 0$. That is, if the government raises ϕ just a little above ϕ_p, then k will not change, so at the margin the investment effect can be ignored. On the other hand, Proposition 4 implies that $R'(\phi_p) \geq 0$ and so $g(k(\phi))R(\phi) - sk(\phi)$ increases when ϕ is raised a little above ϕ_p. Thus we can prove

Proposition 5: $\phi_s \geq \phi_p$, i.e., the government should not want to restrict takeover bids even if investment is sensitive to the rate of return earned by initial shareholders.

We will not give a formal proof of Proposition 5 here. The interested reader is referred to the argument given in the proof of Proposition 6 of Grossman and Hart [1980a].

6. Conclusion

In this paper we have developed a model of the takeover bid process. We have considered a firm with many shareholders, each of whom has a small shareholding. Under these conditions, we would not expect it to pay any shareholder to monitor the firm to find out whether a good performance is the result of good management or of, say, favorable market conditions. The job of monitoring the firm will therefore be left to a potentially large shareholder, such as a prospective bidder.

We have assumed that managers act on behalf of shareholders, i.e. maximize profits, but that they may be inefficient. One role of a potential bidder is to discover whether a firm is being run inefficiently and, if it is, to take it over and replace the current mangement by more efficient management. We call such a allocational. We have also considered a second type of bid -- called an acquisitional bid. An acquisitional bid occurs when a bidder discovers information not available to other traders indicating that a firm is undervalued on the stock market relative to its true performance under current management. Under these conditions, a bidder may attempt to take over the firm simply because he uniquely has this information.

In contrast to allocational bids, (purely) acquisitional bids are bad from the point of view both of shareholders and of society. This is because they do not lead to a better allocation of resources, but simply involve a redistribution of income from the (uninformed) shareholders to the informed bidder -- a redistribution, moreover, which is costly since resources will be used up in the bid. The divergence between private and social benefits is due to the fact that there is only a single bidder with the appropriate information. In addition, since acquisitional bids prevent shareholders from getting the full return on their investments, the existence of (partly) acquisitional bids will tend to reduce the incentives of investors to invest in the corporate sector -- which is both privately and socially undesirable.

The undesirable consequences of acquisitional bids have led some to argue that the government should introduce provisions to restrict takeover bids. As noted by Aranow, Einhorn and Berlstein [1977, pp. 207-257], state takeover bid law seems designed explicitly to make bids more costly (and to protect incumbent management). Grossman and Hart [1980b] show that federal disclosure laws can have the effect of reducing the exclusion of (free riding) minority shareholders and thus have the effect of restricting takeover bids. This paper has argued that even if the bidder has monopsony power due to information possession, it is not the case that the government should restrict takeover bids. If acquisitional bids can be distinguished from allocational bids, then shareholders will prohibit acquisitional bids and government efforts to reduce their impact are unnecessary. On the other hand, if acquisitional bids and allocational bids cannot be distinguished -- as we have assumed in this paper -- then shareholders can, through their own actions, restrict takeover bids sufficiently so that further restrictions by the government are undesirable -- in fact, if anything, the government should act so as to make takeover bids easier. The way that shareholders can restrict bids is by writing a corporate charter which limits the extent to which minority shareholders can free ride on the bidder's improvement of the company.[24/]

As well as yielding normative results concerning the ease with which bids should take place, our analysis provides some explanation for the existence and magnitude of bid premia. Premia arise for two reasons in the model described here. First, if the exclusion factor ϕ is small, the value of not tendering to the bidder and becoming a minority shareholder in the post-takeover company will in general exceed the value of the firm under incumbent management. Thus, a bidder must offer a premium, since otherwise shareholders will hold on to their shares and the bid will fail. Secondly, both allocational and acquisitional bids are more likely to occur when a bidder has inside information indicating that the firm is currently undervalued on the market. Shareholders, with rational expectations, will realize this. Consequently, they will revise upwards their estimate of the <u>current</u> (status quo) value of the firm when they observe a bid. Thus, even if $\phi = \infty$, the bidder will have to offer a premium over the prebid market value of the firm because of this revaluation effect.[25/][26/]

Note that this revaluation effect will persist even if the bidder's bid fails.[27/] Hence our model provides an explanation of the empirical evidence that a firm's shares sell at a premium after an unsuccessful takeover bid.

