

## Large Shareholders as Monitors: Is There a Trade-Off between Liquidity and Control?

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### ABSTRACT

This paper analyzes the incentives of large shareholders to monitor public corporations. We investigate the hypothesis that a liquid stock market reduces large shareholders' incentives to monitor because it allows them to sell their stocks more easily. Even though this is true, a liquid market also makes it less costly to hold larger stakes and easier to purchase additional shares. We show that this fact is important if monitoring is costly: market liquidity mitigates the problem that small shareholders free ride on the effort of the large shareholder. We find that liquid stock markets are beneficial because they make corporate governance more effective.

IS A LIQUID STOCK MARKET a liability for effective corporate governance? Casual empiricism seems to suggest that a liquid market allows investors to sell out if they receive adverse information about a company, and that, by contrast, a less liquid market forces them to hold on to their investment and to use their votes to influence the company to achieve better returns. A typical example is British Airways' experience, when its senior management came under attack for using unfair competitive practices against one of its smaller rivals, Virgin Atlantic. At the time, the *Financial Times* noted that Fidelity, the second largest shareholder with a holding of 4.5 percent, "has disposed of almost its entire position, and the Prudential and Standard Life stakes have

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fallen below 3 percent.”<sup>1</sup> Likewise, on a theoretical level, Bhidé (1993) has argued that liquid stock markets are a hindrance for effective governance, and Coffee (1991) entitled his essay “Liquidity versus control.”<sup>2</sup> However, even though public markets are more liquid and efficient than ever, shareholder monitoring seems to be increasing; as takeovers have become less frequently used as a means to correct managerial failure, large institutional shareholders (notably CalPERS and other public pension funds) have attempted to achieve higher portfolio returns through governance-related activities.<sup>3</sup> More recently, *The Wall Street Journal* has observed that individual investors as well have built up minority stakes in order to influence management.<sup>4</sup> There seems to be no clear-cut evidence for the claim that increasing stock market liquidity reduces monitoring by outside shareholders.

This paper investigates the claim that liquid stock markets prevent effective corporate governance and argues that the alleged trade-off between liquidity and control does not exist. It is easy to accept the argument that in a more liquid stock market it is less costly to sell a large stake. However, by the same token, such a market also makes it easier for investors to accumulate large stakes without substantially affecting the stock price and to capitalize on governance-related activities. The last point is extensively analyzed in relation to takeovers by Kyle and Vila (1991). Liquid stock markets have two opposing effects on corporate governance. On the one hand, liquid markets can facilitate the exercise of corporate control because they allow large shareholders to emerge to correct managerial failure. At the same time liquid markets also allow large shareholders to dispose of their shares ahead of an expected fall in stock prices rather than to become involved in a company's management. Which of these effects dominates is an issue that needs to be investigated, and theoretical results have remained ambiguous so far. However, this paper shows that the impact of liquidity on corporate control is unambiguously positive.

The first objective of this paper is to provide an analytical framework of a stock market economy in which the emergence of large blockholders with incentives to monitor companies can be discussed. Here and following, the word “monitoring” is used as a comprehensive label for all value-enhancing activities; it comprises intervention in a company's affairs as well as information acquisition (e.g., in order to identify a potential target of intervention) and is used synonymously with “intervention” and “shareholder activism.”

<sup>1</sup> Cleaning up ‘the world's favourite airline’: British Airways' directors meet today to decide on action, *Financial Times*, January 21, 1993.

<sup>2</sup> See Charkham (1994) for a critical analysis of market-based corporate governance and arguments for strengthening monitoring by large institutional shareholders.

<sup>3</sup> See Nesbitt (1994) for an analysis of campaigns by CalPERS; see Black (1992b) for an institutional analysis of large shareholder monitoring in the United States and Black and Coffee (1994) for the United Kingdom.

<sup>4</sup> ‘Noisemakers’ buy small stakes and put big heat on companies, *The Wall Street Journal*, 6 January 1995, C1. A case that probably received much public attention was Kirk Kerkorian's attempted takeover of Chrysler Corporation in 1995.

The model studies the decision-making process of a large shareholder to monitor a company. The large shareholder faces a free-rider problem because she bears the costs of monitoring alone, whereas all the small shareholders benefit from her monitoring efforts. The impact of free riding depends on the equilibrium size of the large shareholder, which also has two other effects. First, owning a larger stake makes the return on the company's shares more significant for the large shareholder, hence it biases her toward intervention. We call this the *lock-in effect*. Second, if a larger fraction of the total shares is owned by the large shareholder, then fewer shares are held by households, making the market less liquid in these shares. We call this the *liquidity effect*. This loss of liquidity reduces the large shareholder's expected gains from trading on private information.<sup>5</sup> Because a larger stake biases the large shareholder towards more shareholder activism, she can use either a larger initial stake to commit to more interventions or a smaller stake to avoid being so committed. The large shareholder makes profits on her activities in two ways. She makes a direct profit through trading at the expense of uninformed liquidity traders (households), because the mere fact that she has decided to monitor a company provides her with private information relative to the market. She also makes a profit on her initial stake because shares initially trade below their intrinsic value: households are only willing to hold shares at an adverse selection discount that reflects the expected loss from trading with informed investors in the future.

The second objective of this paper is an analysis of the relationship between stock market liquidity and corporate governance. It will be shown that in equilibrium the large shareholder will purchase a stake in the firm that is too small in the following sense: the capital gain on her initial stake does not cover the costs of monitoring. Part of the incentive to monitor, therefore, comes from the ability to purchase *additional* shares in the stock market at a price that does not reflect the large shareholder's improvements. As a result, the large shareholder's engagement in shareholder activism *increases* with the liquidity of the market. This result runs counter to the conventional wisdom that liquid markets discourage large, activist shareholders. Liquid markets help investors overcome the free-rider problem. *Social optimality* of the allocation would be achieved only if the large shareholder could be locked into an initial stake sufficiently large to commit her to monitor. However, such an arrangement implies a loss for the large shareholder, and she would never enter such a commitment. In a less liquid market the large investor will simply choose a smaller stake.

When initial shareholders write the corporate charter, they can influence the governance of the company. The charter can require more stringent majorities in a voting contest so that the large shareholder has to accumulate a larger stake in order to be able to monitor. Reducing market liquidity and increasing majority requirements both imply that the stake of the large share-

<sup>5</sup> Consider the extreme case where the large investor holds all shares. Then market liquidity would be zero. See Bolton and von Thadden (1998) for an alternative analysis of this effect.

holder becomes less liquid, for the important consideration is the size of the large shareholder's block relative to the liquidity of the market. Although both measures reduce the liquidity of large blocks, they have the opposite effect on monitoring—reducing the liquidity of the market *reduces* monitoring, whereas increasing the majority requirement for a governance contest *increases* monitoring. A higher majority requirement forces the large investor to accumulate a larger stake to be effective, and this in turn implies that she needs to precommit herself to a higher level of monitoring.<sup>6</sup> If founding shareholders cannot extract rents from future large shareholders in this way, their desire to increase the value of the company and to reduce the rents large shareholders can extract from monitoring will cause them to prefer a lower liquidity of the market than is socially optimal.

Some investors can choose to intervene in a company through a hostile takeover or they can take a less adversarial approach to influence the company. Institutions are often legally prohibited from hostile bidding and choose direct negotiations with senior managers or proposals at annual general meetings to pursue their objectives. The model distinguishes these approaches with respect to their costs and their effectiveness, where effectiveness is measured as the likelihood of successfully restructuring the firm. Typically, takeovers are more costly than a voting contest, but they also have a higher probability of success because they do not depend on other shareholders' voting behavior. This is a plausible expectation, but not inevitably true. The model below makes no such formal assumption and also covers the cases where takeovers are less successful or less costly. Ultimately, this is an empirical question. If the stock market is illiquid, the large shareholder prefers the less costly method of restructuring the firm, as she cannot benefit from incurring these costs through trading with uninformed investors. In a more liquid market she can profit from informed trading. Because trading profits are proportional to a stock's volatility, she will be biased towards the restructuring method that has the higher probability of making a more pronounced impact on the company's value and stock price. Trading in more liquid markets helps the large shareholder to pass on part of the restructuring costs to uninformed shareholders, thus making the cost aspect less important. Hence, in a more liquid market the large shareholder prefers the more effective method of restructuring, whereas in an illiquid market she tends to favor the cheaper method of restructuring. In summary, the paper concludes that liquid stock markets are generally beneficial for corporate governance.

Section I discusses the literature. Section II sets out the basic elements of the model. Section III analyzes the model for the case of one large shareholder who can monitor the firm and derives the impact of liquidity on monitoring. Section IV introduces takeovers into the analysis, and Section V discusses the empirical and institutional aspects of shareholder activism.

<sup>6</sup> This argument ignores the fact that some shareholders are not allowed to hold a stake above a certain limit in any individual company (for mutual funds in the United States, this limit is 5 percent).

Section VI concludes. Appendix A contains a generalization of the model. All proofs are in Appendix B.

## **I. Discussion of the Literature**

Several topics addressed in this paper have been discussed by Admati, Pfleiderer, and Zechner (1994) and Kahn and Winton (1995). Admati et al. analyze the impact of shareholder activism on portfolio allocations. They focus on the trade-off between risk sharing and concentrated ownership and analyze the case of an individual investor with an exogenously given stake. In contrast to Admati et al., this paper analyzes a noisy rational expectations model of the stock market with only one stock and risk-neutral agents and a large investor who is constituted endogenously. Kahn and Winton also analyze the relationship between liquidity and monitoring by a large shareholder. They show that the choice between monitoring and informed trading relies on the relative benefit/cost ratios of these actions. In their paper the large shareholder has two options: to become an informed insider or a monitor, as mutually exclusive alternatives. Therefore, their analysis does not address the crucial conflict of interest experienced by a large shareholder who has identified an underperforming company and has to decide between selling on this information or intervening. They also make the initial allocation of shares between the large shareholder and small shareholders a decision of the entrepreneur in the initial placement, thus ignoring the fact that this allocation can be undone in secondary markets. An important contribution of this paper is its emphasis on an ownership structure that is robust to retrading in secondary markets; other papers assume that the relevant ownership structure is the initial one determined in the IPO.

Bolton and von Thadden's (1998) analysis of market liquidity focuses on the initial ownership structure of the firm, and Stoughton and Zechner (1995) discuss the case of a large shareholder who receives a block in the initial placement. Both papers rely on frictions in secondary markets that prevent the undoing effect analyzed in this paper. Zwiebel (1995) takes an altogether different approach by emphasizing that blockholders can extract private benefits of control. His approach is complementary to the analysis here, which focuses on the pecuniary benefits of blockholders that are common to all shareholders rather than on private benefits.

