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DO PUBLICLY TRADED CORPORATIONS ACT IN THE PUBLIC INTEREST?

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ABSTRACT

Models of corporate behavior normally assume that a firm acts in the interest of shareholders, and that shareholders care only about the returns they receive on the shares they own in that firm. But shareholders should also care about the effects of a manager's decisions on the value of shares they own in other firms, on the price they pay as consumers of the firm's output, on the value of the firm's bonds they own, on government tax revenue which finances public expenditures benefiting shareholders, etc. These effects are normally presumed to be of second order. This paper reexamines this presumption, argues that many of these effects are likely to be important, and examines how a variety of conventional conclusions about corporate behavior change as a result.

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Models of the behavior of corporations normally assume that a manager acts in the interests of the firm's shareholders, and furthermore that shareholders care about the manager's decisions only in so far as these decisions affect the returns shareholders receive on the shares they own in that firm. If the return distribution on new projects is within the span of the distributions on available securities, then shareholders unanimously want the manager to maximize share values.[1] This is the objective that papers normally attribute to corporations.[2] But a manager's decisions can affect shareholders in more ways than just through their effects on the value of shares in that firm. For example, shareholders normally hold highly diversified portfolios, so they would want a manager to take into account any effects his decisions might have on the share values of other firms. If shareholders hold proportional amounts of all the firms in an industry, for example, then their portfolio value is maximized if they can induce each manager to maximize the market value of the industry as a whole. Managers would do this by taking into account any externalities their firm imposes on other firms in the industry, such as through spillovers of information from R&D or through advertising or price changes that lead to changes in market shares. Everything else equal, this would lead shareholders to prefer that the industry behave as a cartel and charge the monopoly price, regardless of the implications for the share values of individual firms. However, shareholders may also be consumers of the product, and to that degree they want to discourage firms from exploiting their market power.[3] Further, shareholders

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[1] For further discussion, see Leland(1974).

[2] Even with spanning, a number of papers derive different objectives for managers as a result of asymmetric information (see e.g. Ross(1973) or Myers and Majluf(1984)), strategic considerations (see e.g. Fershtman and Judd(1987)), or more generally the separation of ownership and control (see e.g. Jensen and Meckling(1976)).

[3] See Farrell (1985) and Manning(1988) for a discussion of these conflicting incentives.

may also own bonds issued by the firm. If so, they care what happens to bond values, which lessens the conflict of interest between bondholders and stockholders. Shareholders are also normally citizens of the country in which the firm is located, and therefore benefit from any tax payments or charitable donations that the firm might make.

The implications of this argument are most striking if all shareholders are identical in all respects and the economy is closed. In this case, each firm is owned equally by all members of the economy. Managers, acting in the interests of shareholders, should therefore maximize efficiency.[4] Spillovers (at least those which affect all shareholders equally) will be internalized, monopoly power will not be used, and the public benefits arising from extra tax payments will be taken into account.

If instead the model allows shareholders to differ, for example in their wealth and tastes, will it forecast that firms should maximize their own share values, at least to a first approximation, as is traditionally assumed? This is the question addressed in the paper. It is easy to see that the model suggests not. For example, as long as wealthy individuals maintain diversified portfolios, then they will want managers to take into account the effects of their actions on the value of all other securities.

This story about the internalization of externalities and the offsetting benefits that arise from tax payments is totally different from the story told in Bernheim and Bagwell(1988) about the neutrality of all government policies.[5] The Bernheim and Bagwell(1988) result relies on altruism — people take into account effects on others because they care about the welfare of others, directly or through its effects on the utility of people whose welfare they do care about directly. In this paper, results depend simply on each individual taking into account all the various ways he or she is affected directly by a firm's decisions: qua shareholder, qua bondholder, qua consumer, and qua citizen.

In section 1, I explore the degree to which a firm, acting in the interests of shareholders, should take into account the benefits it generates for others as a result of taxes and direct

[4] An exception would be actions which have different effects on different shareholders, e.g. localized pollution. Deviations could also arise with asymmetric information, as in the principal-agent literature.

[5] It also differs from the argument in Litzenberger and Talmor (1988) that *risk* in government policy is irrelevant if security markets are sufficiently complete. They argue that investors can then fully insure themselves against random policy changes, since random policy creates no aggregate risk. The focus in this paper is on the effects of nonstochastic policies.

externalities. Several extensions of the model are also explored. Section 2 examines the effects of competition among shareholders for control of the firm's behavior. Section 3 discusses how shareholders could design the manager's compensation scheme to induce them to take into account the various ways that managerial decisions affect shareholders. Finally, the last section summarizes the implications of these results for future work.

1. Equilibrium when managers act in the interests of shareholders

A. Basic model

This section develops a simple model to demonstrate the nature of the argument. The implications of relaxing some of the critical assumptions are explored in sections 2 and 3.

The model requires several key features. First, individual portfolios must be diversified. Assume therefore that the income of firms is risky, and that each firm has idiosyncratic risk. For convenience, I will assume further that the separation theorem holds, so that each investor divides his portfolio in some proportion between riskless bonds and a share in the market portfolio of risky equity.

Second, if uniform taxes are to affect allocation decisions, there must be some alternative to physical investment. Rather than introducing a consumption vs. savings decision, I instead assume that the country can invest abroad in risk–free bonds earning a rate of return r.

Third, in order to examine the degree to which firms take into account the benefits to society resulting from extra corporate tax payments, both sides of the government budget must appear explicitly in the model. To keep things simple, let there be a proportional tax at rate τ on the income of firms, at the same rate for all firms. Let the resulting revenue be used to finance transfer payments to individuals in the society, with individual i receiving the fraction β_i of total tax revenue, where $\sum_i \beta_i = 1$.[6]

[6] If the government uses tax revenue to finance publicly provided goods rather than transfer payments, then β_i can be reinterpreted to describe the dollar transfer which provides the same utility that individual i derives from an extra dollar spent on these goods. In this case, however, $\sum_i \beta_i$ need not equal one. See Atkinson and Stern(1974) for a derivation of the equilibrium value of $\sum_i \beta_i$, assuming the government maximizes an additive social welfare function.

