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Complementarities in Corporate Governance: Ownership Concentration, Capital Structure, Monitoring and Pecuniary Incentives

by

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Complementarities in Corporate Governance: Ownership Concentration, Capital Structure, Monitoring and Pecuniary Incentives[*]

Abstract:
The paper shows that, as owners accumulate larger stakes and hence become less risk-tolerant, their incentives to monitor management are attenuated because monitoring shifts some of the firm's risk from management to owners. This counterbalances the positive effect which more concentrated ownership has on monitoring via reduced free rider problems. Moreover, the paper shows how the opportunity cost of concentrated ownership, which is the loss of risk-sharing benefits, creates scope to use leverage as an additional complementary governance instrument. The paper offers new explanations for several empirical regularities found in the literature.

Keywords: Corporate governance, Complementarity, Agency problem
JEL-classification: G 300, D 230

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Contents

1 Introduction

The literature on corporate governance is largely based on variants of the principal agent model of the firm. The problem of corporate governance is viewed as how to minimize the costs arising from agency conflicts at the firm level. In the standard model, asymmetric information is combined with differential tolerance towards risk to create a situation where principal and agent have to strike an imperfect balance between the optimal provision of incentives and the optimal allocation of risk. It has been customary in the literature to employ this model to study the use of a single incentive or governance instrument at a time. For instance, the model has been used to explain how managerial pay can be structured to reduce agency costs, or how the capital structure can be harnessed to this purpose, or how the firm's ownership structure influences agency costs.

What is lacking however is a *systematic* explanation of why firms typically use more than one governance instrument *simultaneously*, and what drives the choice among alternative combinations of governance instruments. Understanding these issues is of considerable importance for empirical research on corporate governance, as most research to date has been based on models which focus on a single governance instrument to the neglect of all others. These models and the empirical findings based on them start from the maintained assumption that all governance instruments that a given firm may be using are independent of eachother at the margin. Moreover, understanding the interplay between governance instruments is important for informing the policy debate about reforming corporate governance systems in the US, the European Union, and in emerging markets.

The present paper submits that governance instruments not only have benefits in terms of reducing agency costs, but also carry opportunity costs in terms of aggravating agency problems. Jensen and Meckling (1976) have argued that leverage can be used as an instrument to govern the agency conflict between management and a dispersed group of owners, but that the use of leverage is limited by the fact that it creates costly agency conflicts between owners and creditors. We follow up on this idea by showing how an additional governance instrument can be used to counterbalance the adverse effects of a first instrument. In particular, we argue that certain groups of governance instruments are Edgeworth complements: the more you use one of them, the more useful it

becomes to use the other(s) in order to counterbalance the adverse effects of the first instrument and thereby reduce its opportunity cost. The reasoning parallels Holmström and Milgrom (1994) who use the concept of Edgeworth complementarity to study the internal organization of firms. We first focus on the benefits and opportunity costs of ownership concentration and then show how the capital structure can be used to lower overall agency costs by counterbalancing the opportunity costs of ownership concentration.

The basic principal agent model takes both the degree of information asymmetry and the difference in risk aversion as given. In an important extension, Holmström (1979) endogenized informational asymmetries by introducing costly monitoring and showed how monitoring can improve the trade-off between incentive provision and insurance. But it is well known since Berle and Means (1932) that monitoring has public good characteristics and is beset by free rider problems in firms with dispersed ownership. Hence the Holmström model seems to require concentrated ownership. However, it retains the standard assumption that the principal is more tolerant towards risk than the agent, which is usually motivated with reference to the ability of shareholders to diversify their portfolios. Hence the Holmström model also seems to require dispersed ownership. It follows that standard principal agent models of the firm, which combine the assumption of differential tolerance towards risk (implying dispersed ownership) with the assumption that monitoring is not beset by free rider problems (implying concentrated ownership), are theoretically unsatisfying.

By endogenizing the degree of ownership dispersion and hence the degree of differential tolerance towards risk, we show that the standard model gives rise to a paradox. On the one hand, by concentrating ownership, incentives to monitor can be strengthened. This serves to reduce asymmetries of information. In a situation where owners have a comparative advantage in risk bearing, the optimal contract would then pay the manager a largely constant wage conditional on high effort as verified through monitoring, and the risk would be borne largely by the owners. On the other hand, concentrating ownership reduces the owners' tolerance towards risk and hence their comparative advantage in bearing it. In a situation where owners are poorly informed, the optimal contract would then call for the owners to receive largely a constant payment and the manager bearing most of the risk.

But since a shift in the concentration of ownership changes the relative tolerance for risk and the degree of free rider externalities in monitoring *at the same time*, the standard model is unable to predict unambiguously in which direction the optimal contract should change in response to a change in the

concentration of ownership. For instance, it is theoretically conceivable that a concentration of ownership would so reduce the owners' tolerance for risk that they would not be willing to insure the management anymore. Hence the additional monitoring that owners would be able to undertake in the absence of free rider problems would lose its value, since if owners are unwilling to pay the manager according to performance, rather than according to the result of his performance as affected by random noise, then measuring performance does not improve matters.

The analysis of the present paper suggests a new interpretation of recent empirical research on managerial compensation. It is frequently found that managerial compensation depends significantly on firm performance (Admati and Pfleiderer 1994, Garen 1994, Hall and Liebman 1998, Murphy 1999, Prendergast 1999). However, relative performance evaluation appears to be used hardly at all, while the standard principal agent model strongly suggests that managers ought to be rewarded for outcomes under their control and should be insured against shocks outside their control (Holmström 1982). This conclusion of the theoretical literature depends critically on owners engaging in significant monitoring activity. By showing that the opportunity cost of monitoring may be large not only in diffusely held firms but also in firms with large owners, we show that the class of firms for which the theory predicts that they should not engage in significant monitoring is larger than commonly thought.

Given that an increase in the concentration of ownership has opportunity costs in terms of destroying some of the gains from risk-sharing that would otherwise be available, the question arises what additional instruments the firm has at its disposal to minimize these costs. One complementary governance instrument that can be used to manipulate the difference in risk tolerance is the capital structure. Raising leverage makes owners more tolerant towards risk because they would be able to pass along part of the losses in bad states of nature to creditors. Thus increases in ownership concentration should go hand in hand with increases in leverage. The reason is that ownership concentration makes sense only if it leads to additional monitoring, and additional monitoring pays only if owners continue to be sufficiently more risk tolerant than managers. Thus the paper provides a new explanation for the observation that hostile takeovers (which serve to concentrate ownership and presumably to provide stronger monitoring of management) are often financed predominantly with debt. More generally, it provides a new explanation for the empirical regularity that more closely held firms often have higher levels of leverage, and that in countries where concentrated (dispersed) ownership of firms dominates, firms also tend to be more (less) highly leveraged (Berglöf 1991).

The paper is organized as follows. Section 2 introduces a standard principal-agent model of the firm and highlights the trade-off between incentives and insurance for given information asymmetry and given differences in attitudes towards risk. In Section 3, it is shown how in the standard model monitoring shifts firm risk away from the manager and towards the owner. Section 4 introduces the ownership structure as a determinant of the difference in attitudes towards risk and shows that more concentrated ownership on the one hand strengthens incentives to monitor because it allows large owners to internalize a greater fraction of the benefits of monitoring, but on the other hand weakens incentives to monitor by making large owners less tolerant towards firm risk. Section 5 argues that these two countervailing effects of changes in the ownership structure create a role for the capital structure as an additional, complementary governance instrument. Section 6 discusses the results of the present model as they relate to the existing literature, and Section 7 concludes.