APPENDIX

Proposition 1: $qE[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] > q$.

Proof: We show that $E[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] > 1 = E\tilde{t}$. Let X be any random variable with finite mean and k a number. Then

$$\begin{aligned} EX &= E[X|\ X \geq k]\text{Prob}[X \geq k] + E[X|\ X < k]\text{Prob}[X < k] \\ &\leq E[X|X \geq k]\text{Prob}[X \geq k] + E[X|X \geq k]\text{Prob}[X < k] \\ &= E[X|\ X \geq k] \ , \end{aligned} \tag{A1}$$

with strict inequality if $\text{Prob}[X < k] > 0$. Setting $X = \tilde{t}$ and $k = \frac{P + c}{v(\theta)}$, we get

$$\begin{aligned} E[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,\ \theta,\ f(\theta,\varepsilon) = q] &= E[\tilde{t}|\ \tilde{t} > \frac{P + c}{v(\theta)}, \theta,\ f(\theta,\varepsilon) = q] \\ &\geq E[\tilde{t}|\ \theta,\ f(\theta,\varepsilon) = q] \end{aligned} \tag{A2}$$

as long as $v(\theta) > 0$, with strict inequality if $\text{Prob}[v(\theta)\tilde{t} - P - c \geq 0|\theta,\ f(\theta,\varepsilon) = q] < 1$. But it follows by taking expectations of (A2) with respect to θ that

$$E[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q] \geq E[\tilde{t}|\ f(\theta,\varepsilon) = q] = E\tilde{t} \tag{A3}$$

with strict inequality if $\text{Prob}[v(\theta)\tilde{t} - P - c \geq 0|\ f(\theta,\varepsilon) = q] < 1$.

To see that there must be strict inequality in (A3), suppose that $\text{Prob}[v(\theta)\tilde{t} - P - c \geq 0|\ f(\theta,\varepsilon) = q] = 1$. Then (15) implies that $P \geq E[q\tilde{t}|\ f(\theta,\varepsilon) = q]$. Hence $\text{Prob}[v(\theta)\tilde{t} - q\tilde{t} - c \geq 0|\ f(\theta,\varepsilon) = q] = 1$, which is impossible since with positive probability ε lies in a neighborhood of $\bar{\varepsilon}$. Q.E.D.

Proposition 5: Assume that $E[\tilde{t}|\ v(\theta)\tilde{t} - P - c > 0,\ f(\theta,\varepsilon) = q]$ is an increasing function of P. Then $R(\phi)$ is increasing in ϕ.

Proof: It suffices to show that $R(\phi,q)$ is increasing in ϕ for each q. Assume

$\pi(\phi,q) > 0$. Then

$$R(\phi,q) = q + \int_{\hat{I}} (v(\Theta)t - c - qt) - c_I$$

where $\hat{I} = \{(\Theta,\varepsilon,t) \mid v(\Theta)t - \hat{P}(\phi,q) - c > 0,\ f(\Theta,\varepsilon) = q\}$ is the set of bidding states. Suppose $\phi < \phi'$. Then the set of bidding states changes from $\hat{I} = \{(\Theta,\varepsilon,t) \mid v(\Theta)t - P - c > 0,\ f(\Theta,\varepsilon) = q\}$ to $\hat{I}' = \{(\Theta,\varepsilon,t) \mid v(\Theta)t - \hat{P}' - c > 0,\ f(\Theta,\varepsilon) = q\}$ where $P' < P$. We will have proved that $R(\phi,q)$ is increasing in ϕ if we can show that

$$\int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt \quad \geq \quad \int_{\left\{\begin{array}{l} v(\Theta)t-P-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt$$

But

$$\int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt = \int_{\left\{\begin{array}{l} v(\Theta)t-P-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt + \int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ v(\Theta)t-P-c \leq 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt \ .$$

Therefore we will be done if we can show that

$$\alpha = \int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ v(\Theta)t-P-c \leq 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt \geq 0 \ .$$