The specific set–up of the model is as follows: there is one good, two periods, F firms, and I individuals. The price of the one good will be the numeraire, and all firms are assumed to take this price as given. Firm f starts out with initial assets K_f^1, derived perhaps from past capital investments. These can be retained and invested in productive capital or paid out as dividends to shareholders in the first period. Let K_f denote the amount retained as productive capital, so that $D_f^1 \equiv K_f^1 - K_f$ denotes initial dividend payments.[7] For simplicity, assume that capital does not depreciate. Let K denote the vector, of length F, of the amount of productive capital in each firm, so that $K = (K_1, \ldots, K_F)$. In the second period, the firm receives profits $\tilde{\theta}_f \pi_f(K)$, where $\tilde{\theta}_f$ is stochastic. Here, I capture any externalities across firms by allowing the profits of each firm to depend on the capital investment decisions made by all firms. Since K_f is the only choice variable for each firm, this formulation is perfectly general. At the end of the second period, each firm shuts down, paying out its capital stock plus its after–tax profits as a dividend to shareholders. Dividend payments to the firm's shareholders in the second period equal $\tilde{D}_f^2 = K_f + \tilde{\theta}_f \pi_f(K)(1-\tau)$. Let $\tilde{\pi} = \sum_f \tilde{\theta}_f \pi_f$ denote aggregate pre–tax profits.

In the first period, I assume that each individual i divides his initial assets, W_i,[8] between riskless bonds and shares in each of the firms. In particular, assume that individual i buys the fraction α_{if} of each firm f. Any remaining assets, plus initial dividend payments, are invested in riskless bonds. Individual i's holdings of riskless bonds are denoted by B_i, and the initial market value of the shares of firm f is denoted by V_f. The first period budget constraint is therefore $W_i = \sum_f \alpha_{if}(V_f - D_f^1) + B_i$. During the second period, each individual consumes all his assets along with any transfer payments he receives from the government. Therefore, second period consumption of individual i, denoted $\tilde{C}_i$, equals

$$\tilde{C}_i = B_i(1+r) + \sum_f \alpha_{if} \tilde{D}_f^2 + \beta_i \tau \tilde{\pi}. \tag{1}$$

In making decisions, the individual acts so as to maximize ex ante utility, denoted by $EU(\tilde{C}_i)$. Optimal portfolio choice implies that individual i should be indifferent to a small

[7] For simplicity, I ignore here the implicit constraint that $D_f^1 \geq 0$, and ignore sources of finance other than foregone dividends.

[8] Initial assets in part consist of initial ownership of equity in the various firms. These claims are then traded on the market during the first period.

shift in assets from equity in firm f to bonds. Differentiating utility with respect to α_{if}, and taking account of how bond holdings must adjust to satisfy the first period budget constraint, yields the first–order condition

$$(1+r)EU_i' = EU_i'[K_f + \tilde{\theta}_f \pi_f (1-\tau)]/V_f. \tag{2}$$

This equation implies that $E(U_i'\tilde{\theta}_f)/EU_i'$ has the same value for all i. This ratio simply equals the certainty equivalent to the lottery $\tilde{\theta}_f$. Denote this common value by R_f. The above assumption that the separation theorem holds, so that individuals divide their portfolios between riskless bonds and the market portfolio of risky securities, implies that α_{if} has the same value for all f. Denote this common value by α_i.

When firms make investment decisions, they face the complication that shareholders' preferences about the appropriate investment level vary. I assume that the firm follows the preferences of the median shareholder, and ignore any possible agency problems. Furthermore, I assume that there are sufficiently many shareholders with the same preferences as that of the median shareholder that no single shareholder is in a position to change the firm's behavior through changing his portfolio choices.[9]

In general, the median shareholder can differ by firm. Each firm chooses the capital stock that maximizes the utility of the median shareholder, taking as given the choices made by the median shareholders in other firms. I therefore examine a Nash equilibrium. If individual i were the median shareholder in firm g, what capital stock would the firm choose? A marginal change in K_g, given the capital stocks in the other firms, causes the expected utility of individual i to change by

$$\frac{\partial EU_i}{\partial K_g} = E\left\{ U_i'\alpha_i \left[-r + \sum_f \tilde{\theta}_f \frac{\partial \pi_f}{\partial K_g}(1-\tau) \right] + U_i'\beta_i \tau \sum_f \tilde{\theta}_f \frac{\partial \pi_f}{\partial K_g} \right\}. \tag{3}$$

Because of the extra capital investment, a smaller dividend is paid in the first period, lowering investments in bonds. Therefore in the second period, the individual has less interest income, but higher dividend income and higher transfer payments from the government,

[9] I return to this issue in section 2.

funded by the tax payments on the income arising from the extra capital, leading to the three terms in equation (3). Individual i views firm g's capital stock as optimal if and only if equation (3) equals zero, which implies that

$$(1-\tau(1-\gamma_i))\sum_f R_f \frac{\partial \pi_f}{\partial K_g} = r. \tag{4a}$$

Here, $\gamma_i = \beta_i/\alpha_i$, and describes individual i's share in government revenue relative to his share of corporate dividends. It measures the fraction of the dividends that he lost due to corporate taxes that he gets back through increased transfer payments. Equation (4a) implies that shareholders differ in their preferences for the capital stock of each firm only because of differences in γ_i. The median value of γ_i among shareholders then determines the firm's capital stock. Because each shareholder is assumed to buy the market portfolio, this median value is the same for each firm. If individual i is this median individual, then he determines the capital stock in each firm, based on the summary of his preferences expressed in equation (4a).