2 Optimal Contract without Monitoring

For expositional purposes, we abstract from any monitoring of the manager by owners at first. This assumption can be motivated if we take the firm to be broadly held, with each small owner avoiding monitoring because of free rider problems. As is standard procedure in principal agent models, we also assume that owners are risk-neutral, an assumption which can also be motivated if we take the firm to be broadly held so that each owner can hold a well diversified portfolio.

The manager chooses an effort e at a cost C(e). The manager's effort together with a random shock determines the firm's profit $p(e,\varepsilon)$. The owner has the right to the profit. Moreover, there is a vector y of verifiable signals of the manager's effort. However, the signals are polluted by the state of nature: $y = y(e,\varepsilon)$.

The manager maximizes his utility $V = 1 - \exp\left[-r\left(w - C(e)\right)\right]$ under constant absolute risk aversion, where r is the coefficient of absolute risk aversion, and w is the manager's pecuniary reward. Let the manager's outside option, his reservation utility, be 0.

For concreteness, let the firm's profit be simply the sum of the manager's effort and the shock, and let the shock be normally distributed:

$p = e + \varepsilon$, $\varepsilon \sim N\left(0, s_{\varepsilon}^{2}\right)$.

Moreover, let the manager's cost of effort be quadratic $C(e) = \frac{e^2}{2}$.

We assume that without any monitoring, the firm's profit is the only signal of managerial performance that the owner can verifiably observe, i.e. $y = p$. Hence the only feasible contract is one where owner and manager share the profit. More generally, Holmström and Milgrom (1987) have shown that with an exponential utility function and normal errors, the optimal contract is linear in the performance signals. Let the manager's share be

(1) $w = b_0 + b_1 p = b_0 + b_1(e + \tilde{e})$,

where b_0 is a constant salary (which may be non-positive) and $0 \le b_1 \le 1$, and the owner's share

(2) $p - w = (1 - b_1)p - b_0 = (1 - b_1)(e + \tilde{e}) - b_0$.

The manager chooses his effort to maximize expected utility given the contract offered by the owner. The incentive constraint (IC) is

(3) $\frac{\partial V}{\partial e} = (-r)(b_1 - e)V = 0$

which implies that the manager picks effort

(3') $e^* = b_1$.

By contrast, maximizing the total expected surplus $e - C(e)$ (which could then be distributed in any desired way among the owner and the manager) would lead to a choice of $\tilde{e} = 1$. Hence the manager's choice coincides with the first best outcome only if $b_1 = 1$, i.e. if he gets all the profit. However, the owners choose the design variables, i.e. the parameters of the incentive contract, to maximize their own expected surplus $Ea(p - w)$ subject to the manager's individual rationality constraint (IRC) and to his incentive constraint $e = e^*$, where a is the controlling owner's stake in the firm, which we take as exogenous for the time being.

In certainty equivalent form, the manager's IRC is given by

(4) $1 - \exp\left[-r\left(b_0 + \frac{1}{2} b_1^2 \left(1 - r s_e^2\right)\right)\right] \ge 0$

Assuming that all the bargaining power resides with the owner, (4) will be binding. Solving for b_0 yields

(4') $b_0 = -\frac{1}{2} b_1^2 \left(1 - r s_e^2\right)$.

Using the IC (3') and the IRC (4'), the owner's objective can be written as

$$\max_{b_1} \quad b_1(1-b_1)+\frac{1}{2}b_1^2\left(1-rs_e^2\right).$$

The optimal contract is then characterized by

(6) $b_1^* = \frac{1}{1+rs_e^2}$ and

(7) $b_0^* = -\frac{1-rs_e^2}{2\left(1+rs_e^2\right)^2}$, and so

(3'') $e^* = \frac{1}{\left(1+rs_e^2\right)}$.

The solution highlights the crucial role of the insurance motive in the basic principal-agent model. If the manager is risk neutral, i.e. r = 0, then $b_1^* = 1$, i.e. there are no gains from insurance, it is optimal for the owner to provide full incentives, and first best is achieved. This implies that the manager gets the entire profit of the firm, after paying a fixed sum to the owner which reduces the manager's utility to his reservation level. If we interprete ownership of the firm as the title to its profits, this solution is equivalent to the manager buying the firm from the owners and thereby abolishing the agency relationship through internalization.

By contrast, if there are gains from insurance (due to differential tolerance towards risk), first best is generally not achievable, because differential tolerance towards risk would call for full insurance ($b_1 = 0$), but with full insurance, performance incentives would be zero ($e^* = 0$). Conversely, with performance incentives, the manager is automatically exposed to risk, as can be seen by looking at the variance of his pay-off which is positive for $b_1 > 0$.

Moreover, we have from equation (6) $\frac{\partial b_1^*}{\partial s_e^2} < 0$ and $\frac{\partial b_1^*}{\partial r} < 0$. Hence in the constrained-optimal design under differential tolerance towards risk, the weight given to the verifiable signal is a decreasing function of its variance. In other words, the more severe the asymmetry of information, the weaker the performance incentive. In the extreme, when the signal does not tell the owners anything about the performance of the manager, it does not make any sense to base the manager's pay-off on the signal (i.e in that case $b_1^* = 0$). The equation also shows that higher risk aversion leads to more attenuated incentives and vice versa. This means that as the difference in risk tolerance grows larger, it is optimal for the owners to provide more insurance to the manager.

In addition, the above solution shows that a more risk-averse manager will require a larger fixed salary b_0^*, and that the fixed salary will have to be higher in more noisy environments, i.e.

$$\frac{\partial b_0^*}{\partial r} > 0 \text{ and } \frac{\partial b_0^*}{\partial \sigma_e^2} > 0 .$$

It is particularly instructive to note that as firm risk σ_e^2 declines, it is optimal to reduce the fixed salary component and to raise the incentive component. The interpretation is that the fixed salary is required to compensate the risk-averse manager for being exposed to firm risk through the incentive component. The less risky the firm, the less compensation is required. In this sense, the fixed salary component can be viewed as a cost of providing performance incentives.

3 Varying Information Asymmetries: The Impact of Monitoring on the Distribution of Risk

The solution of the model of the previous section remains second-best. It strikes a compromise between the optimal provision of incentives and the optimal allocation of risk. The main reason why first best is not achieved is that information is asymmetically distributed. It is therefore natural to extend the model by endogenizing the degree of informational asymmetry. While this extension is standard fare in the literature (the pioneering paper is Holmström 1979), this section focuses on a neglected aspect, namely the consequences of better informed owners for the distribution of firm risk between owners and manager. This relationship will be used subsequently to explain the role of the ownership structure and the capital structure as additional instruments to govern the agency conflict between manager and owners.

The contract between owners and manager determines how the total pay-off of the firm is distributed between the parties. The contract has no impact on the total risk of the firm, which is given by $Varp = \sigma_e^2$. But the contract not only distributes the pay-off between the parties, it also allocates firm risk. The manager's risk is given by equation (5) above. The owners' risk is

$$(8) \qquad Var(p - w) = \left(1 - b_1^{*2}\right)\sigma_e^2 .$$

In other words, reducing the manager's risk by modifiying the contract necessarily raises the risk borne by owners and vice versa. This section looks at the impact of monitoring on this link. We now allow for monitoring by assuming

that owners can observe a second signal s of managerial performance apart from profits. Let $s = e + u$, where u is another random disturbance with $u \sim N\left(0, s_u^2\right)$. The informativeness principle (Holmström 1979) implies that the additional signal that can be obtained through monitoring should be used in the compensation contract whenever it contains additional information about managerial effort not contained in the first signal, i.e. profit. In particular, s will contain additional information if the disturbances e and u are not perfectly positively correlated.[1] The optimal contract will then feature both signals and will continue to be linear in the signals. To simplify the algebra, we assume in the following that the correlation between e and u is zero.