The literature on hostile takeovers has also discussed the role of large shareholders, notably in papers by Shleifer and Vishny (1986) and Kyle and Vila (1991). However, Shleifer and Vishny do not analyze how a large stake could emerge. Kyle and Vila are closer to the approach taken in the current paper, as they also observe that the investor who acquires a toehold before intervening in the management of the company can gain if the market cannot detect this purchase. They perform comparative static analysis in terms of the size of the initial stake held by the large investor, but they do not endogenize the decision to hold such a stake, so their analysis of the impact of market liquidity remains ambiguous. Other aspects of concentrated own-

ership are addressed by Huddart (1993), Burkart, Gromb, and Panunzi (1994), and Dewatripont (1993).

The current model uses standard workhorses and follows Kyle (1985) and Admati and Pfleiderer (1988) for modeling the market structure. The fact that stock will be issued with an adverse selection discount if prices are generated by this structure has already been used by Khanna, Slezak, and Bradley (1994), Holmström and Tirole (1993), and Bernhardt, Hollifield, and Hughson (1995). Note that here, unlike in Khanna et al., the company's ex ante objective and the social objective coincide. The main difference to their model is that, although households may have to sell involuntarily, there are no traders who buy involuntarily. In the current paper, the difference between social and private objectives comes from the free-rider problem and the rents extracted by large investors.

The institutional framework for large shareholder monitoring is described by Black (1992a) for the United States and by Black and Coffee (1994) for the United Kingdom. Also, Coffee (1991), Gordon (1991), and Grundfest (1993) elaborate on different aspects of institutional shareholders' scope for governance activities from a law and economics perspective; however, these papers do not develop an analytical framework to support their claims.

## II. The Model

Assume that the economy has only one firm with assets in place that have payoff  $\tilde{v}$  at the end of the period. It is common knowledge that the assets are worth  $L$  in their current use but that the payoff would be higher if the firm were restructured. In this case the payoff would be  $H$ , where  $L < H$ . The incumbent management is assumed to be unwilling to effect these changes. However, a large outside shareholder with sufficient voting power could force the management to restructure the assets and generate a payoff of  $H$ . Alternatively, assume that the management is unable to generate higher returns and that the large shareholder has sufficient power to replace management. The number of shares in this firm is normalized to 1 and held by a continuum of households. All households have the same shareholdings, and the total measure of households is 1. There is one large investor or large shareholder  $F$  that is distinguished from households in two respects:

- $F$  is not subject to liquidity shocks, and
- $F$  can monitor and improve the management of the firm; this affects the value of the firm such that  $\tilde{v} = H$ , and  $F$  incurs monitoring costs  $c_M$  where  $c_M < H - L$ .

Monitoring can include diverse activities, ranging from voting against takeover defenses to commissioning independent consulting reports.<sup>7</sup> Institutional investors in the United States targeted takeover-related issues in the

<sup>7</sup> See Nesbitt (1994) for a survey of the intervention used by CalPERS and Black (1992a) for a general survey of monitoring activities and the institutional and legal framework.

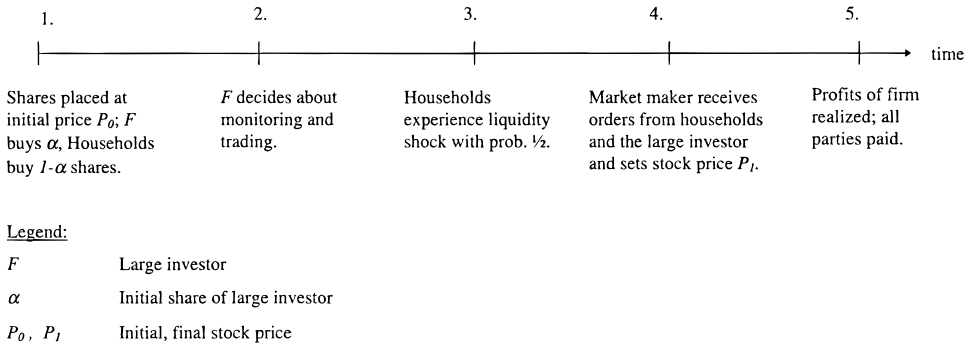


Figure 1. Extensive form of the game.

1980s and then changed their strategies to focus more on performance and governance-related issues (e.g., confidential voting).<sup>8</sup>

Both households and the large investor can also invest in a risk-free asset. The return on the risk-free asset is zero. All investors are risk neutral. Households suffer liquidity shocks that force them to sell their assets, and these shocks are correlated across households. In particular, there is a total probability of  $1/2$  that  $\phi$  households,  $0 < \phi < 1$ , are subject to such a shock and sell their total holdings of shares and the risk-free asset. Hence:

- with probability  $1/2$ ,  $0$  households sell their shares;
- with probability  $1/2$ ,  $\phi$  households sell their shares.

Note this implies that the ex ante probability for any household to suffer a liquidity shock is  $\phi/2$ . The structure of the market is like Kyle (1985).<sup>9</sup> Households and  $F$  submit their orders to a market maker who can observe the total net order flow  $y$ . The price of the security is then set by the market maker according to its expected value, conditional on the order flow:  $P_1 = E(\tilde{v}|y)$ .

Initially, all shares are owned by households. Then  $F$  trades with households by exchanging shares in the company against the risk-free asset. This trade takes place at a price  $P_0$ , and after this trade  $F$  owns a stock  $\alpha$  and households own the remaining  $1 - \alpha$  shares. The timing of events is given in Figure 1.

### III. Analysis

The analysis proceeds by solving the model backward, using subgame perfection as a solution concept. Initially,  $F$ 's shareholdings are taken exogenously in order to solve the subgame starting with a given allocation of

<sup>8</sup> See, e.g., Gillan and Starks (1995), Nesbitt (1994), and Wahal (1996).

<sup>9</sup> The discrete version of the model has been used by Dow and Gorton (1994) and Bernhardt et al. (1995). Since a binary Kyle-model and a Glosten–Milgrom (1985) type model are similar (see Krishnan 1992), this modeling choice has no substantial consequences for the analysis.

shares (stages 2–5 in Figure 1). Later, the equilibrium size of  $F$ 's investment is derived endogenously.

#### *A. The Liquidity Effect and the Lock-In Effect*

The portfolio allocation at the initial stage 1 is taken as given. Suppose that  $\alpha$  shares are owned by  $F$  and  $1 - \alpha$  shares are owned by households. If all households were subject to a liquidity shock, they would be trading  $1 - \alpha$  shares. Hence, if  $\phi$  households are subject to a liquidity shock, they sell a total of  $\phi(1 - \alpha)$  shares to the market maker (this happens with probability  $1/2$ ). Households hold their wealth partly in the form of shares and partly in the form of a risk-free asset. A household subject to a liquidity shock sells all assets—that is, all shares *and* all holdings of the risk-free asset. Obviously, the more shares that are held by  $F$ , the smaller the aggregate sales by households and the less liquid the market in shares. In the extreme case where  $F$  holds all shares in the company, the market would be completely illiquid. This has an impact on the decision of the large shareholder between buying/improving and selling. Without loss of generality assume that  $F$  plays a mixed strategy as follows:

With probability  $q$ : Buy shares in the firm, intervene, and improve management. In this case  $F$  buys a quantity  $x_B > 0$ .

With probability  $1 - q$ : Sell and do not intervene in the management of the firm. In this case  $F$  buys a quantity  $x_S < 0$ .

It can be easily shown that all other strategies (e.g., “buy without monitoring” or “sell and monitor”) are strictly dominated (see a detailed discussion below equation (5)). Assume that  $F$  can only be effective if she controls a sufficient amount of shares  $\mu$ .<sup>10</sup> In this case,  $\mu$  depends on a number of factors and does not need to be 0.5. It can be larger if the restructuring decision (e.g., asset sales) requires more than a majority of the votes. However,  $\mu$  can also be smaller, because  $F$  may be able to depend on other voters like smaller blockholders.<sup>11</sup> Hence,  $F$  can only monitor if  $\alpha + x_B \geq \mu$  for some  $\mu \in [0, 1]$ . There are no short sales constraints, hence it is not required that  $x_S + \alpha \geq 0$ . In order to be able to gain from trading,  $F$  must confound the information contained in the order flow with the liquidity trading from households. This requires that the market maker cannot distinguish between the case where  $F$  buys and households sell, and the case where  $F$  sells and households are not subject to a liquidity shock. This gives the following condition:

$$x_S + 0 = x_B - \phi(1 - \alpha) \Leftrightarrow x_B - x_S = \phi(1 - \alpha). \quad (1)$$

<sup>10</sup> See Dewatripont (1993) for a similar assumption.

<sup>11</sup> See Zwiebel (1995) for a detailed analysis of cooperation among blocktraders of different sizes and noise traders.

Therefore, once  $F$  has chosen how much she wants to buy if she monitors ( $x_B$ ),  $x_S$  is given by equation (1). Note that (1) also assumes that  $F$  trades anonymously as well as before the market discovers her decision to monitor or not to monitor. Hence, any disclosure requirement that forces  $F$  to publicize her trades *prior to* trading would effectively limit market liquidity and the quantities she can trade. However, anonymity of trading does not require that  $F$  conceals her monitoring activities *subsequent to* trading. Similarly, requirements to file trades with regulatory authorities *after* completing a transaction do not affect  $F$ 's trading strategy.

Assume for simplicity that  $F$  chooses symmetric trading quantities  $x_B = -x_S = \phi(1 - \alpha)/2$ . This assumption does not affect the results because  $F$  has two variables that determine her trading intensity: the amount she trades  $x_B$  (or  $x_S$ ) and the randomizing probability  $q$ .<sup>12</sup> These two variables are constrained by only one equation, namely the indifference condition for randomization. Hence, one variable can be arbitrarily chosen.<sup>13</sup> For notational convenience, define  $u \equiv \phi(1 - \alpha)/2$ . Table I gives the possible combinations of transactions and their probabilities as well as the prices set by the market maker.