In contrast, the standard approach in the literature is to assume that investment in firm g continues as long as the market is willing to pay at least a dollar for the returns from an extra dollar invested in the firm. This implies that

$$(1-\tau)R_g \frac{\partial \pi_g}{\partial K_g} = r. \tag{4b}$$

If spillovers across firms can be ignored, and if $\gamma_i \approx 0$, then equation (4a) simplifies to equation (4b). The standard approach implicitly assumes that a firm's shareholders receive back as benefits from government expenditures a trivial fraction of the firm's tax payments, and that these shareholders do not care what happens to competing firms. This story may be an appropriate description of the situation of the owners of a closely held firm. However, since each investor in a publicly traded corporation owns only a small fraction of that firm, effects of that firm's actions on other firms or on tax revenue no longer look small relative to the direct effects on the value of that investor's shares in the firm. As a result, investment decisions become more complicated, as can be seen comparing equations (4a) and (4b).

How does the allocation described by equation (4a) differ from the efficient allocation? Suppose the government can choose the capital stock in each firm and make lump–sum

transfers among individuals so as to maximize the utility of the first individual, while maintaining the utility levels of all other individuals at least at the utility achieved in the above allocation. Then it is straight–forward to show that the resulting capital stock in firm g will be characterized by

$$\sum_f R_f \frac{\partial \pi_f}{\partial K_g} = r. \tag{5}$$

Comparing equations (4a) and (5), two conclusions are immediately apparent. First, firms acting in the interests of shareholders will fully take into account any externalities they impose on other firms — shareholders own a proportional amount of all firms, and so they care only about aggregate profits. This conclusions does not depend on the initial wealth distribution.

Second, taxes distort investment decisions only to the degree to which $\beta_i/\alpha_i \neq 1$ for the median shareholder. If all individuals in the initial population are identical, then $\beta_i = \alpha_i$ for all i, implying that taxes are nondistorting — new capital investments lead to extra tax payments but also lead to increased transfer payments of equal size, and the two effects just offset. Only to the degree to which revenue from corporate investments is redistributed does the corporate tax distort behavior. Depending on the pattern of this redistribution, the tax may either discourage or encourage capital investments. For example, if the initial shareholders include foreign investors, but only domestic investors receive transfer payments, then the median shareholder, assuming he is domestic, could well receive a larger share of tax payments back in transfers than he implicitly pays initially as an owner of corporate shares. In this case the corporate tax *encourages* capital investments, since $\beta_i > \alpha_i$. Shareholding is in fact heavily concentrated among few individuals, however, whereas benefits from government expenditures are much more widely dispersed in the population. As a result, $\alpha_i >> \beta_i$, so that the effective tax distortion may be well approximated by the statutory tax rate.

In the U.S., the link between specific taxes and specific expenditures is quite weak. This is particularly true for the corporate income tax, which makes it difficult to forecast how extra corporate tax revenue will be spent. To the degree that specific taxes are linked to specific expenditures, however, this forecasting becomes easier. For example, since Social Security benefits are linked to the payroll tax, extra corporate tax revenues will not be used

to finance extra Social Security benefits. Our results suggest that if corporate tax revenues were linked to expenditures benefiting corporate shareholders, then the tax distortion to investment decisions would be greatly reduced. For example, suppose increased corporate tax revenues were to be used to reduce tax rates on high income individuals, who according to the data own most corporate equity.[10] Then these shareholders would push publicly held firms to pay less attention to the tax implications of their actions. Such an implicit tie between corporate tax revenues and the progressivity of the personal income tax is not entirely implausible. The model in this paper suggests that an explicit tie, or at least a regular association, could have important effects on corporate behavior.

In general, corporate decisions will become increasingly inefficient as the preferences of the median shareholder diverge from the average preferences of citizens. Even if all individuals own equal amounts of equity, if their preferences otherwise differ then decisions based on the median "voter" will not in general be efficient as emphasized by Buchanan and Tullock(1962). For example, suppose only the few shareholders living near the firm are affected by its pollution emissions. Then the firm, following the preferences of the median shareholder, will not take adequate account of these costs.[11] When individuals own different amounts of equity, the potential for inefficient decisions is much larger. These differences in equity holdings may arise due to wealth differences, tax distortions to portfolio choice, or simply differences in risk tolerance. As a result, any policy change which leads to less inequality in equity holdings may cause increased efficiency of corporate decisions. In this respect, income redistribution should improve the efficiency of the economy, as should a reduction in tax distortions to portfolio composition, e.g. eliminating the favorable treatment of capital gains.

Not all firms are corporations, and not all corporations have shares which are publicly traded. The above results apply only to publicly traded corporations. In contrast, closely

[10] This is essentially what was done by the Tax Reform Act of 1986. The Treasury's stated intent in this Act was to design a distributionally neutral set of tax changes. The argument here requires that the pattern of redistribution in the tax system be held fixed over time through suitable readjustments of tax rates.

[11] Changes in policy which improve the environment over a much larger geographical area, such as cuts in the production of fluorocarbons, are more likely to be supported by the median shareholder, however.

held firms normally have very few owners, with each owner investing a substantial fraction of his or her portfolio in the firm. These owners of a closely held firm care primarily about the value of their firm. As a result, implications of the firm's actions for the value of other firms, or for government tax revenue, would effectively be ignored. While other concerns of the owners of a closely held firm, e.g. the welfare of the community in which they live, could well enter into the firm's decisions, their heavy investment in the firm suggests that as a first approximation they simply maximize the equivalent of own share value.

According to the above model, publicly traded corporations should pursue different objectives than closely held firms. Whether or not publicly traded corporations behave more efficiently than closely held firms depends on the degree to which their efficiency–reducing incentive to exploit the combined monopoly power of the publicly traded firms in each industry is outweighed by their efficiency–increasing incentive to take account of other externalities and of the benefits financed by their tax payments.