(9) $w_m = b_0 + b_e p + b_u s = b_0 + \left(b_e + b_u\right)e + b_e e + b_u u$.

Furthermore, we assume that monitoring entails a cost of $\frac{m}{s_u^2}$.[2] Accordingly, the owners' pay-off will be

(10) $p - w_m - M = \left(1 - b_e - b_u\right)e + \left(1 - b_e\right)e - b_0 - b_u u - \frac{m}{s_u^2}$.

The manager's maximization problem now results in an effort

(11) $e^* = b_e + b_u$.

Maximizing the owners' pay-off subject to the manager's participation and incentive constraints as before yields

(12) $b_i^* = \frac{s_j^2}{s_e^2 + s_u^2 + r s_e^2 s_u^2}$, $i, j = e, u, \quad i \neq j$, and

(13) $b_{0m}^* = -\frac{1}{2}\frac{\left(s_e^2 + s_u^2\right)\left[s_e^2 + s_u^2 - r s_e^2 s_u^2\right]}{\left(s_e^2 + s_u^2 + r s_e^2 s_u^2\right)^2}$.

These equations collapse into (6) if monitoring is not feasible, i.e. if the variance of the additional signal tends to infinity.[3] Moreover, equations (12)

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1 In the extreme, if they were perfectly negatively correlated, summing over the two signals would eliminate disturbances and would provide a perfect measure of managerial effort.

2 That is to say we measure the intensity of monitoring by the inverse of the signal's variance: the more intense the monitoring, the more precise the signal obtained. With perfect monitoring, the variance of the signal would be zero, but the cost would be infinite. Conversely, without monitoring, the variance of the signal would be infinite, and the cost would be zero.

show that the weight assigned to any signal in the manager's compensation is a declining function of the variance of the signal. The more noisy the signal, the less informative it is and the more it exposes the manager to risk, and this is why less weight is attached to it. Conversely, the weight on any one signal is an increasing function of the variance of the other signal, i.e. as one signal becomes more noisy, then the other signal is increasingly substituted for it. In the extreme, where s is a perfect signal, i.e. $s_u^2 = 0$, equations (12) say that the manager's contract should be based only on s (which in this case perfectly measures the manager's performance), and not at all on the result of his performance, p.

To see the impact of (imperfect) monitoring on the distribution of risk between owners and manager, we compare the variances of their respective pay-offs with and without monitoring. With monitoring, the variance of the owners' pay-off is

(14) $$Var(p - w_m) = \left(1 - b_e^*\right)^2 s_e^2 + b_u^{*2} s_u^2.$$

Without monitoring by contrast, the variance of the owners' pay-off is given by

(15) $$Var(p - w) = \left(1 - b_1^*\right)^2 s_e^2.$$

Subtracting (15) from (14) and considering that the second term on the RHS of (14) is always positive, a sufficient condition for the variance to be higher with monitoring than without is

(16) $$b_1^* > b_e^*.$$

It is straightforward to prove that this condition is always met:

$$b_e^* = \frac{s_u^2}{s_e^2 + s_u^2 + r s_e^2 s_u^2} < \frac{s_u^2}{s_u^2 + r s_e^2 s_u^2} = \frac{s_u^2}{s_u^2\left(1 + r s_e^2\right)} = \frac{1}{1 + r s_e^2} = b_1^*.$$ QED.

It is equally straightforward to show that monitoring reduces the variance of the manager's pay-off.

Hence, monitoring indeed results in firm risk being shifted from the manager to the owners. Economically, this is as expected. The increase in the risk borne by owners is a direct *and intended* consequence of monitoring. The purpose of monitoring is to reduce the degree of information asymmetry between manager

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[3] That $\lim_{s_u^2} b_u^* = 0$ is immediate from (12). $\lim_{s_u^2} b_e^* = \lim_{s_u^2} \frac{s_u^2}{s_e^2 + s_u^2\left(1 + r s_e^2\right)} = \frac{1}{1 + r s_e^2}$ by L'Hôpital's rule.

and owners, and thereby to enable owners to tailor the manager's pecuniary reward more closely to actual performance rather than to profits. And the motivation for doing so is to be able to shield the manager from some of the risk without compromising performance incentives. Hence the result of monitoring should be to reduce the weight placed on profit relative to the situation without monitoring.

Also, monitoring adds value overall in that the firm's expected profit stream is larger than without monitoring.

$$Ep_m^* - Ep^* = e_m^* - e^* = b_e^* + b_u^* - b_1^* = \frac{rs_e^2}{\left(1+rs_e^2\right)\left[s_e^2 + s_u^2 + rs_e^2 s_u^2\right]} > 0 .$$

However, the owner will monitor only if the cost of doing so is offset by the additional pay-off accruing to him. Monitoring benefits come from two sources, (i) from the higher overall expected profit stream, and (ii) from the lower risk premium the owner has to pay the manager. Optimal monitoring requires

$$(17) \qquad \frac{\partial E\left[(p-w) - \frac{m}{s_u^2}\right]}{\partial s_u^2} = 0$$

$$\Rightarrow s_u^{2*} \in \left\{ \frac{s_e^2\left[2m\left(1+rs_e^2\right) \pm s_e^2\sqrt{2mr}\right]}{rs_e^4 - 2m\left(1+rs_e^2\right)^2} \right\}$$

The shareholder's pay-off as a function of monitoring is depicted in Graph 1. The bold line shows a situation where (17) has a positive - and hence feasible - solution. The broken line shows a situation where (17) does not have a solution, i.e. where there is no interior optimum. In this case, the shareholder's pay-off is maximized at an infinite variance of the signal, i.e. it is optimal not to engage in any monitoring at all. We can derive the necessary and sufficient condition for some monitoring to be optimal as