Hence, the order flow has three possible realizations:  $-3u$ ,  $-u$ , and  $u$ . If the order flow is either  $-3u$  or  $u$ , then the market maker can infer the value of profits perfectly, and the stock price is fully revealing. If the order flow is  $-u$ , no information is revealed to the market maker, and the price is uninformative. Denote by  $E(P|S)$  the expected price per share at which  $F$  sells and by  $E(P|B)$  the expected price per share at which she buys. If  $F$  buys, the order will be executed at the prices  $P_1 = H$  and  $P_1 = qH + (1 - q)L$  with equal probability; whereas if  $F$  sells, the prices are  $L$  and  $qH + (1 - q)L$  with equal probability, hence,

$$E(P|B) = \frac{H}{2} + \frac{qH + (1 - q)L}{2} \quad E(P|S) = \frac{L}{2} + \frac{qH + (1 - q)L}{2}. \quad (2)$$

These expressions can now be used to calculate the expected payoff from buying and monitoring as

$$u[H - E(P|B)] + \alpha H - c_M = \frac{\phi(1 - \alpha)}{2} \frac{1 - q}{2} (H - L) + \alpha H - c_M. \quad (3)$$

The total payoff consists of the gains from trade, monitoring costs, and the return to the initial portfolio holdings  $\alpha$ . The first expression is simply the quantity traded multiplied by the expected gains per share bought or sold.

<sup>12</sup> Appendix A analyzes the general asymmetric case and shows that the results below are robust with respect to this assumption.

<sup>13</sup> The advantage of this choice is that the model behaves more closely to the equivalent Glosten–Milgrom (1985) model (see Krishnan (1992)). Effectively, this degree of freedom is a result of the discrete state space used here.

**Table I**  
**Order Flows and Market Prices**

The table gives all possible realizations of the aggregate order flow in the first column. The same order flow can result from different combinations of transactions by households (*HH*) and the large shareholder (*F*) (column 2).  $\phi$  is the liquidity parameter (size of households' aggregate liquidity shock),  $\alpha$  is the initial stake of the large investor,  $q$  is the probability of monitoring by the large investor,  $L$  is firm value if the large investor does not monitor,  $H$  is firm value if the large investor monitors, and  $u = \phi(1 - \alpha)/2$  is one transaction unit. The second to last column gives the intrinsic value depending on the intervention of the large shareholder. The last column shows the price set by the market maker, who can only observe the aggregate order flow.

Order Flow	Transactions	Probability	Value	Price
$u$	<i>F</i> buys $u$ <i>HH</i> sell 0	$q/2$	$H$	$H$
$-u$	(i) <i>F</i> buys $u$ <i>HH</i> sell $2u$	(i) $q/2$	$H$	$qH + (1 - q)L$
$-u$	(ii) <i>F</i> sells $u$ <i>HH</i> sell 0	(ii) $(1 - q)/2$	$L$	$qH + (1 - q)L$
$-3u$	<i>F</i> sells $u$ <i>HH</i> sell $2u$	$(1 - q)/2$	$L$	$L$

Similarly, the expected payoff from selling can be calculated as

$$-u[L - E(P|S)] + \alpha L = \frac{\phi(1 - \alpha)}{2} \frac{q}{2} (H - L) + \alpha L. \quad (4)$$

Then, in equilibrium, the randomizing probability  $q$  must equal the market maker's beliefs about the distribution of  $\tilde{v} \in \{L, H\}$ . The market maker must set prices so as to make *F* indifferent between selling and buying. Equating (3) and (4) gives

$$q = \frac{1}{2} - \frac{2(c_M - \alpha(H - L))}{\phi(1 - \alpha)(H - L)}. \quad (5)$$

If  $q$  were higher, the market maker would expect more buying orders and a higher probability of  $\tilde{v} = H$ . Hence,  $P_1$  would be set higher, and the profit from the strategy "sell and don't intervene" would exceed the profit from the alternative "buy and improve" strategy; that is, (3) would be strictly smaller than (4). Hence, selling would always be optimal. Conversely, if  $q$  were lower,  $P_1$  would be lower, and buying would always be optimal. The unique equilibrium has  $q$  as defined in (5). Equation (5) gives the randomizing probability  $q$ , provided the expression lies in the unit interval. If expression (5) exceeds one, then *F* monitors and buys  $u$  shares with certainty ( $q = 1$ ). If (5) is negative, then *F* never monitors ( $q = 0$ ). We can now verify that all strategies other than "sell and do not intervene" and "buy and improve" are never chosen in equilibrium. Note that in *any* equilibrium, *F* expects to trade at

prices that lie between the two payoffs,  $L$  and  $H$ . Because the strategy “buy and do not intervene” yields a profit of  $E(P|B) - H \leq 0$  per share and the strategy “sell and monitor” yields  $L - E(P|S) \leq 0$  per share, both expressions are never positive in any conceivable equilibrium. However, (3) and (4) above are strictly positive; hence, they strictly dominate all these alternatives.

Expected trading profits can be calculated directly by multiplying the profits from buying by  $q$  and the profits from selling by  $1 - q$ , and then adding. This gives

$$(1 - \alpha) \left[ \frac{\phi}{2} q(1 - q)(H - L) \right] \equiv (1 - \alpha)G, \quad (6)$$

where the expression in brackets defines  $G$  as the expected trading profits per share owned (and traded) by households, so that  $(1 - \alpha)G$  denotes the expected profits from trading. The expected *net* trading profits are therefore

$$(1 - \alpha)G - qc_M. \quad (7)$$

The expression for trading profits in (6) is closely related to the one derived in continuous state space versions of the market model. First,  $F$ 's profits are related to the depth of the market, that is, to the degree in which a trade moves the price. (Represent this relation as  $\lambda$  in parallel to Kyle (1985)).  $\lambda$  can best be defined by the difference between the price at which the large shareholder expects to sell and the price at which she expects to buy, relative to the spread between prices if they were fully revealing,  $(H - L)$ :

$$\lambda = \frac{E(P_1|B) - E(P_1|S)}{H - L} = \frac{1}{2}. \quad (8)$$

In an infinitely deep market  $E(P|B) = E(P|S)$  and  $\lambda = 0$ ; whereas if trades always move prices to the fully revealing level, then  $\lambda = 1$ . Hence, define depth as  $1 - \lambda$ , that is, as the probability that market prices are not fully revealing (here,  $\lambda = 1/2$ ), so that trading profits are proportional to the depth of the market. They are also proportional to the liquidity of the market measured by  $\phi(1 - \alpha)$ , a measure of uninformed trading: the larger the expected proportion of households that sell, the larger is the size of the transactions  $F$  can undertake. Finally,  $G$  is closely related to the variance of the final payoff, which is  $\text{Var}(\tilde{v}) = q(1 - q)(H - L)^2$ . If  $F$  does not randomize, then the payoff of the company is known with certainty and trading profits are zero. Hence,  $F$ 's trading profits can be written as

$$(1 - \alpha)G = \frac{\text{Var}(\tilde{v})}{H - L} * (1 - \lambda) * \phi(1 - \alpha). \quad (9)$$

Thus, profits are a product of liquidity and depth and are a measure of the dispersion of the firm's profits. Finally, in order to be effective when monitoring,  $F$  needs to own sufficiently many shares. After purchasing additional shares, her total must exceed  $\mu$ . The following proposition summarizes the results for this situation.

**PROPOSITION 1 (Equilibrium):** *Assume the large shareholder has an initial stake  $\alpha$ , and her total stake after purchasing  $u$  additional shares in the market is sufficient to exercise voting control ( $\alpha + u \geq \mu$ ). Then there is a unique equilibrium where the large shareholder monitors the firm with probability  $q$  ( $q$  is given by (5)). The probability of monitoring increases in  $F$ 's initial stake  $\alpha$  and decreases in the monitoring costs  $c_M$ .*

It is easy to see that there is a Bayesian equilibrium in pure strategies that is equivalent to this mixed-strategy equilibrium. In this case  $F$  is of different types distinguished by her monitoring costs  $\bar{c}_M$ , and these costs are her private information. Then  $F$  will monitor if and only if her costs are below a critical level  $\hat{c}$  and  $q = \text{Prob}(\bar{c} \leq \hat{c})$ .<sup>14</sup> Then the market maker and all other investors will perceive  $F$ 's strategy as random because they do not know her costs. These costs can then also be interpreted as  $F$ 's (unknown) ability to monitor.

The randomizing probability  $q$  can be viewed as an indicator of the welfare properties of the allocation, since an incremental increase in  $q$  by  $\Delta q$  yields a welfare increase of  $\Delta q(H - L - c_M) > 0$ . Equation (5) shows that  $q$  decreases if the costs of monitoring increase. This is very intuitive, as monitoring should become less attractive as its costs rise. The initial stake  $\alpha$  affects  $q$  in two ways.<sup>15</sup> First, the larger the initial stake  $\alpha$ , the more important to the gains from trade is the payoff on the portfolio holding  $\alpha$  and, hence, the more  $F$  is locked into the firm and committed to monitoring—this is the *lock-in effect*. Second, a higher  $\alpha$  reduces the liquidity of the market because a smaller amount of shares held by households implies that fewer shares are traded. For this reason, the factor  $1 - \alpha$  multiplies the liquidity parameter  $\phi$  in the denominator of (5)—this is the *liquidity effect*. However, the randomizing probability  $q$  increases in the liquidity of the market  $\phi$  if and only if

$$\alpha < \frac{c_M}{H - L}, \quad (10)$$

and it decreases in  $\phi$  whenever the reverse inequality holds. Equation (10) says that the portion of the benefits from monitoring that accrue to the large shareholder, equal to  $\alpha(H - L)$ , is *not* sufficient to cover the costs from monitoring  $c_M$ . The rationale for this result is that a more liquid stock mar-

<sup>14</sup> For a textbook exposition of the purification theorem, see Fudenberg and Tirole (1991), pp. 233 ff.

<sup>15</sup> The endogenous determination of  $\alpha$  is deferred to Section III.B below. The remainder of this section analyzes the comparative statics of the equilibrium in terms of a given  $\alpha$ .

ket makes it easier for  $F$  to sell and exit from this firm, but such a market also facilitates buying and therefore monitoring. Which of these two effects dominates depends on whether (10) is satisfied or not. Equation (10) is therefore critical for several results below. The increased ease of selling and avoiding the monitoring cost is the effect conventionally associated with the argument that more liquid markets make monitoring less likely.<sup>16</sup> However, a more liquid stock market also makes it easier to camouflage share purchases and therefore increases the benefits from monitoring. Equation (10) gives the criterion as to which of these two effects dominates. If  $\alpha(H - L) < c_M$ , then  $F$  would never monitor if she could not trade. The free-rider problem is severe, since she bears all the costs and receives only a fraction  $\alpha$  of the benefits from monitoring, which are too small to reimburse her for the costs incurred. However, a more liquid market gives her a second source of benefits from monitoring through higher trading gains, and the more liquid the stock market, the higher these trading gains and the greater the opportunity to benefit from monitoring. Hence, if  $\alpha(H - L) < c_M$ , a more liquid stock market helps to overcome the free-rider problem. Conversely, if  $\alpha(H - L) > c_M$ , then  $F$  already has a sufficient incentive to monitor on the basis of her portfolio holdings in the company, and she would always monitor if she could not trade. Then a more liquid stock market reduces the degree of lock-in and therefore  $F$ 's incentives to monitor. For brevity, we will refer to  $c_M/(H - L)$  as that stake where  $F$  recovers her costs, because at this stake the capital gain on her initial stake just equals her monitoring costs. However, note that because  $F$  can recover some costs through trading,  $\alpha < c_M/(H - L)$  does not imply that she makes negative expected profits.