B. Extensions

Monopoly power

This basic model can be extended to address a variety of related corporate decisions. The above model implies that firms will take into account any externalities they impose on other firms. But if firms attempt to maximize joint profits, then they have an incentive to collude and charge the monopoly price. In extending the above model to address this question, however, the fact that shareholders may also be consumers of the firms' output must be taken into account. Shareholders qua consumers are hurt by any increase in the price of the firms' output, which reduces the price they want the firms to charge. This point has been developed in Farrell(1985) and Manning(1988).

Debt finance

The above model did not allow for debt finance. The traditional approach to modeling debt vs. equity decisions[12] is to argue that increased use of debt lowers taxes, because

[12] See, for example, Gordon and Malkiel(1981).

interest payments but not dividends are deductible from corporate taxable income. However, increased use of debt also raises the probability of bankruptcy, which has real costs. These real costs arise in large part due to conflicts of interest between different classes of creditors, which can lead to drawn out legal proceedings and decisions benefiting some classes of creditors at the expense of others.[13] Conflicts of interest between different creditors can also create agency costs prior to bankruptcy.[14] The firm trades off these various costs of extra debt against any tax savings to determine the firm's debt–equity ratio. If corporate debt were introduced into the above model, but the model were otherwise left unchanged, then this debt would be risky in equilibrium and so would be part of the market portfolio of risky securities. Individual i would therefore own the fraction α_i of both the equity and the debt issued by each firm. As a result, each shareholder would want the firm to ignore any conflicts of interest between debt and equity. Without the agency costs and bankruptcy costs that arise from the conflict of interest between different classes of creditors, debt finance would be less costly at the margin and more debt would be used.

This story may well explain why debt–equity ratios are much higher in Japan than in the U.S. In Japan, both equity and debt are heavily owned by a few large banks. Since the same banks own both securities, they want the firm to maximize firm value rather than equity value. In the U.S., in contrast, debt and equity holdings are heavily segmented, since the advantageous personal tax treatment of capital gains on equity is of much higher value to those in high tax brackets.[15] Conflicts of interest between debt and equity are therefore much more important, with the resulting agency and bankruptcy costs. As a result, less debt is used.

Charitable donations

[13] See, for example, Bulow and Shoven(1978) and White(1989).

[14] Standard references are Jensen and Meckling(1976) and Myers(1977).

[15] Note, however, that in the U.S. corporate bonds are owned mainly by banks, insurance companies, and defined benefit pension plans. Since the return on these bonds ultimately belongs to the shareholders in these institutions, and not depositors, policy holders, or pension recipients, equity holders do own considerable corporate bonds.

This model may also provide an explanation for why corporations donate money to charity. By the logic of the above model, the firm would take into account any utility shareholders receive from funds donated to charity. Having the firm, rather than shareholders, donate money has two advantages. First, if the effective tax rate on corporate income is higher than that on personal income, then the tax savings are larger. More importantly, the firm can solve the free–rider problem among individual corporate shareholders by donating for all of them simultaneously.[16] Similarly, corporations may accept restrictions on their behavior, such as the Sullivan rules which restrict the nature of their actions in South Africa, because their shareholders care about more than just share values, and not because of other outside pressures.

2. Competition for Control of Corporations

In the above model, I assumed that there were enough shareholders with identical characteristics to those of the median shareholder that no one shareholder's behavior could affect the characteristics of the median shareholder. Through this assumption, I was able to avoid dealing with competition among shareholders for control of a firm. Yet, when shareholder preferences differ, control is valuable, giving shareholders an incentive to alter their portfolios in order to influence a firm's behavior. For example, there is an incentive for a small group of individuals who care little about other implications of the firm's actions (e.g. for whom $\alpha_i >> \beta_i$) to take over the firm, shift its behavior to that of share value maximization, and thereby profit substantially from the resulting capital gains.[17] Does the above model merely forecast that ownership will become concentrated, so as to insure that the firm maximizes share values?

In this section, I argue that while such takeovers may happen, perhaps in the form of leveraged buyouts, there are strong forces preserving public ownership. To begin with, the

[16] See Hochman and Rogers(1969) for a justification for government donations as an alternative solution to the free–rider problem.

[17] A small group who cared strongly about other implications of the firm's actions could also attempt to take over the firm. However, as a result of their investing heavily in the firm's shares, they will end up weighting heavily what happens to share values when making decisions, and so should end up behaving approximately like share value maximizers. Note also that if a firm were taken over by another publicly owned corporation, the incentives of the owners would not change.

optimal allocation of risk–bearing argues for broad ownership, so that a takeover by a small group increases the costs of risk–bearing.[18] In addition, current regulations prevent a small group from acquiring more than five percent of a firm's shares anonymously. But if the group must announce publicly its attempt to acquire more shares, then those contemplating selling shares will sell only at a price at least as high as the price they expect to prevail later. If their expectations are rational, then the small group cannot profit on the shares they purchase publicly, confining their profits to the five percent of shares acquired anonymously. Finally, those selling shares should realize that their sales in particular will cause some shift in the firm's behavior.[19] Those who find this shift undesirable will be more reluctant to sell.

In order to see more clearly the conflicting pressures, consider first the case of anonymous trading in a firm's shares. Previously, I assumed that each shareholder's assets were too small to allow the shareholder to affect the characteristics of the median shareholder in any firm through his or her own portfolio choices, resulting in the first–order condition characterizing optimal portfolio choice described by equation (2). If the shareholder's portfolio choices do affect the firm's behavior, then the first–order conditions for optimal portfolio choice would need to take into account these effects, with all the ramifications they might have for the utility of the shareholder. Optimal portfolios may no longer be balanced. Just as the median shareholder in firm f was assumed to take as given the capital stocks chosen by other firms when making decisions, I assume as well that any investor contemplating investing more in firm f takes as given the capital stocks chosen by other firms. Under these assumptions, the first–order conditions for optimal portfolio choice become

$$V_f(1+r)\mathrm{E}U_i' = \mathrm{E}U_i'[K_f + \tilde{\theta}_f \pi_f (1-\tau)] + \frac{\partial \mathrm{E}U_i}{\partial K_f}\frac{\partial K_f}{\partial \alpha_{if}}. \qquad (2a)$$

[18] If there were both voting and nonvoting stock, then a takeover of control no longer necessarily implies inefficient risk–bearing. Also, if the firm could be subdivided into many identical smaller firms, with no loss in efficiency, then each of these could be owned by a small group without extra risk–bearing costs.