Now

$$\alpha = \int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ v(\Theta)t-P-c \leq 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} v(\Theta)t - c - qt \geq \int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ v(\Theta)t-P-c \leq 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} P' - qt$$

$$= \int_{\left\{\begin{array}{l} v(\Theta)t-P'-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} (P' - qt) - \int_{\left\{\begin{array}{l} v(\Theta)t-P-c > 0 \\ f(\Theta,\varepsilon)=q \end{array}\right\}} (P' - qt)$$

$$= E[P' - q\tilde{t} \mid v(\Theta)\tilde{t} - P' - c > 0,\ f(\Theta,\varepsilon) = q]\text{Prob}[v(\Theta)\tilde{t} - P' - c > 0 \mid q] - E[P' - q\tilde{t} \mid v(\Theta)\tilde{t} - P - c > 0,\ f(\Theta,\varepsilon) = q]\text{Prob}[v(\Theta)\tilde{t} - P - c > 0 \mid q]$$

$$\geq E[P' - q\tilde{t} \mid v(\Theta)\tilde{t} - P' - c > 0,\ f(\Theta,\varepsilon) = q](\text{Prob}[v(\Theta)\tilde{t} - P' - c > 0,\ f(\Theta,\varepsilon) = q] - \text{Prob}[v(\Theta)\tilde{t} - P - c > 0 \mid q])$$

since, by assumption, $E[\tilde{t} \mid v(\Theta)\tilde{t} - P - c > 0,\ f(\Theta,\varepsilon) = q] \geq E[\tilde{t} \mid v(\Theta)\tilde{t} - P' - c > 0,\ f(\Theta,\varepsilon) = q]$. Hence

$$\alpha \geq 0$$

since $\text{Prob}[v(\Theta)\tilde{t} - P' - c > 0 \mid q] \geq \text{Prob}[v(\Theta)\tilde{t} - P - c > 0 \mid q]$ and, by (15), $P' \geq qE[\tilde{t} \mid v(\Theta)\tilde{t} - P' - c > 0,\ f(\Theta,\varepsilon) = q]$.

This proves that $R(\phi,q)$ is increasing in ϕ if $\pi(\phi,q) > 0$. The case where $\pi(\phi,q) \leq 0$ is straightforward and is left to the reader. Q.E.D.

Footnotes

1/ The Williams Amendment of 1968 to the 1933 Securities and Exchange Act contains federal regulations concerning takeover bids. This Amendment was first proposed by Senator Williams, who stated: "In recent years we have seen proud old companies reduced to corporate shells after white collar pirates have seized control..., then sold or traded away the best assets..." [111 Cong. Rec. 28257, Oct. 22, 1965]. References to similar remarks by other legislators can be found in Aranow and Einhorn [1973, pp. 64-68]. The Federal Trade Commission, in its Economic Report on Corporate Mergers (reprinted in Brudney and Chirelstein [1979, pp. 504-509]), notes that "...merger profits may arise if the acquired assets can be bought at bargain prices." The fear that shareholders will be bought out at too low a price is one of the reasons for the disclosure provisions of the Williams Amendment. The chairman of the Securities and Exchange Commission, in remarks reprinted in Brudney and Chirelstein, op. cit. pp. 720-722, argued that a company might be selling for $5 per share, but a person making the takeover bid thinks he can liquidate the company for $15 per share. It is suggested that if shareholders do not know the liquidation value is $15, then the takeover bid might succeed at $6. This is used to argue that there should be a disclosure law. Implicit in this argument is the assumption that there is not competition for the shares of the company among bidders who know that its worth is $15. The chairman of the SEC noted that "the disclosure required...might discourage some tender offers, [but] it is a small price to pay for informed choice by shareholders..." op. cit. p. 722. State law has had an even more important effect on restricting takeover bids. Many states require long delays and the approval of a state commission which certifies that shareholders get a "fair value" for their shares. It is generally agreed that these state regulations have the effect of making takeover bids much more difficult than in the past; see Aranow, Einhorn and Berlstein [1977, pp. 207-257].

2/ See Dodd and Ruback [1977].

3/ For a discussion of motives for making takeovers, including the allocational and acquisitional motives, see Gort [1969], Mueller [1969], Lintner [1971], Dodd and Ruback [1977], Manne [1965], and Smiley [1976].