**PROPOSITION 2 (Liquidity):** *The probability that the large shareholder monitors decreases in the liquidity of the market iff she can recover the costs of monitoring through a capital gain on her initial stake  $\alpha$ .*

Hence, the sign of the liquidity effect depends on whether  $\alpha$  is larger or smaller than the smallest stake that enables  $F$  to recover her monitoring costs. We therefore need to determine the initial stake  $\alpha$  held by  $F$  in equilibrium. This will be undertaken in Section III.B below.

If  $F$  owned a sufficiently large initial stake, she would internalize a large enough proportion of the gains from active monitoring to make this activity always worthwhile and the social optimum would be implemented:

**PROPOSITION 3 (Social Optimum):** *The social optimum is achieved only if the initial stake of the large shareholder exceeds a threshold  $\alpha^*$ . In this case  $F$  monitors with probability one and her trading gains are zero. The threshold  $\alpha^*$  strictly exceeds the value  $c_M/(H - L)$  where  $F$  recovers her costs, and the difference between  $\alpha^*$  and  $c_M/(H - L)$  is strictly increasing in the liquidity of the market  $\phi$ .*

<sup>16</sup> See, e.g., Bhidé (1993) for an exposition of this argument, and Bolton and von Thadden (1998) for a formalization.

This shows that even if the free-rider problem could be overcome in principle such that  $\alpha \geq c_M/(H - L)$ , there is still an incongruence remaining between  $F$ 's objectives and social welfare.  $F$  trades off gains from monitoring against gains from trading, whereas the only social gains are the gains from monitoring. If the large shareholder holds more than  $\alpha^*$  shares, her objective is perfectly aligned with maximizing social welfare. Therefore,  $\alpha^*$  is large enough for the benefits from monitoring to compensate  $F$ , not only for the costs of monitoring, but also for the foregone profits from selling overpriced shares. Thus,  $\alpha^*$  is significantly larger than the stake  $\alpha = c_M/(H - L)$  that is just sufficient to cover the monitoring costs. Moreover, the higher the liquidity of the market, the larger are  $F$ 's opportunity costs of not selling. Hence, the gap between  $\alpha^*$  and  $c_M/(H - L)$  increases in  $\phi$ .

For maximizing total welfare, it would be optimal to have  $F$  commit to hold  $\alpha \geq \alpha^*$ , to ensure that she always monitors. However, from Proposition 2, this implies that  $G = 0$ ; then, from Proposition 1, total profits are  $-c_M < 0$ ; that is,  $F$  would bear all the costs without any trading benefit. This follows because  $F$  benefits from the volatility of the end of period payoff because the trading gains  $G$  are proportional to the dispersion of final payoffs. If she always monitored, this volatility would be zero, and so would her trading profits. Hence,  $F$  can use the initial investment  $\alpha$  in order to increase the uncertainty she creates over final holdings and, thereby, to increase her trading gains. Before the trade-offs involved in this consideration are taken up below, note that the trading gains  $G$  are maximized if the randomizing probability  $q$  is equal to  $1/2$ . This leads to the following result which also follows immediately from Proposition 1 and equation (5):

**COROLLARY 1 (Cost Coverage):** *The randomizing probability  $q$  maximizes the uncertainty over final payoffs and the gains from trading  $G$  if and only if the capital gains from monitoring on the initial stake  $\alpha$  exactly cover the costs of monitoring, that is,  $\alpha(H - L) = c_M$ .*

Hence, the gains from trade depend crucially on  $\alpha$ . At the social optimum  $\alpha = \alpha^*$ ,  $F$ 's gains from trade are minimized because she is locked in, whereas at the smaller value  $\alpha = c_M/(H - L)$  the gains from trade  $G$  are maximized. The endogenous determination of  $\alpha$  is analyzed in the next section.

### *B. The Initial Stake of the Large Shareholder: The Commitment-Effect*

The important observation for determining  $\alpha$  endogenously is that  $F$  makes profits from two sources: First, from trading because of asymmetric information and, second, from the purchase of the initial stake at price  $P_0$  relative to the expected price for which  $F$  would liquidate her initial stake. The expected price per share  $F$  receives when liquidating her holding is the intrinsic ex ante value, namely  $qH + (1 - q)L$ . Households also receive this price per share if they do not have to liquidate their stock holdings in the intermediate period and hold them until the final period. This happens with probability  $1 - \phi/2$ . With probability  $\phi/2$ , a household has to sell its stake

when a proportion  $\phi$  of the other households liquidate their stakes. This household receives a price  $P_1$ , where  $P_1$  is the price established by the market maker (cf. Table I above):  $P_1 = L$  if  $F$  sells and  $P_1 = qH + (1 - q)L$  if she buys. It is only in the last case that households lose money because they sell at  $qH + (1 - q)L$  even though the shares are intrinsically worth  $H$ . Hence, households lose  $H - (qH + (1 - q)L)$  with probability  $q\phi/2$ . Because the initial share price is determined by the valuation of households,  $P_0$  is lower than  $qH + (1 - q)L$  for this reason:

$$\begin{aligned} P_0 &= qH + (1 - q)L - \frac{q\phi}{2} (qH - (qH + (1 - q)L)) \\ &= qH + (1 - q)L - G. \end{aligned} \tag{11}$$

The shares are trading at an adverse selection discount to their intrinsic value that is exactly equivalent to  $F$ 's trading gains per share. This is intuitive as the initial market in shares will only clear if the shares are fairly priced from the point of view of households who are the marginal investors. If households expected to make a loss on purchasing shares, they would not buy them, and the market would not clear at  $P_0$ . Conversely, if households expected to profit from buying shares, there would be excess demand for shares. Because  $F$  is not subject to liquidity shocks, she makes profits from two sources: from trading against uninformed traders and from purchasing shares at a discount to their intrinsic value.  $F$  buys  $\alpha$  shares at  $P_0$  and expects to liquidate them at  $H$  with probability  $q$ , and at  $L$  with probability  $1 - q$ . Then, total benefits from the initial purchase are

$$\alpha(qH + (1 - q)L - P_0) = \alpha G. \tag{12}$$

$F$  obtains the same profits per share from both sources: from informed trading and from the discount per share received at  $t = 0$ , when  $F$  buys the initial stake  $\alpha$ . The latter is equal to the expected loss (per share) that households suffer in equilibrium. Adding the trading gains from (7) to the profits on initial purchases from equation (12) gives

$$(1 - \alpha)G - qc_M + \alpha G = G - qc_M. \tag{13}$$

As a result of equation (13), the size of the initial stake  $\alpha$  enters  $F$ 's total profits only indirectly through determining  $q$  and hence  $G$ .  $F$  gains from active monitoring only through the uncertainty she creates over final payoffs (reflected in  $G$ ). Specifically, it is not by affecting the mean of the company's payoffs that she gains from her improvements, for these are always reflected in the share price—letting all other shareholders free ride on  $F$ 's activism. This leads to the following proposition, which gives the main result of this

section for the case where the voting constraint is not binding (where  $\mu$  is not too large).<sup>17</sup>

PROPOSITION 4 (Commitment-effect): *Assume the large shareholder chooses her initial stake  $\alpha$  so that she maximizes her payoff from this investment. Then she invests in a positive initial stake  $\hat{\alpha}$  that is strictly smaller than the stake  $c_M/(H - L)$  where she recovers her costs. Also, her equilibrium probability of monitoring the firm,  $\hat{q}$ , increases strictly in the liquidity of the stock market. The expressions for  $\hat{\alpha}$  and  $\hat{q}$  are:*

$$\hat{\alpha} = \frac{c_M}{2(H - L) - c_M} \quad \hat{q} = \frac{1}{2} - \frac{c_M}{\phi(H - L)}. \quad (14)$$

Two opposing effects drive the choice of the optimal size of the initial shareholding  $\alpha$ . A large investor has a comparatively larger incentive to monitor and therefore a larger expected monitoring cost from the lock-in effect. At the same time,  $F$  can use this effect to move closer to the randomizing probability  $q = 1/2$  which maximizes the gains from trade  $G$ . In the neighborhood of the size  $\alpha = c_M/(H - L)$ , where  $F$  maximizes the gains from trade (cf. Corollary 1 above), a small change in  $\alpha$ , and hence in  $q$ , has only a second-order effect on the gains from trade, but a first-order effect on expected costs. This reduces the equilibrium level of  $q$  to  $\hat{q}$ , below the value that maximizes trading gains. The optimal size of  $\alpha$  is therefore smaller than  $c_M/(H - L)$ .  $F$  chooses  $\alpha = \hat{\alpha}$  in order to commit to the profit-maximizing incentives to monitor so that  $q = \hat{q}$  in equilibrium. We call this the *commitment effect*.

The most important implication of Proposition 4 is that the direction of the liquidity effect can now be determined (cf. Proposition 2): social welfare and (ex ante) shareholder value *increase* in the liquidity of the stock market. This is an implication of the free-rider problem.  $F$  anticipates that investing larger stakes in a company commits her to costly monitoring in the future. At the margin, this commitment is more costly than giving up the benefit from fully exploiting the increased volatility of the stock price from more monitoring. Hence, she invests smaller stakes in the company, which leaves her sufficient freedom to sell and exit in the future. Proposition 2 above has shown that this implies that  $F$  will subsequently choose to monitor more frequently if the stock market is more liquid because she needs a source of profits to benefit from monitoring in addition to the capital gains on her own portfolio.<sup>18</sup> The equilibrium randomizing probability  $\hat{q}$  depends on the *ratio* between stock market liquidity  $\phi$  and monitoring costs: the relevant variable becomes the extent to which monitoring costs can be compensated through informed trading. Propositions 2 and 4 expose the weakness of the argument

<sup>17</sup> See Section III.C below for a separate discussion of the case where  $\mu$  violates the constraint stated in Proposition 4.