[19] Many papers in the literature on takeovers follow Grossman–Hart(1980) in assuming that each outside shareholder is so small relative to the market that he ignores any effects of his actions on market outcomes. Since in the above model, shareholders can explicitly affect the firm's behavior through their votes, for consistency I allow them to take into account this fact in their portfolio decisions as well.

Here, $\partial EU_i/\partial K_f$ is given by equation (3); it would equal zero in equilibrium for the median shareholder in firm f, but could potentially be large and of either sign for shareholders with extreme preferences.

What determines $\partial K_f/\partial \alpha_{if}$? Within the model, a shareholder can affect K_f only by changing the characteristics of the median shareholder. Therefore, one factor affecting the value of buying a share is the preferences of the seller of the share. If the seller's preferences are on the same side of the median preferences as that of the buyer, the transaction has no effect on the characteristics of the median shareholder; if the seller's preferences are on the other side of the median, then the purchase changes the median shareholder in the desired direction. When buying (selling) shares, however, an investor does not normally know anything about the preferences of the seller (buyer). In order to maintain this anonymity of trade, I assume there is a small and equal probability that each shareholder must alter his holdings by a given percent, either up or down, for reasons outside of the model.[20] Therefore, in any equilibrium, balanced trade would continue to occur, with no effect on market prices.

An initial allocation will be viewed to be an equilibrium if, starting from this allocation, no trade occurs except where required under the above assumption. If, starting from such an allocation, an investor considers buying an extra share, there is an equal likelihood that the seller will be above vs. below the median. Therefore, half the time the transaction will move the median in the desired direction. The size of the movement is determined by the density of shareholders around the median in the initial allocation. If this density is "thinner", then $\partial K_f/\partial \alpha_{if}$ will be larger in absolute value, and always of the same sign as $\partial U_i/\partial K_f$. Since the size of $\partial K_f/\partial \alpha_{if}$ would be the same for any investor on the same side of the median, the last term in equation (2a) will be zero for the median shareholder, positive for all other shareholders, and larger the further the shareholder's preferences are from those of the median shareholder. Therefore, the desire to change the firm's actions raises the value of a share beyond what can be explained based on the return distribution of the existing shares (described by the first term on the right-hand side of equation (2a)).

[20] See Kyle(1985) for a careful application of an analogous assumption to a different problem.

As a result, an equilibrium share price will be higher than the price forecast based on this return distribution alone, due to the value shareholders attach to control. Also, ownership will be more concentrated among those who care more about changing the firm's actions (those with extreme preferences) than would be forecast based on risk preferences alone.

The equilibrium may not be unique, however. The formal characterization of the equilibrium is more complicated than in the standard portfolio framework because the value of a share to an individual depends on who else owns shares as well as on the share's return distribution. To see the possibility of multiple equilibria, assume that p is an equilibrium price for a firm's shares. If the price had been slightly higher, then those with preferences near the median (for whom the second term in equation (2a) is near zero), would demand fewer shares. The resulting thinner distribution of shareholders around the median raises the value of extra purchases for those with extreme preferences, potentially justifying the higher price.

The analysis of a public offer for shares in the firm, by a raider who already owns at least five percent of the firm's shares, would face similar complications. What would be the response of existing shareholders to any given bid price? Each shareholder would need to forecast the future return distribution for the firm's shares, given the distribution of ownership that results from the bid and its implications for the firm's behavior. Given this distribution, sales would be determined by equation (2a). For tendering shareholders whose preferences are on the same side of the resulting median as those of the raider, sales to the raider have *no* effect on the characteristics of the median voter, so that $\partial K_f/\partial \alpha_{if} = 0$. For these shareholders, sales decisions would be based simply on the share's return distribution. Shareholders whose preferences are on the opposite side of the median would be more reluctant to sell because of the adverse effect on the behavior of the firm.

Surprisingly, the total number of shares acquired does not necessarily go up as the bid price increases. Certainly, the price rise has to be more than large enough relative to any improvement in future profits to make it attractive for anyone to sell more shares. If so, then those whose preferences are on the same side of the median as those of the raider, and those near enough to the median that they are roughly indifferent to any resulting changes

in the firm's behavior,[21] would tender more shares. However, the resulting thinner distribution of shareholders around the median implies that any sale by remaining shareholders has a larger effect on the location of the median shareholder, leading to a larger adverse change in the behavior of the firm from their perspective. This extra cost of selling shares could well outweigh the advantage of the higher price, causing remaining shareholders to sell fewer shares in response to the higher price. It is even possible that fewer shares would be sold in total. What is clear, however, is that the higher price leads to share ownership being more concentrated among those with extreme preferences.

What bid price would the raider prefer? Due to the misallocation of risk that results from a concentration of ownership, the return distribution on each share would be more valuable to outside investors than to the raider. Investors whose preferences are on the other side of the median will value shares in addition as a way to limit the behavioral changes desired by the raider. As a result, given rational expectations on the part of outside investors, the raider would need to pay more per share than the resulting return distribution per se would be worth to him. These losses would be larger the larger the share of the firm that the raider acquires. But the larger the number of shares acquired, the larger the change in the behavior of the firm, until the raider acquires half the shares. At that point, any further acquisitions have no effect on the behavior of the firm, so would not be desirable given the increased costs of risk-bearing.