4/ The number $f(\theta,\varepsilon)$ can also be interpreted as the firm's net present value or the market value of its shares -- in this paper we will make no distinctions between profit, net present value and market value.

5/ In writing the firm's profit function as $f(\theta,\varepsilon)$, we are ignoring the effect of other firms' production decisions on market prices and hence on this firm's profits. This means that, among other things, we are ignoring the role played by competition in the product market in eliminating inefficient management -- on this, see Winter [1971]. An important extension of the present work would be to include this role of competition explicitly.

6/ The acquirer should be thought of as being either an entrepreneur or another firm with a highly efficient manager.

7/ It is being assumed that the higher productivity of superior management is not offset by the increased wages that they must be paid. In particular, we assume that status quo management is unwilling or unable to vote itself out of office and hire better managers to run the firm. One reason that hostile takeover bids (as opposed to friendly acquisitions) occur is that current management does not have the same information as the acquirer and disagrees with him about what decisions will maximize profit. Throughout this paper we assume that the acquirer has strictly better information than the incumbent and so is able to extract a higher value out of the firm. In this interpretation ε parametizes the quality of the decision maker's information. We assume that the acquirer has the best information available $\bar{\varepsilon}$.

8/ We assume that no further bids by this bidder or other bidders occur.

9/ The assumption that shareholders know nothing about their particular firm's characteristics is obviously rather strong. Our analysis would go through unchanged, however, if it was assumed that $q = f(\theta_1,\theta_2,\varepsilon)$ where θ_1 represents known characteristics about the firm and θ_2 represents unknown characteristics (θ_1 might, for example, be the book value of the firm's assets, profits and sales in the last few years, etc.).

10/ Grossman [1977] has emphasized that securities markets can serve as a place where traders earn a return on information collection, thereby facilitating a better allocation of resources as the price system aggregates and transmits information across traders.

11/ We assume that, if the bidder takes over the firm, he purchases all the shares. This assumption will be justified below (see footnote 13).

12/ This is a reasonable assumption if investors in the market hold well diversified portfolios.

12a/ After a successful tender offer, the acquirer often votes to merge the target into the acquirer. This involves the acquirer (the new manager) stating what the "true value" of the target's assets are. Since it has voting control, it can attempt to mistreat minority shareholders in the target by having a poor appraisal of the assets if this is permitted by the corporate charter. In Grossman and Hart [1980b], we show that ϕ is related to the amount of disclosure (and the quality of the appraisal) that the acquirer is required to make to the minority shareholders of the target at the time of the post-takeover merger.

13/ At this price $\hat{P}$ shareholders are just indifferent between tendering and not tendering their shares. We will assume that all shares are in fact tendered.

14/ Given this signalling effect, it may be wondered whether it might be in the bidder's interest to try to fool the shareholders by sometimes bidding in unprofitable states, i.e. when $v(\theta) - P - c \leq 0$. While this would lead to lower profits in some bids, it might through worsening the quality of the bid price signal increase profits in the long run. This fooling possibility is only important, however, if the same bidder takes over many firms during his life and is therefore prepared to sacrifice profits in the short run for profits in the long run. We will avoid the fooling possibility by assuming that the bidder only makes one bid during his life, so that only current profit is important.

15/ The above should not be confused with the bilateral monopoly problem which arises when person A offers person B P dollars for the latter's stock. When this occurs, person B knows that his stock must be worth at least P dollars to A (and thus in general has an expected worth of more than P to A). Thus we might conclude that B holds out for more than P and thus no trade ever takes place -- which is absurd. In our case there are many small sellers (i.e. shareholders) and each one assumes that he can not sell and still share in the improvement of the corporation. That is, the bilateral monopoly problem concerns the trade of a private good (either A gets $v(\theta)$ or B does, but not both), while our problem concerns the trade of shares in a common property, the corporation, which is a public good among its shareholders.

16/ On possiblity that we have ruled out is that the bidder makes a takeover bid without investigating the firm, i.e. the bidder makes an uninformed bid and simply installs management of quality $\bar{\varepsilon}$ without incurring the cost c_I. One justification for ruling this out is the following. Suppose shareholders always assume that bidders are informed. Then the tender price will be given by $\hat{P}(\phi,q)$ as determined in this section. If the bidder makes an uninformed bid, his expected profit is $E[v(\theta) - \hat{P}(\phi,q) - c | q]$. As long as c is large enough relative to c_I and $v(\theta)$ is sufficiently variable, however, this is less than $E[\max(v(\theta) - \hat{P}(\phi,q) - c, 0) | q] - c_I$, which is his expected profit if he investigates the firm. Thus uninformed bids will not occur under these conditions.