$$(18) \qquad \frac{1}{2}\frac{rs_e^4}{\left(1+rs_e^2\right)^2} > m .^4$$

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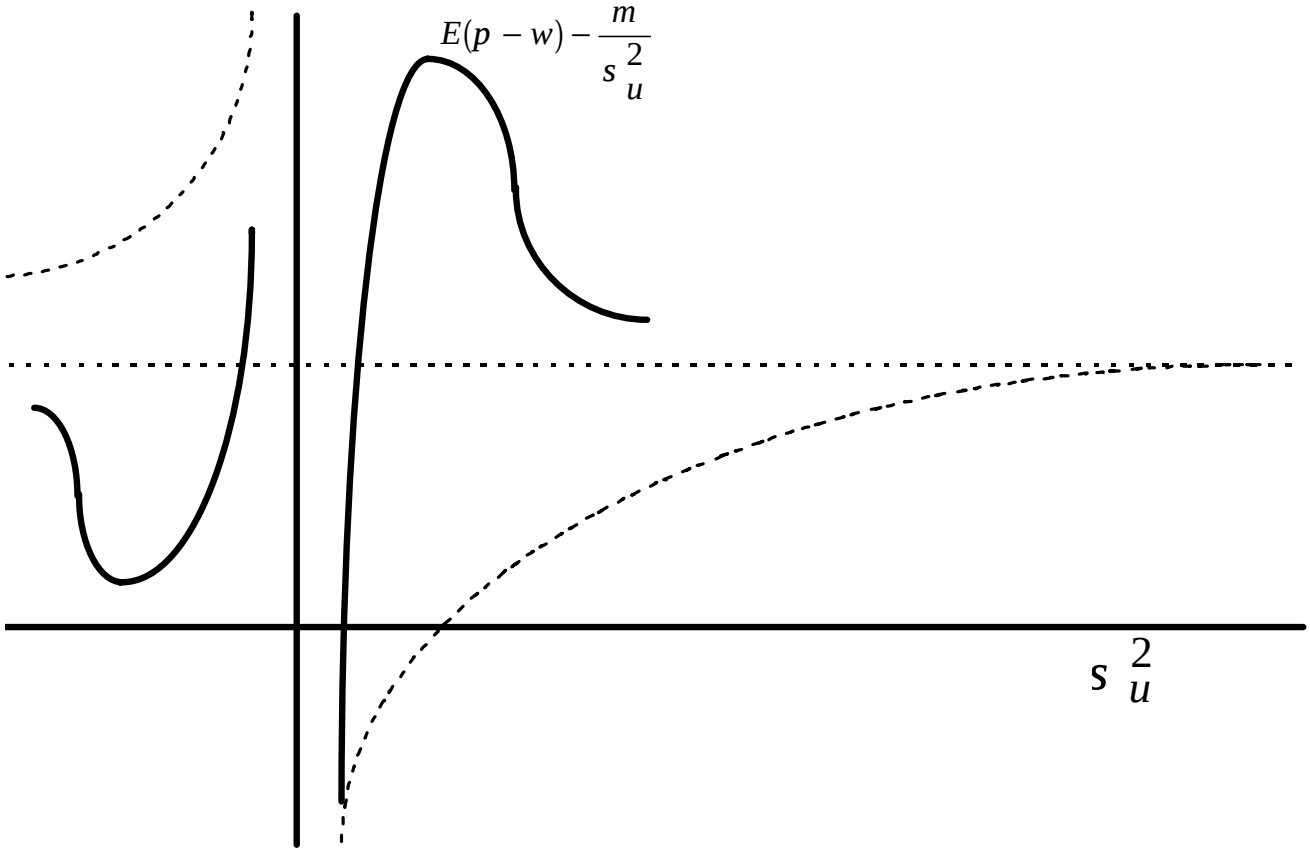
4 To see that (18) is sufficient and necessary for the existence of an interior solution first observe that s_u^2 is non-negative by definition. It follows that for any feasible interior solution of (17), the numerator and denominator must be of the same sign. The numerator can always be made positive by considering the „+"-solution. Hence for an interior solution to exist, it is sufficient that the denominator be positive. As is readily seen, (18) is the (necessary and sufficient) condition for this to be the case. This completes the sufficiency part of the proof. The necessity part is obtained by assuming that a feasible interior solution exists without (18) being satisfied and deriving a contradiction. If (18) did

Thus, monitoring will not be undertaken if its marginal cost is too high or if firm risk is too low.

Graph 1 — Expected shareholder pay-off as a function of (the inverse of) monitoring



Assuming that (18) is satisfied and monitoring is undertaken, then from (17) the (inverse of the) optimal level of monitoring is

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not hold, the denominator would be non-positive, and hence a feasible interior solution could exist only if the numerator was negative. The (necessary and sufficient) condition for this to be the case is $2m\left(1+rs_e^2\right)-s_e^2\sqrt{2mr}<0$. But if the denominator is non-positive (i.e. (18) does not hold), then $2m\left(1+rs_e^2\right)-s_e^2\sqrt{2mr}\geq rs_e^4-\frac{rs_e^4}{1+rs_e^2}>0$ which contradicts the condition for the numerator to be negative. This completes the necessity part of the proof.

$$(19) \qquad s_u^{2*} = \frac{s_e^2\left[2m\left(1+rs_e^2\right)+s_e^2\sqrt{2mr}\right]}{rs_e^4-2m\left(1+rs_e^2\right)^2}.$$

Straightforward but somewhat tedious manipulations (see appendix) show that the optimal level of monitoring is decreasing in monitoring costs and increasing in overall firm risk, as expected.

So monitoring is a way for owners to better exploit the differences in risk tolerance that exist between them and the manager. The purpose of monitoring is to shift risk from the risk-averse manager to the less risk-averse owners without compromising managerial performance incentives. In so doing, monitoring lowers the costs to the owners of providing performance incentives.

4 Varying Differences in Risk Tolerance: The Impact of the Ownership Structure

So far we have followed the standard literature in assuming that there is either only one owner or that owners form a homogeneous group not beset by collective action problems so that free riding on the monitoring efforts of others is not an issue. Moreover we have followed standard procedure by assuming that owners are risk-neutral. In this section we demonstrate that these two assumptions of the standard literature are in conflict with each other. We then take advantage of this conflict to motivate the roles of ownership structure and capital structure as additional governance instruments.

To this end, we now consider a particular owner holding a fraction a of the firm's equity. Assuming that this owner engages in monitoring, his expected pay-off then is

$$(20) \qquad a\,E(p-w_m)-\frac{m}{s_u^2}\,.^5$$

Note that the owner bears the full cost of his monitoring activity but shares in the firm's profit only in line with his ownership stake. Clearly, the same

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5 More exactly, we discuss the behavior of a particular owner *under the assumption that no other owners engage in monitoring*. To the extent that different owners would be able to collect different pieces of information on the performance of the manager, and hence to the extent that monitoring by more than one owner would make sense, the model therefore would have to be interpreted as discussing the trade-offs facing all monitoring owners as a group.

managerial contract which maximizes (10) above also maximizes (20). Hence a risk-neutral owner, caring only about his expected pay-off, would choose his ownership stake according to

$$(21) \qquad \frac{\partial}{\partial a} E\left[a(p - w_m) - \frac{m}{\sigma_u^2} \right] = 0 \Leftrightarrow \frac{1}{2} \frac{\sigma_e^2 + \sigma_u^2}{\sigma_e^2 + \sigma_u^2 + r\sigma_e^2 \sigma_u^2} = 0,$$

where (12) and (13) have been used.

Since the LHS is always positive, this implies that a risk-neutral owner would choose the maximum feasible ownership stake, i.e. 100 percent. This result is not surprising since in this scenario, ownership concentration would be costless, whereas ownership dispersion carries the cost of creating externalities of monitoring. This is why the twin assumptions of costly monitoring and risk-neutral owners logically imply concentrated ownership.

However, risk-neutrality is usually justified by arguing that owners hold well-diversified portfolios. More exactly, the risk neutrality assumption is really a lapse of language based on the assumption that the representative owner holds a tiny stake in the firm. What is actually meant is that the objective function of a risk-*averse* owner holding a tiny fraction of the firm is (almost) *observationally equivalent* to the objective of a risk-neutral owner.

To see this, consider a risk-averse owner holding a fraction a of the firm. Let his utility function be $U = -\exp\left(-r_o \left[a(p - w_m) - \frac{m}{\sigma_u^2} \right] \right)$ where r_o is the owner's degree of absolute risk aversion.