<sup>18</sup> See the discussion of the liquidity effect above in Section III.A.

that there is a trade-off between liquidity and control, requiring large shareholders to hold sufficiently large blocks so that reducing market liquidity would increase the lock-in effect. This argument assumes that the size of large blocks is exogenously given. Endogenizing it leads to the conclusion that large investors will always avoid the degree of lock-in implicitly assumed by claims for a liquidity–control trade-off.

The result in Proposition 4 is consistent with the observation that institutional investors typically hold much larger numbers of securities, and hence smaller stakes in companies, than required in order to benefit from diversification. The analysis of this section suggests that large block investors also limit the size of their stakes in order to maintain the liquidity of their investments.

### C. Monitoring and Voting Rights

Proposition 3 has imposed the condition that  $\hat{\alpha} + \phi(1 - \hat{\alpha}) \geq \mu$ , so  $F$ 's voting power is always sufficient to generate the higher payoff  $H$ . This section more closely analyzes the connection between initial holdings and voting power. A problem may arise if the charter of the firm requires a very high majority for the type of restructuring that needs to be undertaken. In this case, the majority rule may violate the constraint  $\hat{\alpha} + \phi(1 - \hat{\alpha}) \geq \mu$ , and  $F$  may have to invest in a suboptimally high initial stake, since she would otherwise be unable to monitor the firm. The majority requirement thus imposes a lower limit on  $\alpha$ : if the initial stake  $\alpha$  is smaller than some  $\underline{\alpha}$ , then the additional purchases in the market will not enable  $F$  to monitor. However,  $F$  will only monitor if she can assure herself a non-negative profit from doing so—that is, she will forgo the option of monitoring if  $G - qc_M$  is not positive for some feasible  $q$ , and hence for some  $\alpha$ . This imposes an *upper* limit on  $q$  (i.e., there will be no monitoring equilibrium where the equilibrium  $q$  exceeds a certain threshold level):

$$G - qc_M \geq 0 \Leftrightarrow q \leq 1 - \frac{2c_M}{\phi(H - L)}. \quad (15)$$

Because  $q$  increases in  $\alpha$ , this condition imposes an upper limit  $\bar{\alpha}$  on  $\alpha$ . The two conditions are consistent only if  $\underline{\alpha} \leq \bar{\alpha}$ , leading to the next proposition.

**PROPOSITION 5 (No Monitoring):** *If the majority  $\mu$  required for restructuring exceeds some threshold  $\bar{\mu}$ , then the conditions (A) that the large shareholder has to buy sufficiently many shares to obtain voting control ( $\alpha + x_B \geq \mu$ ) and (B) that investing in a positive initial stake  $\alpha > 0$  is ex ante profitable ( $G - qc_M \geq 0$ ) are mutually inconsistent. Then also, there is no equilibrium with monitoring; the upper limit for  $\mu, \bar{\mu}$ , is increasing in market liquidity  $\phi$ .*

Hence, if the majority requirement exceeds some threshold  $\bar{\mu}$ , then the required initial stake  $\alpha$  is so large that it commits  $F$  to a monitoring probability  $q$  where she cannot profit sufficiently from trading to cover her ex-

pected costs, and no monitoring equilibrium can exist. The more liquid the stock market, the higher are the trading gains and the higher is the cutoff point for this requirement. However, even if  $\mu \leq \bar{\mu}$ , a stringent supermajority requirement can change the previous results.

**PROPOSITION 6 (Majority Requirement):** *Assume the majority requirement of the firm is stringent such that  $\mu \geq \underline{\mu}$  for some threshold  $\underline{\mu}$ , but that this requirement does not exceed  $\bar{\mu}$  as defined in Proposition 5. Then an equilibrium with monitoring exists where  $F$  chooses an initial investment  $\alpha$  that exceeds the stake  $c_M/(H - L)$  where she recovers her costs. In this case the equilibrium probability of monitoring  $q$  decreases in market liquidity.*

If the majority requirement  $\mu$  lies in the interval defined in Proposition 6, then the requirement is binding, but lies below the threshold defined in Proposition 5 where monitoring becomes unprofitable. In this case  $F$  has to purchase a higher initial stake  $\alpha$  that commits her to a higher randomizing probability  $q$ . An increase in stock market liquidity would *reduce* the initial stake  $\alpha$  that  $F$  has to buy, since she could purchase more shares in the market later on. However, other things being equal, this reduces her inclination to monitor.

The monitoring technology used here simplifies the matter by assuming that monitoring succeeds in improving profits with an exogenous probability. The probability of succeeding in monitoring will, in many cases, be a function of the votes controlled by the large shareholder; however, although this way of modeling may be more realistic, it is unlikely to change the results of this section: what is significant is the relationship between effective monitoring and the size of  $F$ 's investment. This is captured with the parameterization chosen here. This and the previous subsections have analyzed the impact of  $F$ 's monitoring on the allocation and total welfare. The next subsection analyzes the problem from the point of view of shareholders.

#### *D. What is Optimal for Shareholders?*

The total initial wealth of all shareholders initially is given by  $P_0$ , the total value of their shares. If the firm is initially owned by households,  $P_0$  is the value of their investment. If the firm is initially owned by an entrepreneur who sells it in a public flotation,  $P_0$  is also the price the entrepreneur would realize. Hence, from the point of view of initial shareholders,  $P_0$  is the objective according to which they determine the majority requirement  $\mu$ . The following analysis takes the perspective of an organizational designer or founding shareholder, before time 0, who chooses the majority requirement  $\mu$ . Possibly, the founding shareholder can also influence market liquidity, through the choice of the stock exchange where the shares are listed. The term "initial shareholder" in this subsection refers to this founding shareholder who chooses these parameters before date 0. His interests will generally be different from those of the large blockholder or the households who acquire

shares later.<sup>19</sup> From Proposition 4 it is clear that social welfare increases in the liquidity of the market. However, this is not the case for initial shareholders, thus:

**PROPOSITION 7 (Shareholder Value):** *Initial shareholders' wealth is not monotonic in market liquidity. Shareholder value is maximized at a unique value for market liquidity  $\phi^*$  that is increasing in  $c_M/(H - L)$ .*

The important implication of Proposition 7 is that the shareholders' objective does not coincide with social welfare. Shareholders trade on two aspects of market liquidity. In a more liquid market, large shareholders will monitor more and, hence, increase the ex ante value of the company. However, market liquidity also increases the amount of informed trading and, hence, the adverse selection discount required by uninformed shareholders. This trade-off determines a unique degree of market liquidity, which increases with the relative costs of monitoring. Initial shareholders can affect the trading gains of large monitoring shareholders by requiring a more stringent majority requirement for outside shareholders to exercise voting control. The following result follows immediately from Proposition 5:

**COROLLARY 2:** *Initial shareholders' wealth is maximized if the corporate charter specifies a majority requirement that leaves large monitoring shareholders just indifferent between monitoring the firm and not taking any action. In this case  $\mu = \bar{\mu}$ .*

Hence, initial shareholders can extract the rent of the large monitoring shareholder by choosing a majority requirement that is (1) small enough to induce the large shareholder to acquire a block and monitor, but (2) large enough to reduce  $F$ 's trading down to a level that just permits her to recover her costs, that is,  $G = qc_M$ . One implication of Corollary 2 and Proposition 6 is that shareholders maximize their wealth by choosing more stringent majority requirements in more liquid markets. This follows because in more liquid markets the lock-in effect is weaker, and it is easier for  $F$  to recover her monitoring costs; hence, shareholders have to choose a more stringent majority rule in order to extract all of  $F$ 's rents from trading. It follows also that this higher majority requirement improves social welfare because it increases  $\alpha$  and therefore  $q$ . These implications apply only if  $\bar{\mu}$  does not exceed the maximum stake a large investor can take. In the United States, the high majority requirement would probably exclude mutual funds from governance activities.

#### IV. Monitoring and Takeovers

This section compares the two different forms by which a large outside investor can intervene and restructure a company: monitoring, where a large shareholder tries to influence the incumbent management, and hostile take-

<sup>19</sup> See DeMott (1996) for a legal analysis of the conflicts of interests that arise between different classes of shareholders if the large shareholder has the ability to monitor.

overs, where the large shareholder tries to replace the incumbent management. In order to place these two forms in the context of the current model, we make the following two assumptions (the subscript  $M$  refers to monitoring and the subscript  $T$  to takeovers).

ASSUMPTION 1: *Takeovers and monitoring have different probabilities of success in restructuring companies. Specifically, if  $F$  takes over the firm, she generates the higher return  $H$  with probability  $s_T$ ; if she monitors the firm, restructuring is successful with probability  $s_M$ . Assume  $0 \leq s_M, s_T \leq 1$ .*

ASSUMPTION 2: *Takeovers and monitoring have different costs,  $c_T$  and  $c_M$  respectively, that  $F$  incurs in order to effect restructuring. The costs are incurred even if restructuring is unsuccessful or the bid fails. Assume*

$$0 < c_j < s_j(H - L) \quad j = M, T, \quad (16)$$

*i.e., monitoring and takeovers are both ex ante beneficial.*

Lastly, define the cost advantage of these two methods of effecting restructuring by their costs relative to the success probabilities of restructuring:

CONDITION 1 (Cost Advantage): *Takeovers are said to enjoy a cost advantage over monitoring if costs and success probabilities satisfy*

$$\frac{s_T}{c_T} \geq \frac{s_M}{c_M}. \quad (17)$$

*Monitoring enjoys a cost advantage if the reverse inequality holds.*

Note that no restriction is placed on parameters except (16). It would generally be plausible to assume that  $s_T > s_M$ , since a takeover raider can always impose changes on a target, whereas voting campaigns by large shareholders are not always successful.<sup>20</sup> Also,  $c_T > c_M$  seems a more likely case than  $c_T < c_M$ , since preparing a bid involves higher costs than a public campaign. However, no formal assumption along these lines is required here.  $F$  can now choose between three different actions at stage 2 of the game (cf. Figure 1):

- (A) Sell and don't intervene;
- (B) Buy and monitor; or
- (C) Buy and attempt a takeover.