For a bid to be worthwhile, any gains to the raider from the change in behavior must be large enough to offset the losses incurred on the shares purchased publicly. What gains would occur? Any change in behavior causes an increase in the value of any shares the raider acquired before publicly announcing his intention to buy shares. If the raider gains full control of the firm, then he may also be able to take profits directly, rather than sharing profits proportionately among all shareholders.[22] Finally, the raider may care about the behavior of the firm for reasons other than its effect on the share value of that firm. Since

[21] The median shareholder by construction is indifferent at the margin to any change in the firm's behavior.

[22] These were the types of gains pointed out in Grossman and Hart(1980) that provided the incentive for takeovers. They ignored the offsetting losses described here, however.

both gains and losses increase as the raider acquires more shares, the optimal bid (if any) depends on the magnitudes of the gains and losses.

How likely are equilibria with concentrated ownership? Concentrated ownership implies higher costs of risk–bearing, implying that larger and riskier companies are less likely to be owned by small groups. This suggests that firms will initially go public only when they become too large to be owned comfortably by a small group. When they do go public, our model implies that the objectives of the firm are likely to change. To the degree to which this shift in firm behavior results in a fall in share values, it becomes more expensive for the initial owners to take the firm public. The shift in firm behavior need not necessarily result in a *fall* in share prices, however. If the rest of the industry is already publicly owned, then selling this firm to the same group of shareholders may result in greater monopoly profits for the industry as a whole, and possibly for this firm as well. In addition, agency costs may be lower when both the firm's equity and the firm's debt are owned by the same investors, and these reduced costs would be reflected in share prices. If the price of a publicly owned firm were high enough relative to that resulting from share–value–maximizing behavior, then private ownership would not be an equilibrium.

Perhaps leveraged buyouts can be understood in part as shifts to share–value–maximizing behavior. Certainly, managers are normally under much more pressure to maximize profits after a leveraged buyout. In fact, existing statistical work does indicate that profits tend to rise after a buyout, and that public shareholders are normally paid a sizable premium when firms go private.[23] These buyouts are not easy to explain using conventional models. For example, any benefits from extra interest deductions could have been obtained earlier, and extra leverage does not require a buyout.[24] Also, the shift in the manager's incentive package could equally well have been arranged earlier under public ownership.[25] The hypothesis here is that it did not occur under public ownership because the public

[23] See, for example, Kaplan(1988) and DeAngelo,DeAngelo, and Rice(1984).

[24] Jensen(1986) has argued that extra debt also lessens agency costs, particularly for firms with free cash flow. This gain does not seem to require taking a firm private, however.

[25] Another proposed gain from taking a firm private is reduced registration, listing, and other shareholder servicing costs. This will be more important for smaller firms.

owners had more complicated objectives, and that the shift to private ownership enabled the managers to ignore these other objectives, thereby increasing profits.

3. Implications for Managerial Incentives

Ultimately, the behavior of the firm depends on the incentives faced by the manager. In the above discussion, managers were simply assumed to pursue the objectives desired by shareholders. But, as emphasized in the principal–agent literature, shareholders' ability to induce a manager to act in their interests is limited by the amount of information they have about the actions of the manager. Much work has been done attempting to derive plausible characteristics of a manager's compensation package, assuming shareholders care only about maximization of share values. If shareholders have more complicated objectives, how does the forecasted compensation package change? What can observed forms of managerial compensation tell us about the objectives of shareholders?

If the principal's objective were maximization of share values and there were no risk, then managerial compensation would simply be based on share values (assuming that the manager's effort is not observable directly). Providing adequate incentives to put in effort requires that the manager keep all changes in the aggregate value of the firm. The problem that arises in doing this is that share values depend on more than just the manager's effort level, and it is difficult to control for the effects of these other factors. Without such controls, the manager ends up facing substantial risk, which creates its own efficiency costs. As a result, optimal compensation packages pay the manager less than all changes in the aggregate value of the firm in order to reduce these risk–bearing costs.

A potentially important outside factor affecting share values is shifts in demand for products of the industry as a whole, which in principle affect all firms in the industry in equal proportions.[26] One way to control for the effects of this factor is to base the pay of the manager on the performance of his/her firm relative to that of other firms in the industry.[27] This can be done directly, by basing pay on relative performance, or

[26] Unexpected tax changes and business cycles would also likely affect all firms in the industry proportionately.

[27] See, for example, Holmstrom(1982) for a formal derivation of this type of pay scheme.

alternatively by requiring the manager to hold a portfolio long in the stock of his own firm and short in stock of other firms in the industry.[28]

If the objectives of the principal were to maximize the value of the market portfolio, however, as was the case above if $\gamma_i \approx 0$ for the median shareholder, how would shareholders want to design the incentives faced by the manager? Without uncertainty, the manager's pay would be based on the performance of the market portfolio. With uncertainty, the optimal compensation scheme would now include a less short position in other shares, or perhaps even a long position. The specific amount would depend on the degree to which the manager can influence the values of these other firms.

To see this in a simple example, I extend a special case of the model in Holmstrom(1982) in order to incorporate spillovers. In his model, shareholders want to motivate the manager to exert effort. Since they cannot observe his effort directly they instead base his pay on observed share values, which are affected by his effort. In particular, assume that the effort by the manager of firm f, denoted by e_f, affects not only the value of firm f but also the values of all $N-1$ other firms in the industry. Assume in addition that there is a common risk factor, ν, affecting equally all firms in the industry, as well as independent idiosyncratic risk factors, μ_f, affecting separately each firm f. Specifically, let the ex post value of firm f in period 2, denoted V_f^2, equal

$$V_f^2 = e_f + \delta \sum_{g \neq f} e_g + \nu + \mu_f. \tag{6}$$

Assume that these risk factors are distributed normally with zero mean. The variance of ν is denoted σ and the variance of each of the μ_f is denoted s.