17/ We assume that the bidder cannot charge shareholders directly for the true costs c_I and c incurred, as these cannot be directly monitored by shareholders. Another interpretation of ϕ is that it states the maximum amount that the raider can charge shareholders for the takeover bid.

18/ Alternatively, the wealthy individual can announce a counter tender offer at a price between P and $qE[\tilde{t} | v(\theta)\tilde{t} - P - c > 0, f(\theta,\varepsilon) = q]$.

19/ We will say that a real valued function f of a real number x is <u>increasing</u> if $x' > x \Rightarrow f(x') \geq f(x)$. We will say that it is <u>strictly increasing</u> if $x' > x \Rightarrow f(x') > f(x)$.

20/ We will assume that if a bid takes place at all, it occurs almost immediately. Thus shareholders receive <u>either</u> $q\tilde{t}$ <u>or</u> $\hat{P}(\phi,q)$ rather than some weighted combination of the two, with the weigths being determined by the length of time incumbent management is in office.

21/ For if (15) holds with strict inequality, then since the RHS is continuous in P, (15) will be satisfied for a slightly lower value of P. This contradicts the fact that $P(\infty,q)$ is the smallest P satisfying (15).

22/ This is the same conclusion that was arrived at in the analysis of disciplinary raids given in Grossman and Hart [1980a]. The main differences between the two analyses are: (1) in the present paper, the ex ante information cost c_I and the bid cost c are treated separately, whereas in Grossman and Hart [1980a] they were lumped together; (2) in Grossman and Hart [1980a], the disciplinary effect of bids meant that making bids easier by increasing ϕ caused managers to work harder on the shareholders' behalf, i.e. to increase q. This effect on q is missing in the allocational model described here because inefficiencv is due only to managerial inability and not the managerial discretion.

23/ Further remarks on the case where raiders compete may be found in Grossman and Hart [1980a].

24/ We are, of course, not claiming that government restrictions of takeover bids are never warranted. If, for example, most takeover bids occur in order to restrict competition in the product market, then government restrictions may be justified. All we are claiming is that the view that government intervention is justified because of the existence of acquisitional bids is unfounded.

25/ There is a third reason for the existence of premia. We have assumed throughout that only a single bidder investigates the firm and makes a bid. In general, however, a number of bidders may choose to monitor the same firm. One of these will discover the firm's secrets first -- in the present model the secrets concern whether the firm has a good manager and a bad capital stock, say, or a bad manager and a good capital stock -- and will make a bid. This bid will, however, signal information to others (including those who were not monitoring the firm) that the firm is worth taking over, and this may induce others to make competing bids. If the process of making bids and counterbids is expensive, the bidder making the first bid may prefer to offer a sufficiently large premium to deter competing bids rather than to engage in a bid battle.

26/ It is sometimes suggested that a further reason for premia is that the demand curve for the firm's shares is downward sloping; that is, shareholders get consumer surplus out of the earnings stream provided by the firm. (This can occur when there is imperfect competition in the production of earning streams.) Then the market price q of shares represents the marginal worth of a share rather than the total worth of 100% of the shares. It is claimed that in this case, in order to take over the firm, a bidder will have to "go up the demand curve." This is false, however. If fact, if $\phi = \infty$, the bidder can get the firm for q. For if he offers $q + \varepsilon$, where $\varepsilon > 0$, then if shareholders think that he will succeed, they tender, since their shares will be worthless if they hold on, while if they think he will fail, they also tender since they are being offered more than q now and can always repurchase their shares for q once the bid has failed. Now let $\varepsilon \to 0$.

27/ In the model studied here, there are no unsuccessful bids. However, unsuccessful bids could easily be introduced by assuming that the raider does not know shareholders' assessments of the potential value of the firm, $v(\theta)$, so that the raider will sometimes offer too low a price and will not obtain a majority of the shares.

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