Then his certainty equivalent is

$$(22) \qquad a\, E(p - w_m) - \frac{m}{\sigma_u^2} - \frac{1}{2} r_0 a^2 Var(p - w_m),$$

where the first two terms capture the expected pay-off, and the last term is the risk premium reflecting the owner's aversion to risk. Now in the limit as the ownership stake a tends to zero, the risk premium vanishes „faster" than the expected pay-off, and so the certainty equivalent tends to the expected pay-off. Hence for arbitrarily small ownership stakes, the risk-averse owner's behavior approximates the behavior of a risk-neutral owner arbitrarily closely. This demonstrates that the assumptions of risk-neutrality and perfect ownership

concentration contradict each other, and that a meaningful model of costly monitoring must allow for risk-averse owners explicitly.[6]

The consequence of incorporating owner risk aversion into the model is that the representative owner no longer maximizes his expected pay-off (10), but its certainty-equivalent (21). As a result, the optimal managerial contract will no longer be given by (12) and (13).

With the fairly general monitoring technology of the previous section, introducing owner risk aversion and an endogenous ownership structure quickly makes the model highly unwieldy. We therefore simplify now by assuming that the owner only has the choice between not monitoring at all or monitoring at a specific level of intensity, rather than choosing, as before, from a continuum of possible monitoring levels. We assume that monitoring, if it is undertaken, will be perfect, i.e. the signal obtained perfectly reveals the manager's choice of effort ($s = e$). Accordingly, the cost associated with monitoring is now fixed at M.

The manager's optimal choice of effort is unaffected by the owners' risk tolerance for a given contract and is given by (3). For a given ownership structure a, and assuming for the time being that monitoring is profitable, the owner maximizes his certainty equivalent utility subject to (3), and to the manager's individual rationality constraint as before. The owner's certainty equivalent is

$$(23) \quad CE_o = a\left(b_1 - \frac{1}{2}b_1^2\right) - M - \frac{1}{2}r_o a^2 s_e^2 .$$

A higher ownership stake a is seen to have two countervailing effects on the owner's certainty equivalent under risk aversion and monitoring. It raises the owner's gross expected pay-off and thereby increases the revenue available to defray monitoring costs. At the same time, a higher ownership stake exposes the owner to more of the firm's idiosyncractic risk and hence reduces the owner's utility via a higher risk premium in the certainty equivalent.

Maximization of (23) yields the following contract:

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[6] Relaxing the risk-neutrality assumption obviously begs the question why there should be an agency relationship at all since agency conflicts are typically based on information asymmetry and comparative advantages in risk bearing. There are two answers to this objection. First, even when allowing owners to be risk-averse, we may still constrain them to be less risk-averse than the manager, thereby preserving comparative advantages in risk bearing. Second, we may assume that the manager is wealth-constrained so that an agency relationship is supported by comparative advantages in financing rather than in risk bearing.

(24a) $b_1'^{*} = 1$ and

(24b) $b_0'^{*} = -\frac{1}{2}$.

Hence perfect monitoring induces the manager to choose the first best level of effort *e = 1*. Taking the ownership stake as exogenous for the time being, the corresponding pay-off is

(25) $\frac{a}{2}\left(1 - a\, r_O s_e^{\,2}\right) - M$.

But ex ante, the owner will decide to monitor only if his certainty equivalent pay-off with monitoring exceeds what he could obtain without monitoring. Considering that the only benefit of concentrated ownership is that it allows a controlling owner to internalize monitoring benefits, the optimal ownership structure without monitoring is perfectly dispersed. Moreover, we have seen above that dispersed owners behave like risk-neutral owners. Hence the relevant benchmark for the decision whether or not to monitor is the case of risk-neutrality which we first considered in Section 2.

Comparing the entire pay-off of the firm under risk neutrality and without monitoring to the certainty equivalent pay-off of a monitoring owner as established in (21) would be inappropriate, though, because a representative owner in the benchmark case would have far less of his wealth tied up in the firm (while all owners together would have invested more than the optimal stake of a risk-averse monitoring owner). Therefore, the appropriate comparison is between a risk-averse monitoring owner having invested a share of a of his wealth in the firm (and the rest in the market portfolio), and a non-monitoring owner having invested (almost) nothing in the firm and (almost) all of his wealth in the market portfolio. But in order to attract any capital, the unmonitored widely-held firm will have to offer to owners at least the market rate of return. [7] Taking the return to an unmonitored firm as the market return, we have to compare the pay-off to the monitoring owner on his stake of size a to the pay-off of a stake of size a in an unmonitored firm.

For this reason, an investor will decide to acquire a large stake and to monitor iff

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[7] This assumes that if it does not pay to monitor the firm under consideration, then it also does not pay to monitor other firms. If there were other firms available which had a monitoring owner, then investors could free ride on these monitoring efforts and presumably could obtain a higher return than in the unmonitored firm.

(26) $$\frac{a}{2}\left(1 - a\, r_O s_e^2\right) - M \geq \frac{a}{2}\frac{1}{1 + r\, s_e^2},$$

where the RHS is the pro rata pay-off of a risk-neutral owner without monitoring. After rearranging we have

(26') $$\frac{a}{2}\left(\frac{r\, s_e^2}{1 + r\, s_e^2} - a\, r_O s_e^2\right) \geq M.$$

Inter alia, (26') shows that monitoring will never occur if the owner is highly risk-averse. Differentiating the LHS with respect to the ownership stake a gives us the impact of a change in the ownership stake on the monitoring decision.

(27) $$\frac{1}{2}\left(\frac{r\, s_e^2}{1 + r\, s_e^2} - 2a\, r_O s_e^2\right).$$

Since the sign of (27) is a priori indeterminate, the impact of an increase in ownership concentration on the monitoring decision is indeed ambiguous. In particular, more concentrated ownership will weaken monitoring incentives if the ownership stake is already very high, or if the owner is very risk-averse. Thus the adverse effect of ownership concentration on the owner's exposure to firm risk may indeed discourage monitoring.

We now endogenize the ownership structure by allowing the owner to optimize over it. With monitoring, the owner chooses his optimal ownership stake according to

(28) $$\frac{\partial CE_O}{\partial a} = 0 \Rightarrow a^* = \frac{1}{2 r_O s_e^2}.$$ [8]

It follows that more risk-averse owners will choose to hold smaller stakes, and risk averse owners will choose to hold smaller stakes in more risky firms. Plugging equations (24) and (28) into (23), we obtain the owner's certainty-equivalent pay-off under risk aversion and with monitoring as

(29) $$CE_{O,M} = \frac{1}{8 r_O s_e^2} - M.$$

Now the condition for monitoring to be optimal will be

(30) $$\frac{1}{8 r_O s_e^2} - M \geq \frac{1}{2 r_O s_e^2}\frac{1}{2}\frac{1}{1 + r s_e^2},$$

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[8] It should be noted that we have abstracted from potential private benefits of control which would introduce an additional agency conflict between controlling and minority shareholders. Allowing for private benefits of control would generate a further constraint on the optimal stake of the monitoring owner.

where the LHS is the maximal certainty-equivalent of a monitoring owner, and the RHS is the return of investing the same capital into unmonitored firms. It follows that the necessary and sufficient condition for monitoring to occur is

$$(31) \qquad M \le a^{*}\left(\frac{1}{4}-\frac{1}{2}\frac{1}{1+r\mathbf{s}_e^2}\right)=\frac{1}{4r_0\mathbf{s}_e^2}\left(\frac{1}{2}-\frac{1}{1+r\mathbf{s}_e^2}\right).$$