As in Section III.A, start by assuming that the initial stake  $\alpha$  is given. We proceed by assuming that  $F$  randomizes either between (A) and (B) with

<sup>20</sup> See Gordon and Pound (1993) for evidence on governance-related proposals. They demonstrate a large variation of voting outcomes.

probability  $q_M$  (called the “monitoring equilibrium”) or between (A) and (C) with probability  $q_T$  (called the “takeover equilibrium”). This assumption leads to Proposition 8 below. We then show that the assumption of Proposition 8 is always valid and we derive conditions where the takeover equilibrium is preferred to the monitoring equilibrium (Proposition 9). Including the success probabilities above the market maker’s pricing rule can now be written as follows (remember that  $u \equiv \phi(1 - \alpha)/2$ ):

$$\begin{aligned} P(-3u) &= L \\ P(-u) &= q_j s_j H + (1 - q_j s_j)L \\ P(u) &= s_j H + (1 - s_j)L \end{aligned} \quad j = M, T. \quad (18)$$

Thus,  $F$ ’s payoff from buying and selling, calculating as in equations (2)–(4) above, is

$$\begin{aligned} \text{Buy:} & \quad \frac{\phi(1 - \alpha)}{2} \frac{q_j s_j (H - L)}{2} \\ \text{Sell:} & \quad \frac{\phi(1 - \alpha)}{2} \frac{(1 - q_j) s_j (H - L)}{2} \end{aligned} \quad j = M, T. \quad (19)$$

This gives total trading profits as follows:

$$\frac{\phi(1 - \alpha)}{2} q_j (1 - q_j) s_j (H - L) \quad j = M, T. \quad (20)$$

Accordingly, the result corresponding to Proposition 1 and Proposition 4 can be stated as follows:

**PROPOSITION 8 (Equilibrium with Takeovers):** *Assume that the large shareholder can choose between a takeover equilibrium (where she randomizes between selling and taking over) and a monitoring equilibrium (where she randomizes between selling and monitoring). Then she buys  $\alpha$  shares of the firm initially, and her probability of intervention is*

$$q_j = \frac{1}{2} - \frac{c_j}{\phi s_j (H - L)} \quad j = M, T, \quad (21)$$

*depending on her choice of takeover or monitoring.*

The proposition assumes that  $F$  makes an ex ante decision about whether to restructure by takeover or by monitoring *if* she decides to restructure, and that she subsequently randomizes between selling and buying/restructuring.

This assumes that all other possible strategies (e.g., sell and take over) are dominated and never chosen in equilibrium. This is almost always true.

PROPOSITION 9 (Takeover vs. Monitoring): *F randomizes either between selling and taking over or between selling and monitoring. Independent of the pricing rule of the market maker, F prefers takeovers to monitoring if and only if*

$$c_T - c_M \leq \left[ \frac{\phi(1 - \alpha)}{2} + \alpha \right] [(s_T - s_M)(H - L)]. \quad (22)$$

*Except for those parameters for which the condition holds as an equality, F never randomizes between taking over and monitoring.*

From Proposition 9 it is legitimate to compare a “takeover equilibrium,” where *F* randomizes between selling and taking over, and a “monitoring equilibrium,” where she randomizes between monitoring and selling. Proposition 9 validates the assumption of Proposition 8. The first term in brackets in (22) is the stake *F* holds *after* purchasing additional shares in the market, and the second expression in brackets represents the additional capital gain per share through taking over relative to monitoring. Hence, the right-hand side of the equation represents the portion of the incremental capital gain from taking over after additional purchases in the market. The left-hand side of the inequality represents the additional costs of taking over. Hence, the condition simply requires that the relevant comparison of the costs and benefits of takeover versus monitoring refers to the *post*-purchase stake. This finding is different from the analysis in Section III (cf. equation (10)), where the relevant condition was always expressed in terms of the shares *F* holds before any additional purchases in the market.

In order to determine which equilibrium *F* prefers *ex ante*, we have to calculate the net benefits of these two equilibria. From Proposition 3 above, we need to calculate  $G - qc$ , where  $q$  is given by equation (21), and then to calculate whether it is higher for monitoring or for takeovers. This leads to

LEMMA 2: *F prefers the takeover to the monitoring equilibrium if and only if*

$$\frac{s_M}{s_T} \geq \left( \frac{\phi s_M(H - L) - 2c_M}{\phi s_T(H - L) - 2c_T} \right)^2. \quad (23)$$

Lemma 2 gives an implicit condition for the ranking of monitoring and takeover equilibria from *F*'s point of view. Lemma 2 can now be used together with Proposition 8 to establish the main result of this section.

PROPOSITION 10 (Comparative Statics): *If takeovers enjoy a relative cost advantage over monitoring such that Condition 1 (equation (17)) holds, then*

- (i) *The optimally chosen randomizing probability in the takeover equilibrium is higher:  $\hat{q}_T > \hat{q}_M$ ;*
- (ii) *A higher liquidity of the stock market  $\phi$  makes it less likely that  $F$  prefers the takeover equilibrium over the monitoring equilibrium;*
- (iii) *Shareholder wealth is maximized for a value  $\phi^*$  of market liquidity, which is lower in the takeover equilibrium than in the monitoring equilibrium.*

The first two results follow directly from the discussion in Section III. The choice of the randomizing probability  $q$  to which  $F$  commits in equilibrium depends on the trade-off between maximal uncertainty over the firm's pay-offs (to increase trading profits) and the costs of monitoring she has to incur. From equation (21) above, we can see that trading profits and uncertainty are directly proportional to the success probability of monitoring  $s_j$ . However, a higher success rate is bought by higher costs, and it is only if one element outweighs the other that  $q$  increases.

Market liquidity affects the trade-off between takeover and monitoring because it determines to what extent the associated costs can be passed on to uninformed investors. In an illiquid market, cost advantages of one restructuring method over another are therefore important, as only a small portion of the costs can be recovered through informed trading. However, in a more liquid market the benefit of this cost advantage is eroded. If takeovers enjoy a cost advantage over monitoring in the sense of Condition 1 (see equation (17)), then this advantage will be worth more in an illiquid than in a liquid market. Hence, other things being equal, if  $F$  prefers takeovers to monitoring in an illiquid market because of their relative cost advantage, she may likewise prefer monitoring in a more liquid market where this advantage is less important and the surplus generated by each method, measured by  $s_j(H - L) - c_j$ , becomes more relevant. As a corollary of Proposition 7, the optimal liquidity from the point of view of shareholders is now lower, since the trade-off between more interventions (inversely related to costs) and higher losses from adverse selection is biased toward lower costs, if takeovers enjoy a cost advantage.

## V. Empirical Issues

One focus of recent empirical research is the question whether shareholder activism leads, on average, to better performance of the companies, as well as of the portfolios of activist shareholders. So far, no clear conclusion to this question has been reached. Whereas Nesbitt (1994) and Smith (1996) find that CalPERS was successful in its performance targeting after 1990, other studies on a larger sample of pension funds are more skeptical. Gillan and Starks (1995) find that there is a significant wealth gain from institutional monitoring in the short term that is not sustained in the long term. Similarly, Wahal (1996) finds that performance-based targeting leads to sig-

nificant wealth effects, but he did not find evidence for long-term improvements. Unfortunately, none of the empirical studies relates the wealth effects to the effectiveness of institutions for changing voting outcomes. The results of Gordon and Pound (1993) suggest that a significant proportion of shareholder proposals fail, so that a potential problem may be for shareholders to influence voting outcomes and coordinate with other shareholders. Leleux, Vermaelen, and Banerjee (1995) analyze the impact of large blockholders on firm performance in France and find that the identity of the blockholder is crucial: whereas holding companies' acquisitions of large stakes do not generate significant abnormal returns, other acquirers are able to create significant shareholder wealth.<sup>21</sup> Brickley, Lease, and Smith's (1988) study of anti-takeover amendments finds that independent institutions are actually *more* likely to oppose charter amendments. These findings show that the characteristics of the large shareholders, whether they are private individuals or institutions, and their organizational structure are potentially important aspects for the success of monitoring activities.

## VI. Conclusion

This paper has studied a model of intervention by large investors who follow two investment objectives: (i) monitoring a company in order to benefit from the capital gain on their shares, and (ii) trading on private information in public markets. The main results are:

- Expected improvements in the profits of the monitored firm are always incorporated in the share price. This result is a manifestation of the free-rider problem for all gains are shared with non-monitoring shareholders. The only source of profits from monitoring for the large investor comes from the uncertainty she creates over final payoffs. She benefits from increasing volatility, not from increasing the mean of the company's returns.
- The large shareholder realizes a capital gain from monitoring, but she limits her initial stake in the company so that the capital gain on this stake is always insufficient to cover her monitoring costs.
- If stock markets are less liquid, large shareholders will engage in less monitoring. In order to avoid the commitment to monitor, they will hold more diversified portfolios; that is, they will have smaller stakes in more companies.
- A more liquid stock market leads to more monitoring because it allows the investor to cover monitoring costs through informed trading.
- The founders of the company can affect the likelihood of future monitoring by large shareholders through *increasing* majority requirements,

<sup>21</sup> Majumdar and Nagarajan (1994) analyze asset-allocation decisions and refute the notion that institutional investors are myopic.

provided the required stake needed by the large shareholder does not exceed a certain threshold. This requirement extracts rents from potential monitors, providing that large shareholders are allowed to hold a sufficient number of shares.

- When the large investor can choose between takeovers and monitoring as different forms of intervention in underperforming companies, then she will prefer the less costly method if the stock market is illiquid and the more effective method if the stock market is liquid.

Summarizing, it follows that a liquid stock market improves the likelihood of successful corporate restructuring in two ways:

- (i) Liquid stock markets allow large investors to benefit from monitoring through informed trading and help to overcome the free-rider problem.
- (ii) The more liquid the market, the more likely that a restructuring method will be preferred for its effectiveness rather than for its low costs.

This paper therefore concludes that liquid stock markets, far from being a hindrance to corporate control, tend to support effective corporate governance. The analysis has also shown that the large shareholder will generally extract a rent from the possibility to monitor the firm. Shareholders can reduce or even eliminate this rent if they require higher majorities in voting contests, forcing the large shareholder to invest in larger stakes, which are then less liquid. This is a more efficient way of locking the large shareholder into her stake than reducing the liquidity of the market. Reduced liquidity aggravates the free-rider problem, but it does not eliminate the rents of the large shareholder. However, a larger majority requirement induces the large shareholder to increase her initial holding, and this reduces her rents and increases her inclination to monitor.

One limitation of the model here is that it focuses on the decision-making of one large investor. The paper cannot therefore analyze how several different initial shareholders free ride on each other's monitoring activities. In most cases, large shareholders cooperate in order to influence the management of a company. Analyzing the incentives of large shareholders to cooperate would be important, not the least in order to inform the views of regulators who set the rules for large shareholders to coordinate their actions, generally at the exclusion of smaller shareholders. A second aspect that has been set aside in this paper concerns the company's internal organization and the incentives of the large shareholders themselves. The empirical literature (see Section V above) suggests that there are important differences between individuals and institutions. This is most probably because large institutions are themselves subject to conflicts of interests between the owners or beneficiaries and the managers who exercise control. These issues are beyond the scope of this paper and left for future research.