Assume that the pay of the manager of firm f, w_f, can be expressed as a linear function of the values of each of the shares, so that $w_f = a + bV_f + c\bar{V}$, where $\bar{V} = \sum_g V_g/N$.[29]

[28] Under these schemes, the manager should in principle be prevented from trading freely in equity. In particular, the principal would want to prevent the manager from trading on inside information, since such trades can produce profits of arbitrary size, thereby providing an incentive to generate new information regardless of its effects on the value of shares in the firm. While insider trading rules cover trade in the stock of one's own firm, however, they do not restrict trade in the shares in other firms whose value might be affected by the manager's actions.

[29] Holmstrom did not impose any functional form assumptions here. This restriction is imposed to simplify the discussion.

Following Holmstrom's assumption that the risk factors are distributed normally, the utility of the manager, U_f, can be expressed as a function of the mean and variance of w_f as well as the effort level of the manager. In particular, assume that $U_f = U(\mathrm{E}(w_f), \mathrm{var}(w_f), e_f)$. Let U_i denote the derivative of U_f with respect to its i'th argument. The manager chooses e_f to maximize U_f, implying that the first–order condition characterizing the optimal value of e_f is

$$U_1[b + c(1 + (N-1)\delta)/N] = -U_3(e_f). \tag{7}$$

Assume that the manager can obtain utility $\bar{U}$ elsewhere, so accepts this position if and only if $U_f \geq \bar{U}$.

For simplicity, assume that shareholders are risk neutral. Shareholders then determine the pay of the manager of firm f by maximizing $\sum_g \mathrm{E}V_g - w_f$ with respect to a, b, and c. They do so subject to the constraints that $U_i \geq \bar{U}$ and that e_f satisfy equation (7). The resulting first–order conditions imply that

$$b = (1-\delta)\left(\sigma + \frac{s}{N}\right)A \qquad \text{and} \tag{8a}$$

$$c = (\delta s - (1-\delta)\sigma)A, \qquad \text{implying that} \tag{8b}$$

$$-\frac{b}{c} = \frac{\sigma + s/N}{\sigma - \delta s/(1-\delta)}. \tag{8c}$$

Here, $A > 0$.[30] If $\delta = 0$, so that spillovers can be ignored, then the optimal compensation scheme has $c \approx -b$ for large N, implying that the manager would be paid based approximately on relative performance, following the results in Holmstrom. In general, $b \geq 0$, while $c \leq 0$ if $\delta \leq \sigma/(\sigma + s)$ but is positive otherwise. For $\delta < \sigma/(\sigma + s)$, $-b/c$ increases as δ increases, implying that the compensation scheme is based more heavily on own share prices, though pay still depends negatively to some extent on industry performance. For yet larger δ, however, manager's pay depends positively on industry performance, and in the limit when $\delta = 1$ it depends *only* on industry performance.

In a recent study of the compensation of 2214 executives in 1295 different corporations, Gibbons and Murphy(1989) regress the compensation of each manager on the rate of

[30] To be complete, $A = (\partial e_f/\partial c)(1 + (N-1)\delta)/\{(\partial e_f/\partial c)[(1 + (N-1)\delta^2)s + (N-1)(1-\delta)^2\sigma] - 2U_3(1 + (N-1)\delta)(\sigma + s/N)s\}$.

return earned on their own firm's shares and on the rate of return earned on both the market portfolio and an industry portfolio. Not surprisingly, the return on the firm's own shares has a positive effect on the manager's compensation. In contrast, the return on the market portfolio has a negative effect on the manager's compensation, and its coefficient is roughly comparable in absolute value to that on the firm's rate of return, suggesting that compensation is based on the firm's performance relative to the market. The above theory would forecast this if the manager's actions have little impact on the market as a whole. However, the coefficient on the industry portfolio is close to zero. The above theory would forecast that $c = 0$ if spillovers within the industry are sufficiently important. This coefficient seems difficult to explain otherwise.[31] In addition, compensation is only one component of a manager's total income, which also includes the return on stock options and income from the manager's personal stockholdings in both the manager's own firm and in other firms. Therefore, total income should be based yet more heavily on the return to the firm and less negatively on the performance of the industry. These compensation schemes are much more easily understood if shareholders care about the value of the market portfolio, and not just the value of the shares in this one firm.

Therefore, once the principal–agent problem is added to the previous model, the theory no longer forecasts that managers take full account of the effects of externalities their actions generate. If the pay of managers does not depend on the performance of competing firms, then managers would ignore spillovers entirely. In contrast, however, if shareholders in a firm care only about the value of that firm's shares, then the theory forecasts that managers should have an incentive to undermine the performance of competitors, contrary to the above empirical results.

How might shareholders push the firm to take into account any benefits they receive from the firm's tax payments? When compensation is based solely on share values, taxes should cause managers to invest less. If shareholders wish to offset this incentive, they can reward the manager based not only on share values but also on the size of the firm.

[31] Gibbons and Murphy attempt to explain this anomaly by claiming that industry definitions are likely to be noisy, biasing the coefficient towards zero. However, they find similar results using much broader industry definitions.

Managers of large firms as a rule do get paid more than managers of small firms. This dependence of pay on the size of the firm could easily be manipulated by shareholders to create the desired overall investment incentives, though it does not correct tax distortions to the type of investment (such as structures vs. equipment).

Other more complicated ways in which the manager's actions affect the utility of shareholders may be hard to incorporate directly into the manager's compensation scheme. For example, how could the manager be induced to take into account the benefits to shareholders from charitable donations, or the degree to which shareholders are also bondholders, and therefore prefer that managers maximize firm value rather than equity value? One answer is that the boards of directors could push managers to take these more complicated effects of their actions into account. Often, for example, major lenders to the firm place a representative on the firm's board of directors. Managers of other firms which are strongly affected by this firm's actions might also be put on the board. Another way to provide these incentives is through the threat of shareholder initiatives or corporate takeovers — shareholders might be willing to tender shares to a raider who promises the desired policies even if the offered price is not otherwise attractive.