As expected, if the manager is more risk averse, monitoring tends to become more attractive (as it offers a relatively cheaper way of providing incentives to management), whereas if the owner is more risk averse, monitoring tends to become less attractive (as it exposes the owner to more risk). Moreover, higher monitoring costs tend to discourage monitoring and thereby also discourage concentrated firm ownership. However, differentiating the RHS of (31) with respect to firm risk yields an effect of unclear sign.

$$(32) \qquad \frac{\partial}{\partial \mathbf{s}_e^2}\frac{1}{4r_0\mathbf{s}_e^2}\left(\frac{1}{2}-\frac{1}{1+r\mathbf{s}_e^2}\right)=\frac{1}{4r_0}\left[\frac{1+2r\mathbf{s}_e^2}{\left(\mathbf{s}_e^2\left(1+r\mathbf{s}_e^2\right)\right)^2}-\frac{1}{2\mathbf{s}_e^2}\right]$$

The ambiguity is due to the fact that higher firm risk has two countervailing effects on the owner's incentives to monitor. On the one hand, higher firm risk raises the cost of providing performance incentives to management via profit sharing, thereby encouraging monitoring as a way to provide incentives to management which are not tied to profits. But on the other hand, higher firm risk discourages monitoring because it reduces the certainty-equivalent pay-off of a risk-averse owner who, in order to internalize the gains from monitoring, would have to hold a significant stake in the firm.

There are a number of empirical papers which document that firm risk is an important variable explaining the strength of profit incentives found in executive contracts (i.e. the size of b_e). However, these papers invariably find little evidence of relative performance evaluation (Aggarwal and Samwick 1999, Garen 1994, Hall and Liebman 1998, Murphy 1999, and Prendergast 1999). The authors interpret this as being in conflict with the predictions of the standard agency model which holds that managers should ideally be paid for their performance, over which they have control, while being insured from economy-wide or industry-wide shocks outside their control (Holmström 1982). Our theory points to a possible explanation for this finding. As we have shown, providing insurance against shocks outside the management's control is possible only if ownership remains dispersed, in which case however, monitoring (as a basis for relative performance evaluation) may not be undertaken due to free rider problems. At the same time, with more concentrated ownership, monitoring may not be undertaken and the manager's contract may not be based on relative

performance evaluation because owners, being risk-averse, prefer not to insure management.[9]

5 The Capital Structure as a Complementary Governance Instrument

Given that with risk-averse owners, monitoring is not only limited by externality problems (which ownership concentration could overcome), but also by risk-sharing problems, we now ask how the negative effect of ownership concentration on monitoring incentives, which is at the root of the problem, might be neutralized. The idea here is similar to the literature on optimal job design in organizations (Holmström and Milgrom 1991, Holmström and Milgrom 1994). In that literature, several tasks compete for the agent's limited attention. Incentives geared towards encouraging efforts directed at one of the tasks come at the opportunity cost of diverting effort from other tasks. Hence when it is optimal to strengthen one incentive, it tends to become optimal to also strengthen others in order to avoid undesirable substitution effects between several tasks. In this sense, incentives for various tasks can be complementary.

Applied to our present case, we have seen in the previous section that increasing ownership concentration, while having the benefit of reducing monitoring externalities, comes at the opportunity cost of making the owner less tolerant towards risk and therefore less inclined to use information obtained via monitoring. Hence it may be valuable for the firm to use an additional governance instrument to counteract the risk-shifting effect of ownership concentration. The present paper proposes changes in the capital structure as a way to achieve this. Specifically, it has been recognized that higher leverage

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[9] Our argument does not go through if relative performance evaluation can be achieved by basing managerial pay on excess firm returns relative to a market portfolio. Since information on market returns is available real-time at trivial cost, even dispersed owners should have incentives to use this information. Therefore the conflict between concentrating ownership to cover monitoring costs and diversifying portfolios to insure against risk does not arise in this case. However, stock options indexed to a market return carry significant tax penalties in the US. This discourages the use of relative performance evaluation based on stock options (Murphy 1999). The alternative is to base relative performance evaluation on accounting variables. But in this case, the costs of accumulating the necessary benchmark information on a timely basis is very considerable, and internalization-insurance trade-offs can help explain why relative performance evaluation is not observed more frequently.

allows owners to share the downside risk of the firm with creditors, without forcing them to share the upside risk (see e.g. Jensen and Meckling 1976). This suggests that increases in leverage can be used to balance the risk-shifting effects of increases in ownership concentration.

In order to discuss the impact of the capital structure on monitoring incentives, we introduce a further simplification by assuming that the random shock influencing firm profits is dichotomous rather than normally distributed.

$$(33) \qquad e = \begin{cases} \bar{e} \text{ with } \bar{p} \\ \underline{e} \text{ with } 1-\bar{p} \end{cases}$$

In a firm financed fully with equity, the shareholder's pay-off with monitoring then is

$$(34) \qquad a\,(p-w)_M - M = \begin{cases} a\left(\bar{e}+\frac{1}{2}\right) - M \text{ with } \bar{p} \\ a\left(\underline{e}+\frac{1}{2}\right) - M \text{ with } 1-\bar{p} \end{cases}$$

with mean $E\left[a\,(p-w)_M - M\right] = \frac{1}{2} - M$.

The change in the underlying distribution of the random shock does not affect the solution. The corresponding certainty equivalent is $\frac{a}{2}\left(1 - a\,r_O s_e^{\,2}\right) - M$ as before. It follows that the optimal ownership stake is also $a^* = \frac{1}{2r_O s_e^{\,2}}$ as before.

Without monitoring, the owner's pay-off is

$$(35) \qquad a\,(p-w)_N = \begin{cases} a\,\frac{1}{1+r s_e^{\,2}}\left(\frac{1}{2}+\bar{e}\right) \text{ with } \bar{p} \\ a\,\frac{1}{1+r s_e^{\,2}}\left(\frac{1}{2}+\underline{e}\right) \text{ with } 1-\bar{p} \end{cases}$$

with mean $E\,a\,(p-w)_N = \frac{a}{2}\frac{1}{\left(1+r s_e^{\,2}\right)}$, again as before.

The condition for monitoring to occur is of course also the same as before. The owner will be indifferent between monitoring and not monitoring iff

$$(36) \qquad M = \frac{1}{4r_0 s_e^{\,2}}\left(\frac{1}{2} - \frac{1}{1+r s_e^{\,2}}\right).$$

Now suppose the firm is not financed fully with equity, but with a combination of debt and equity. Specifically, assume the firm requires an investment of K. Then without any leverage, the owner has wealth $a\,K$ tied up in the firm. Now suppose instead that he takes on outside debt in the amount of D. Then an equity

stake of a corresponds to an investment of $a\,(K-D)$, thus freeing an amount of $a\,D$ of the owner's wealth for investment in some safe asset with return s. Let the debt service payment due at maturity be $(1+i)D$ where i is the unit cost of (risky) debt and $i > s$. Clearly, if the debt service is such that it can be paid with probability 1 regardless of whether monitoring is undertaken or not, then the introduction of debt will not change the monitoring decision. By contrast, if the payment due on the debt is larger, such that due to limited liability expected gross pay-offs and their variances are affected, then the monitoring decision will be affected as well.

Assume that $\underline{e} + \frac{1}{2} < 0$.[10] Then for any positive level of debt we have $(1+i)D > 0 > \frac{1}{1+r\,s_e^{\,2}}\left(\underline{e} + \frac{1}{2}\right) > \underline{e} + \frac{1}{2}$, and so limited liability reduces the firm's profit in the bad state of nature to zero with and without monitoring.