### Appendix A

This appendix discusses the possibility of  $F$  choosing the amounts bought and sold asymmetrically, i.e., arbitrary  $x_B$  and  $x_S = \phi(1 - \alpha)$  (cf. equation (1)).

Order Flow	Transactions	Probability	Price
$x_B$	$F$ buys $x_B$ $HH$ sell 0	$q/2$	$H$
$x_B - (1 - \alpha)\phi$	(i) $F$ buys $x_B$ $HH$ sell $(1 - \alpha)\phi$ (ii) $F$ buys $x_S = x_B - (1 - \alpha)\phi$ $HH$ sell 0	(i) $q/2$ (ii) $(1 - q)/2$	$qH + (1 - q)L$
$x_B - 2(1 - \alpha)\phi$	$F$ buys $x_B - (1 - \alpha)\phi$ $HH$ sell $(1 - \alpha)\phi$	$(1 - q)/2$	$L$

Then the expected payoff from buying and monitoring is

$$x_B[H - E(P_1|B)] - c_M + \alpha H = x_B \left( \frac{1 - q}{2} \right) (H - L) - c_M + \alpha H. \quad (\text{A1})$$

The expected payoff from selling is calculated analogously as

$$x_S \left[ L - \frac{L + qH + (1 - q)L}{2} \right] + \alpha L = ((1 - \alpha)\phi - x_B) \frac{q}{2} (H - L) + \alpha L. \quad (\text{A2})$$

Then expected trading profits can be calculated as

$$\begin{aligned} & qx_B \frac{1 - q}{2} (H - L) + (1 - q)((1 - \alpha)\phi - x_B) \frac{q}{2} (H - L) \\ &= (1 - \alpha)\phi \frac{q(1 - q)}{2} (H - L) \equiv (1 - \alpha)G, \end{aligned} \quad (\text{A3})$$

where  $G$  is defined as in (6). Note that this expression is equivalent to the expression (6) obtained in Section III.A, so that the restriction on  $x_B$  does not change the result on trading gains. Also, because the adverse selection discount on the share is equal to the trading gains per share, the total payoff is still given by (14). Now  $q$  has to satisfy the indifference condition:

$$\begin{aligned} x_B \frac{1 - q}{2} (H - L) + \alpha H - c_M &= ((1 - \alpha)\phi - x_B) \frac{q}{2} (H - L) + \alpha L \\ \frac{x_B}{2} (H - L) + \alpha(H - L) - c_M &= \phi(1 - \alpha) \frac{q}{2} (H - L) \\ \Leftrightarrow q &= \frac{\alpha(H - L) - c_M}{\phi(1 - \alpha)(H - L)/2} + \frac{x_B}{\phi(1 - \alpha)}. \end{aligned} \quad (\text{A4})$$

Because the payoff is still equal to  $G - qc_M$ , the optimal value for  $q$  is given by (17). Then, for any given  $x_B$ , the equilibrium value of the initial stake  $\alpha$  is

$$\alpha = \frac{\frac{2c_M}{H-L} - x_B + \phi}{\phi + 4 - \frac{2c_M}{H-L}}. \quad (\text{A5})$$

As a result, the optimal value of  $q$  chosen by  $F$  can be implemented with a continuum of combinations of  $\alpha$  and  $x_B$ , so that any combination which satisfies (A5) is optimal. The voting constraint is now as follows:

$$\hat{\alpha} + x_B \geq \mu. \quad (\text{A6})$$

Proceeding analogously to Proposition 4, we require that  $G - qc_M \geq 0$ , which is equivalent to

$$q \leq 1 - \frac{c_M}{\phi(H-L)/2}. \quad (\text{A7})$$

Inserting  $q$  from (A4) and rearranging gives the following:

$$\alpha \leq \frac{\phi - x_B}{\phi + 2 - \frac{2c_M}{H-L}} \equiv \bar{\alpha} \Rightarrow \alpha + x_B \leq \frac{\phi + x_B \left( \phi + 1 - \frac{2c_M}{H-L} \right)}{\phi + 2 - \frac{2c_M}{H-L}}. \quad (\text{A8})$$

Now  $\bar{\alpha}$  is a function of  $x_B$ , so the expression  $\alpha + x_B$  needs to be evaluated as a sum rather than by individual components. Observe that  $0 \leq x_B \leq \phi(1 - \alpha)$ . The highest majority requirement  $\mu$  that is consistent with non-negative profits for  $F$  is the highest value that the right-hand side of (A8) can attain while still satisfying (A7) with  $q$  determined by (A4). The right-hand side of (A8) is maximized either at  $x_B = 0$  or at  $x_B = \phi(1 - \alpha)$ , depending on whether (A8) is increasing or decreasing in  $x_B$ . If  $x_B = 0$ , the highest value for  $x_B + \alpha$  is simply  $\alpha$ , and the highest value for  $\alpha$  consistent with (A7) is determined from (A8); hence,

$$\bar{\mu} = \frac{\phi}{\phi + 2 - \frac{2c_M}{H-L}}. \quad (\text{A9})$$

If the right-hand side of (A8) is increasing in  $x_B$ , it is maximized at  $\alpha = 0$  and  $x_B = \phi$ ; hence,  $\bar{\mu} = \phi$ . Therefore,

$$\bar{\mu} = \text{Max} \left[ \frac{\phi}{\phi + 2 - \frac{2c_M}{H-L}}, \phi \right], \quad (\text{A10})$$

which is slightly larger than the expression for the symmetric case (19), but qualitatively equivalent.

### Appendix B

*Proof of Proposition 3:* Because  $H - L > c_M$ , the social optimum is achieved whenever  $q = 1$ . From (9) this requires that:

$$\frac{1}{2} + \frac{2(\alpha(H-L) - c_M)}{\phi(1-\alpha)(H-L)} \Leftrightarrow \alpha \geq \alpha^*, \quad (\text{B1})$$

where

$$\alpha^* \equiv \frac{\frac{c_M}{H-L} + \frac{\phi}{4}}{1 + \frac{\phi}{4}}. \quad (\text{B2})$$

Q.E.D.

*Proof of Proposition 4:*  $F$  chooses  $\alpha$  to pick the randomizing probability  $q$  that maximizes

$$\frac{\phi}{2} q(1-q)(H-L) - qc_M, \quad (\text{B3})$$

which gives immediately  $\hat{q}$ . Then from (9) and (17)  $\alpha$  needs to satisfy

$$\frac{1}{2} - \frac{2(c_M - \alpha(H-L))}{\phi(1-\alpha)(H-L)} = \frac{1}{2} - \frac{c_M}{\phi(H-L)} \Leftrightarrow \alpha = \hat{\alpha}, \quad (\text{B4})$$

with  $\hat{\alpha}$  given in (14). Q.E.D.

*Proof of Proposition 5:* Equation (15) before the proposition follows from

$$\begin{aligned}
 G - qc_M &\geq 0 \\
 \Leftrightarrow \frac{\phi}{2} q(1-q)(H-L) &\geq qc_M \\
 \Leftrightarrow 1-q &\geq \frac{c_M}{\phi(H-L)/2} \\
 \Leftrightarrow q &\leq 1 - \frac{2c_M}{\phi(H-L)}. \tag{B5}
 \end{aligned}$$

From (6), the last condition is equivalent to

$$\alpha \leq \frac{\phi}{\phi + \frac{4(H-L-c_M)}{H-L}} \equiv \bar{\alpha}. \tag{B6}$$

Hence,  $G - qc_M \geq 0$  requires  $\alpha \leq \bar{\alpha}$ . Conversely,  $\alpha + x_B \geq \mu$  requires

$$\alpha + \frac{\phi}{2}(1-\alpha) = \frac{\phi}{2} + \alpha\left(1 - \frac{\phi}{2}\right) \geq \mu \Leftrightarrow \alpha \geq \frac{\mu - \phi/2}{1 - \phi/2} \equiv \underline{\alpha}. \tag{B7}$$

Both conditions are consistent only if  $\underline{\alpha} \leq \bar{\alpha}$ , i.e., if  $\mu$  satisfies

$$\mu \leq \frac{\phi}{2} + \bar{\alpha}\left(1 - \frac{\phi}{2}\right) = \frac{\phi}{2} + \frac{\phi\left(1 - \frac{\phi}{2}\right)}{\phi + \frac{4(H-L-c_M)}{H-L}} \equiv \bar{\mu}. \tag{B8}$$

Because

$$\frac{\partial \bar{\mu}}{\partial \phi} = \frac{1}{2}(1-\bar{\alpha}) + \left(1 - \frac{\phi}{2}\right) \frac{\partial \bar{\alpha}}{\partial \phi} > 0 \tag{B9}$$

and  $\partial \bar{\alpha} / \partial \phi > 0$ ,  $\bar{\mu}$  is increasing in  $\phi$ . Q.E.D.

*Proof of Proposition 6:* From Proposition 2 and equation (10), the sign of the liquidity effect is reversed if  $\alpha > (c_M/(H-L))$ . However,  $\alpha \geq \underline{\alpha} \Rightarrow \alpha > c_M/(H-L)$  if and only if

$$\frac{\mu - \phi/2}{1 - \phi/2} > \frac{c_M}{H-L}, \tag{B10}$$

which is equivalent to

$$\mu \geq \phi + (1 - \phi) \frac{c_M}{H - L} \equiv \underline{\mu}. \quad (\text{B11})$$

Q.E.D.

*Proof of Proposition 7:* Substituting (11) into (14) gives

$$P_0 = \frac{H + L}{2} - \frac{c_M}{\phi} - \frac{\phi(H - L)}{8} + \frac{c_M^2}{2\phi(H - L)}. \quad (\text{B12})$$

This function is concave in  $\phi$ , and the unique value for  $\phi$  where  $P_0$  is maximized is given by

$$\phi^{*2} = \frac{4c_M}{H - L} \left( 2 - \frac{c_M}{H - L} \right). \quad (\text{B13})$$

Q.E.D.