4. Conclusions

By assuming that firms act to maximize their own share values, traditional models of corporate behavior implicitly assume that the only systematic way in which a firm's actions affect the welfare of its shareholders is through effects on its own share values. However, a firm's shareholders may also be affected by the firm's decisions in their roles as shareholders in other firms, as lenders to the firm, as consumers of the firm's products, as people hurt by the pollution emitted by the firm, and even as citizens who benefit from the expenditures financed by the firm's taxes. If these effects are large enough, and if they affect a large enough share of the firm's shareholders, then the assumption that firms act in the interests of shareholders no longer implies share value maximization. The implied changes in the forecasted behavior of the firm could easily challenge many standard conclusions. In practice, how important are these other ways in which shareholders are affected by a firm's actions, and what implications would these effects have for the forecasted behavior of the firm?

To begin with, standard models of portfolio choice forecast that equity holders invest proportionally in the shares of all publicly traded firms.[32] This implies that equity holders want each firm to take full account of all the ways in which its actions affect the value of other firms in the economy. Such externalities could arise from a spillover of information, e.g. from R&D or from attempts to market new products. They could also arise from competitive actions that lower industry profits, such as charging a price below the monopoly price or advertising to raise own profits at the expense of industry profits. If firms do take these spillovers into account, then collusion among existing firms would become much easier since firms would not focus on how market shares are divided among the firms in the industry. Even breaking up firms through antitrust policy would prove to be ineffective.

How successfully can shareholders design the incentive package of managers to induce them to maximize aggregate profits? In order to induce managers to take into account such spillovers, shareholders want to reward managers for actions which raise the value of competing firms. As Holmstrom(1983) shows, however, when shareholders care only about own share values, the optimal compensation scheme bases the pay of managers on the firm's performance relative to that of competing firms in the industry, so penalizes the manager for raising the share values of competing firms. Had shareholders instead cared about the value of the market portfolio, then the optimal compensation scheme would impose less of a penalty for successful performance of competitors, or even some reward. In practice, Gibbons and Murphy(1989) find that the pay of managers is not affected by the performance of competing firms. This observation is much easier to understand if shareholders do indeed care about the value of the market portfolio rather than just the value of that firm's shares. However, with this pay scheme, managers have no incentive to internalize spillovers, in spite of the underlying objectives of shareholders — the principal–agent problem seems to undermine the ability of shareholders to induce managers to collude.

Ignoring tax and regulatory distortions to portfolio composition,[33] standard models also forecast that investors will invest proportionately in all risky securities, implying that

[32] Tax distortions, however, may lead high tax rate individuals to favor shares in firms with a low dividend payout rate, though these effects do not seem large. Historically, brokerage fees may have made it cheaper to invest in fewer firms, though now mutual funds should make it cheaper to invest in the market portfolio.

[33] Bank regulations, for example, allow banks to invest much more easily in debt than in equity.

they would buy in equal proportion all the securities issued by any given firm. As a result, investors would care only about total firm value, and not just about the value of equity. This suggests that the seeming importance of the conflict of interest between different classes of creditors in the U.S. arises from government policies which distort portfolio choice rather than from any more fundamental aspect of the operation of publicly traded corporations. In fact, in countries like Japan in which both corporate equity and corporate bonds are heavily owned by a few large banks, conflicts of interest between different classes of creditors seem much less important. Therefore, changes in these tax and regulatory distortions to portfolio composition may have more far reaching effects than is normally thought.

To what degree would shareholders take into account the increased government expenditures financed by each firm's tax payments? In a homogeneous country, in which shareholders are representative of the population as a whole, they would benefit equally from money the firm pays them directly and money the firm pays in taxes, which they then receive indirectly as citizens, implying that they would want the firm to maximize pre-tax profits. Even if shareholders are highly unrepresentative of the population as a whole, as in the U.S., they would value profits paid in taxes to the government to the extent that these taxes are earmarked for expenditures or personal tax reductions that favor shareholders. For example, if the overall progressivity of the tax system as traditionally measured is held fixed as a matter of policy, then extra corporate tax payments should lead to a reduction in taxes on wealthy individuals. In this case, shareholders would wish the firm to take into account the benefits they receive as a result of extra corporate tax payments. To what extent this earmarking is perceived to occur is subject to debate. In principle, such earmarking could have important effects on the behavior of publicly traded corporations.

Finally, shareholders are also customers of the firm. Ignoring this fact, the publicly traded firms within each industry, acting in the interests of their shareholders, should take full advantage of their collective market power. However, the larger the fraction of their output that is purchased by their own shareholders, the less willing they should be to exploit this monopoly power. If shareholders are primarily domestic citizens, for example,

then export-oriented firms should be more willing to exploit market power than firms that sell domestically.

All of these arguments apply only to publicly traded corporations. Since ownership of other firms is typically concentrated among very few individuals, these firms are likely to maximize share values. The model therefore predicts that publicly traded firms pursue different objectives than closely held firms. When firms change status, e.g. when they go public or when there is a leveraged buyout, their behavior would therefore be forecasted to change. As a result, this theory may explain why profits of firms that are bought out tend to rise and why profits of firms that go public tend to stagnate.

If publicly owned firms pursue different objectives than do privately owned firms, what implications does this have for public policy? The model in section 1 does not necessarily imply that publicly owned firms behave more efficiently. They may, for example, cooperate with other firms in the industry to charge a price above marginal cost. In theory, taxes or regulations could be used to encourage whatever ownership structure leads to the greatest public benefits. If these effects are important, then any analysis of policies, e.g. the corporate income tax, that may affect a firm's choice of organizational form needs to assess whether or not publicly traded corporations behave more efficiently than other firms.

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