Then with monitoring, the optimal stake of the monitoring owner is

$$a = \frac{\overline{p}\left[\overline{e} + \frac{1}{2} - (1+i)D\right] + (1+s)D}{\overline{p}^{\,2} r_O s_e^{\,2}}, \tag{37}$$

and the certainty equivalent of the monitoring owner is

$$CE_O = \frac{\overline{p}\left[\overline{e} + \frac{1}{2} - (1+i)D\right] + (1+s)D}{\overline{p}^{\,2} r_O s_e^{\,2}} \left\{\overline{p}\left[\overline{e} + \frac{1}{2} - (1+i)D\right] + (1+s)D - \frac{1}{2}\right\} - M. \tag{38}$$

The benchmark pay-off of a representative owner without monitoring then is

$$E\,a\,(p-w)_N = \frac{\overline{p}\left[\overline{e} + \frac{1}{2} - (1+i)D\right] + (1+s)D}{\overline{p}^{\,2} r_O s_e^{\,2}} \cdot \left\{\overline{p}\left[\frac{1}{1+r s_e^{\,2}}\left(\overline{e} + \frac{1}{2}\right) - (1+i)D\right] + (1+s)D\right\}. \tag{39}$$

Hence the difference between the pay-offs with and without monitoring is

$$CE_O - E\,a\,(p-w)_N = \frac{\overline{p}\left[\overline{e} + \frac{1}{2} - (1+i)D\right] + (1+s)D}{\overline{p}^{\,2} r_O s_e^{\,2}} \cdot \left\{\overline{p}\left(\overline{e} + \frac{1}{2}\right)\frac{r s_e^{\,2}}{1+r s_e^{\,2}} - \frac{1}{2}\right\} - M \tag{40}$$

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[10] An analogous argument can be constructed for the other cases.

Now suppose that in the absence of leverage, owners would have been indifferent between monitoring and not monitoring. Then combining (36) and (40) we have

$$CE_O - E\,a\,(p-w)_N = \frac{\overline{p}\left[\overline{e}+\frac{1}{2}-(1+i)D\right]+(1+s)D}{\overline{p}^{\,2}r_O s_e^{\,2}} \left\{\overline{p}\left(\overline{e}+\frac{1}{2}\right)\frac{rs_e^{\,2}}{1+rs_e^{\,2}}-\frac{1}{2}\right\}-\frac{1}{4r_0 s_e^{\,2}}\frac{rs_e^{\,2}-1}{2\left(1+rs_e^{\,2}\right)} \tag{41}$$

Clearly, there will be parameter combinations for which taking on debt will make monitoring worthwhile. As an illustration, assume that $\overline{p}\left(\overline{e}+\frac{1}{2}\right)=1$. In this case, (41) reduces to

$$\left[\frac{\overline{p}\left[1-(1+i)D\right]+(1+s)D}{\overline{p}^{\,2}r_O s_e^{\,2}}-\frac{1}{4r_0 s_e^{\,2}}\right]\frac{rs_e^{\,2}-1}{2\left(1+rs_e^{\,2}\right)} \tag{41'}$$

which will be positive if

$$4\left(\overline{p}\left[1-(1+i)D\right]+(1+s)D\right)-\overline{p}^{\,2}>0\,. \tag{42}$$

Thus, for sufficiently high riskless returns, or for sufficiently low costs of risky debt,[11] leveraging the firm will encourage monitoring beyond the point which would be optimal without leverage. There are two channels through which leverage strengthens the incentives to monitor. First, leverage introduces an additional investor who will share in the downside risk of the firm. As a consequence, the owners' incentives are distorted towards raising the amount of risk borne by all investors together by reducing the amount of risk borne by the manager. Second, comparing equations (37) and (28) reveals that if condition (42) holds, the optimal ownership stake of the monitoring owner will be larger in a leveraged firm than in a firm financed fully with equity. I.e. by shifting risk to creditors, leverage also encourages owners to take on larger stakes in the firm and enables them to internalize more of the benefits of monitoring.

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[11] The costs of risky debt inter alia include agency costs which arise precisely from the fact that creditors prefer the firm to invest into relatively safe projects, while leverage encourages owners to invest into more risky projects. While overall firm risk is exogenous in the present model, and hence the agency costs of debt can be ignored, allowing owners to control firm risk would introduce a trade-off between governing the agency conflict between owners and manager, and governing the agency conflict between owners and creditors (Heinrich 1999).

Summing up the discussion, we have used the fact that monitoring necessarily exposes owners more strongly to the risk of the firm to focus attention on a trade-off which has so far been ignored in the literature on optimal managerial incentives. This trade-off is between the internalization benefits for monitoring owners of holding large stakes, and the attendant cost of foregone risk diversification which discourages owners from taking on more firm risk through monitoring. We have used this trade-off to show that accumulating a larger ownership stake does not necessarily strengthen monitoring incentives because it makes owners more sensitive to firm risk. Finally, we have shown how financial leverage can be used to reduce the costs of concentrated ownership and thereby reduce the opportunity cost of monitoring.

The theory advanced in this paper therefore predicts that empirically, firms which rely mostly on pecuniary incentives tied to firm value, rather than on incentives tied to performance measures obtained through monitoring, will tend to have dispersed ownership structures and low leverage, whereas firms which rely more heavily on monitoring, and hence tie pecuniary incentives less strongly to firm value, will tend to have more concentrated owneship structures and will be more highly leveraged.

Moreover, our theory is able to generate testable hypotheses on how observed governance solutions should vary systematically with variations in parameters such as the cost of monitoring, the cost of risky debt, the return on riskless assets, and idiosyncratic firm risk. Thus our model ties in with recent empirical work on the legal determinants of financial structure (La Porta et al. 1997, 1998a, 1998b) which argues that different national legal and regulatory systems differ widely in the degree of protection they afford outside investors, and in the information they require firms to disclose to investors. On a policy level, our theory offers a handle on the effects which legal and regulatory reforms which affect the costs of monitoring, or the cost of risky debt might have on corporate governance.

6 Discussion of the Related Literature

In their seminal paper, Jensen and Meckling (1976) discuss the role of increased leverage in softening the agency problems generated by dispersed ownership. However, they abstract from monitoring and pecuniary incentives for management. Instead their point is simply that financing the firm with debt obviates the need to bring in outside shareholders. Zhang (1998) has a model

where the agency conflict between a large, risk-averse controlling shareholder and risk-neutral minority shareholders over whether to undertake risky investment projects can be mitigated by issuing debt. The effect of the debt is to make the controlling large shareholder more tolerant towards risk. Similar to the present paper, one of the predictions of Zhang is that leverage should increase with controlling ownership. The present paper is different, though, in that it considers the conflict between shareholders and management rather than between controlling and minority shareholders, that monitoring targets managerial effort rather than the quality of investment projects, and that accordingly it generates testable hypotheses about the impact of ownership structure and capital structure on management pay, which is outside the scope of Zhang (1998).

In contrast to the present paper, Inderst and Müller (1999) argue that dispersed ownership can be a device for shareholders to commit not to interfere with management and thereby to commit not to induce the firm to undertake excessively risky projects. As a result, the agency costs of debt will be lower than with concentrated ownership, and presumably the degree of leverage in the firm will be higher. The difference to our result is due to the fact that Inderst and Müller assume that shareholders are always risk-neutral regardless of the ownership structure. If they allowed for shareholder risk aversion, ownership concentration itself would serve to more closely align the interests of shareholders with those of creditors and would thereby reduce the agency conflict of debt. Similarly, Brander and Poitevin (1992) argue that a suitably designed managerial compensation contract can reduce the agency cost of debt by deliberately not aligning managerial interests with shareholder returns. However, their paper does not consider agency conflicts between owners and managers, assumes that all parties are risk-neutral, does not consider the ownership structure, and abstracts from monitoring.