*Proof of Proposition 9:* The pricing rule of the market maker can be written as

$$\begin{aligned} P(u) &= s_j H + (1 - s_j)L \\ P(-u) &= q_j s_j H + (1 - q_j s_j)L \\ P(-3u) &= L. \end{aligned} \quad (\text{B14})$$

$F$  has six pure strategies from all combinations of possible restructuring actions she can take (monitoring, takeover, or no intervention) combined with either buying or selling. It is sufficient to show that (i) any method of restructuring (monitoring or takeover) combined with buying dominates restructuring with selling; (ii) no intervention combined with selling dominates no intervention combined with buying; and (iii) if the market anticipates that  $F$  will take over subsequent to buying, she has no incentive to deviate to monitoring (and vice versa). Statement (i) requires that

$$\begin{aligned} & \frac{\phi(1 - \alpha)}{2} \left( s_j H + (1 - s_j)L - \frac{P(u) + P(-u)}{2} \right) + \alpha(s_j H + (1 - s_j)L) - c_j \\ & \geq -\frac{\phi(1 - \alpha)}{2} \left( s_j H + (1 - s_j)L - \frac{P(u) + P(-u)}{2} \right) \\ & \quad + \alpha(s_j H + (1 - s_j)L) - c_j. \end{aligned} \quad (\text{B15})$$

Using the definition of  $P(u)$  above, this can be rewritten as

$$\frac{P(u) - P(-u)}{2} + \frac{P(u) - P(-u)}{2} + \frac{P(u) - P(-3u)}{2} > 0, \quad (\text{B16})$$

and the claim follows. Similarly, (ii) requires

$$\begin{aligned} & \frac{\phi(1-\alpha)}{2} \left( L - \frac{P(u) + P(-u)}{2} \right) + \alpha L \\ & \geq -\frac{\phi(1-\alpha)}{2} \left( L - \frac{P(-u) + P(-3u)}{2} \right) + \alpha L; \end{aligned} \quad (\text{B17})$$

and because  $P(-3u) = L$ , the conclusion follows. Lastly, (iii) requires that if the market expects  $F$  to monitor subsequent to buying, then she has no incentive to deviate to takeover:

$$\begin{aligned} & \frac{\phi(1-\alpha)}{2} \left( s_M H + (1-s_M)L - \frac{P(u) + P(-u)}{2} \right) + \alpha(s_M H + (1-s_M)L) - c_M \\ & \geq \frac{\phi(1-\alpha)}{2} \left( s_T H + (1-s_T)L - \frac{P(u) + P(-u)}{2} \right) \\ & \quad + \alpha(s_T H + (1-s_T)L) - c_T. \end{aligned} \quad (\text{B18})$$

This is equivalent to equation (23). It is easy to see that if  $F$  randomizes between selling and buying/takeover, then she must prefer takeover to monitoring, and the reverse condition of (23) must be true. Hence,  $F$  would randomize between all three alternatives only if (23) were satisfied as an equality. Q.E.D.

*Proof of Lemma 2:* The net gains from takeovers or monitoring are

$$G_j - q_j c_j + \frac{\phi}{2} q_j (1 - q_j) s_j (H - L) - q_j c_j \quad j = M, T. \quad (\text{B19})$$

Using (21) for  $q_j$  and rearranging gives that

$$G_j - q_j c_j = \frac{(\phi s_j (H - L) - 2c_j)^2}{8\phi s_j (H - L)}. \quad (\text{B20})$$

Comparing  $G_T - q_T c_T$  and  $G_M - q_M c_M$  gives (23). Q.E.D.

*Proof of Proposition 10:*

(i) This follows directly, using (21):

$$\frac{1}{2} - \frac{c_T}{\phi s_M(H-L)} > \frac{1}{2} - \frac{c_M}{\phi s_M(H-L)} \Leftrightarrow \frac{s_T}{c_T} > \frac{s_M}{c_M}. \quad (\text{B21})$$

(ii) Taking square roots on both sides of (23) and then the derivative of the right-hand side gives

$$\frac{\partial}{\partial \phi} \frac{\phi s_M(H-L) - 2c_M}{\phi s_T(H-L) - 2c_T} = \frac{\frac{2(H-L)}{c_T c_M} \left( \frac{s_T}{c_T} - \frac{s_M}{c_M} \right)}{(\phi s_T(H-L) - 2c_T)^2} > 0 \Leftrightarrow \frac{s_T}{c_T} > \frac{s_M}{c_M}, \quad (\text{B22})$$

which proves the last result.

(iii) This follows directly, using the same procedure as in Proposition 6, which gives the optimal value for  $\phi$  as

$$\phi_j^2 = \frac{4c_j}{s_j(H-L)} \left( 2 - \frac{c_j}{s_j(H-L)} \right). \quad (\text{B23})$$

This implies immediately that

$$\phi_T^{*2} - \phi_M^{*2} = \frac{4}{H-L} \left( \frac{c_T}{s_T} - \frac{c_M}{s_M} \right) \left( 2 - \frac{\frac{c_T}{s_T} + \frac{c_M}{s_M}}{H-L} \right). \quad (\text{B24})$$

By assumption  $s_j(H-L) > c_j$ ,  $j = T, M$ , therefore the second bracket is always positive. The second bracket is negative if and only if Condition 1 (equation (17)) holds, hence the conclusion follows. Q.E.D.

## REFERENCES

- Admati, Anat R., and Paul Pfleiderer, 1988, A theory of intraday patterns: Volume and price variability, *Review of Financial Studies* 1, 3–40.
- Admati, Anat R., Paul Pfleiderer, and Josef Zechner, 1994, Large shareholder activism, risk sharing, and financial market equilibrium, *Journal of Political Economy* 102, 1097–1130.
- Bernhardt, Dan, Burton Hollifield, and Eric Hughson, 1995, Investment and insider trading, *Review of Financial Studies* 8, 501–543.
- Bhide, Amar, 1993, The hidden costs of stock market liquidity, *Journal of Financial Economics* 34, 31–51.
- Black, Bernard S., 1992a, Agents watching agents: The promise of institutional investor voice, *UCLA Law Review* 39, 811–892.
- Black, Bernard S., 1992b, The value of institutional investor monitoring: The empirical evidence, *UCLA Law Review* 39, 895–939.

- Black, Bernard S., and John C. Coffee, 1994, Hail Britannia?: Institutional investor behavior under limited regulation, *Michigan Law Review* 92, 1997–2087.
- Bolton, Patrick, and Ernst-Ludwig von Thadden, 1998, Blocks, liquidity, and corporate control, *Journal of Finance* 53, 1–25.
- Brickley, J. A., R. C. Lease, and C. W. Smith, Jr., 1988, Ownership structure and voting on antitakeover amendments, *Journal of Financial Economics* 20, 267–291.
- Burkart, Mike, Denis Gromb, and Fausto Panunzi, 1994, Large shareholders, monitoring, and fiduciary duty, Working paper, Massachusetts Institute of Technology and Stockholm School of Economics.
- Charkham, Jonathan, 1994, *Keeping good company: A study of corporate governance in five countries* (Clarendon Press, Oxford).
- Coffee, John C., 1991, Liquidity versus control: The institutional investor as corporate monitor, *Columbia Law Review* 91, 1277–1368.
- DeMott, Deborah A., 1996, Agency principles and large block shareholders, mimeo, Duke University Law School.
- Dewatripont, Mathias, 1993, The “leading shareholder” strategy, takeover contests and stock price dynamics, *European Economic Review* 37, 983–1004.
- Dow, James, and Gary Gorton, 1997, Noise trading, delegated portfolio management, and economic welfare, *Journal of Political Economy* 105, 1024–1050.
- Fudenberg, Drew, and Jean Tirole, 1991, *Game theory* (MIT Press, London and Cambridge).
- Gillan, Stuart L., and Laura T. Starks, 1995, Relationship investing and shareholder activism by institutional investors, Working paper, University of Texas at Austin.
- Glosten, Lawrence R., and Paul R. Milgrom, 1985, Bid, ask and transaction prices in a specialist market with heterogeneously informed traders, *Journal of Financial Economics* 13, 71–100.
- Gordon, Jeffrey N., 1991, Shareholder initiative: A social choice and game theoretic approach to corporate law, *Cincinnati Law Review* 60, 347–385.
- Gordon, Lilli A., and John Pound, 1993, Information, ownership structure, and shareholder voting: Evidence from shareholder-sponsored corporate governance proposals, *Journal of Finance* 48, 697–718.
- Grundfest, Joseph A., 1993, Just vote no: Minimalist strategies for dealing with barbarians inside the gate, *Stanford Law Review* 45, 857–937.
- Holmström, Bengt, and Jean Tirole, 1993, Market liquidity and performance monitoring, *Journal of Political Economy* 101, 678–709.
- Huddart, Steven, 1993, The effect of a large shareholder on corporate value, *Management Science* 39, 1407–1421.
- Kahn, Charles, and Andrew Winton, 1995, Ownership structure, speculation, and shareholder intervention, Working paper, Northwestern University.
- Khanna, Naveen, Steve L. Slezak, and Michael Bradley, 1994, Insider trading, outside search, and resource allocation: Why firms and society may disagree on insider trading restrictions, *Review of Financial Studies* 7, 575–608.
- Krishnan, Murugappa, 1992, An equivalence between the Kyle (1985) and the Glosten-Milgrom (1985) models, *Economic Letters* 40, 333–338.
- Kyle, Albert S., 1985, Continuous auctions and insider trading, *Econometrica* 53, 1315–1335.
- Kyle, Albert S., and Jean-Luc Vila, 1991, Noise trading and takeovers, *Rand Journal of Economics* 22, 54–71.
- Leleux, Benoit, Theo Vermaelen, and Saugata Banerjee, 1995, Large shareholdings and corporate control: An analysis of stake purchases by French holding companies, Working paper, INSEAD.
- Majumdar, Sumit K., and Anuradha Nagarajan, 1994, The long-term orientation of institutional investors: An empirical investigation, Working paper, University of Michigan.
- Nesbitt, Stephen L., 1994, Long-term rewards from shareholder activism: A study of the “CalPERS Effect,” *Journal of Applied Corporate Finance* 6, 75–80.
- Shleifer, Andrei, and Robert W. Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 176–216.

- Smith, Michael P., 1996, Shareholder activism by institutional investors: Evidence from CalPERS, *Journal of Finance* 51, 227–252.
- Stoughton, Neal M., and Josef Zechner, 1998, IPO-mechanisms, monitoring and ownership structure, *Journal of Financial Economics*, forthcoming.
- Wahal, Sunil, 1996, Pension fund activism and firm performance, *Journal of Financial and Quantitative Analysis* 31, 1–23.
- Zwiebel, Jeffrey, 1995, Block investment and partial benefits of corporate control, *Review of Economic Studies* 62, 161–185.