Huddart (1993) has a model with precisely the conflict addressed in the present paper. Monitoring is valuable because it allows more precise measurement of managerial effort and better incentives. But monitoring is a public good that requires concentrated ownership if underprovision is to be avoided, and concentrated ownership forces the large owner to bear more idiosyncratic firm risk. However, in Huddart (1993) there is no extension to the consideration of additional governance instruments that can improve the trade-off. Hence the paper does not generate any hypotheses on the impact of the capital structure on other governance instruments. In contrast to the present paper, Jaditz (1992) argues that gains from closer monitoring will compensate a large shareholder for the increased financial risk of a poorly diversified portfolio. The different result

is due to the fact that the effect of monitoring in Jaditz (1992) is to directly reduce the idiosyncratic risk of the firm whereas in the present paper monitoring reduces the variance of the relevant signal about managerial effort but leaves firm risk unchanged. Hence in the Jaditz model monitoring would not have any opportunity cost in terms of exposing owners to more risk.

Admati et al. (1994) discuss the trade-off between monitoring and insurance and the fact that concentrated ownership may be necessary to avoid free-rider problems of monitoring, but dispersed ownership may be required to achieve optimal risk sharing. They study under which conditions financial markets will produce the optimal ownership structure. Usually, efficiency will be missed because of free rider problems of monitoring. Typically, there will be not enough risk sharing; moreover there may be too little, or the wrong kind of monitoring. However, the paper is not about insurance of management by owners, but about owners gaining insurance through portfolio diversification. Accordingly, pecuniary incentives for management are not considered. Moreover the paper does not consider debt as an additional device to optimize along the insurance-monitoring trade-off.

Finally, Meran (1992) tries to explain differences in leverage across firms by measures of ownership structure, monitoring intensitiy and executive performance incentives. The idea is that executives choose the capital structure and that the governance instruments are used to provide incentives for them to choose that capital structure which is optimal from the owners' point of view. Without incentives, executives would choose too little leverage because they are too risk-averse due to the fact that most of their human capital is tied up in the firm. By contrast, in the present paper owners choose the capital structure and use it as an instrument to govern the conflict arising from the separation of ownership from control. Another major difference is that in Meran's empirical specification, all variables enter linearly. Hence the implicit assumption is that the variables are independent of eachother in the Edgeworth sense.[12] By contrast, the model set out in the present paper would predict significant interaction terms in regressions of corporate performance on corporate governance instruments. Consistent with the theory advanced in the present paper, Meran finds a positive association between leverage and ownership concentration in US data. However,

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[12] I.e. the marginal impact of any one governance instrument (ownership structure, monitoring, pecuniary incentives) on leverage is independent of the level of the other governance instruments.

the - non-interacted - link between managerial profit incentives and leverage is found to be negative.[13]

7 Conclusions

The present paper focuses on the counterveiling effects which an increase in the concentration of shareholdings of a firm may have on the monitoring incentives of owners. On the one hand, larger ownership stakes imply that owners can internalize more of the returns to monitoring. This effect tends to encourage monitoring. On the other hand, larger ownership stakes imply that owners' portfolios are less well diversified and that owners are more exposed to firm-specific risk. This effect tends to encourage owners to shift firm risk towards the firm's manager and hence discourages owners from monitoring. Hence the overall effect of ownership concentration on monitoring is theoretically ambiguous. The presence of these two countervailing effects can explain why empirical studies frequently find that owners engage in less monitoring than would be expected on the basis of the standard principal-agent model.

However, the adverse effect of ownership concentration on the incentives to monitor can be mitigated by suitable adjustments in the firm's capital structure. Higher leverage tends to make owners more risk-tolerant. Therefore higher leverage can be used to maintain sufficiently large gains from risk sharing between owners and manager in the face of more concentrated ownership and hence to strengthen the owners' incentives to monitor. The theory advanced in the present paper thus predicts that cross-sectional studies of the link between ownership concentration and monitoring, or between ownership concentration and the structure of managerial incentives will be more successful when controlling for firm leverage. Moreover, the theory provides a novel explanation for the empirical regularity that takeover transactions, which are designed to increase ownership concentration, are usually highly leveraged. More generally,

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[13] In a similar vein, Brailsford et al. (1999) use Australian data to estimate the links between ownership concentration, managerial share, and ownership leverage. Like Meran (1992), they interprete leverage not as a governance instrument but as a sort of performance measure. They find a positive association between ownership concentration and leverage, but find that beyond a certain threshold, managerial ownership weakens the link.

our paper contributes to the literature on optimal capital structure[14] by providing a new rationale for the link between ownership structure and capital structure.

Moreover, our theory gives an explanation for how governance solutions at the firm level change in response to changes in the cost of monitoring, the cost of risky debt, the return on riskless assets, and idiosyncratic firm risk. Recent empirical work on law and finance (La Porta et al. 1997, 1998a, 1998b) has documented that there are considerable international differences in investor protection and information disclosure. On a policy level, our theory offers a handle on the effects which legal and regulatory reforms which affect the costs of monitoring, or the cost of risky debt might have on corporate governance.

The findings of the present paper also bear on the literature on national systems of corporate governance. First, our model suggests that in countries in which firms are typically closely held,[15] debt finance should play a more prominent role than in countries characterized by more dispersed ownership structures (Berglöf 1991). Second, arguments according to which systems with more concentrated ownership are superior because they allow for more monitoring (see e.g. Mayer 1999) need to be qualified. In particular, systems characterized by more concentrated ownership would call for higher debt levels in order to achieve more monitoring. But higher debt levels create higher agency costs of debt, hence the benefits of mitigating agency conflicts between owners and managers must be weighed against higher agency costs of debt (John and John 1993). This points to the importance in countries characterized by concentrated ownership of having institutions which help mitigate agency conflicts of debt.

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[14] See Dewatripont and Tirole (1994) for a different approach based on incomplete contracts and the different control rights attached to equity and debt. Rajan and Zingales (1995) or Corbett and Jenkinson (1996) provide overviews of the international evidence on capital structure.

[15] Concentrated ownership is the dominant arrangement in the vast majority of countries (La Porta et al. 1998).

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Mathematical Appendix

I. The comparative statics of optimal monitoring with risk-neutral owners and concentrated ownership

For an interior solution, the optimal level of monitoring has to satisfy

$$(19)\quad s_u^{2*} = \frac{s_e^2\left[2m\left(1+rs_e^2\right)+s_e^2\sqrt{2mr}\right]}{rs_e^4-2m\left(1+rs_e^2\right)^2}.$$

Differentiating (19) with respect to monitoring costs yields

$$(A1)\quad \frac{\partial s_u^{2*}}{\partial m} = \frac{s_e^2\left[2\left(1+rs_e^2\right)+\frac{r}{\sqrt{2mr}}\right]+2m\left(1+rs_e^2\right)s_u^{2*}}{rs_e^4-2m\left(1+rs_e^2\right)^2}$$

which is positive because the denominator will be positive if monitoring occurs at all (cf. (18) above) and s_u^{2*} is positive by definition. Thus the optimal level of monitoring $1/s_u^{2*}$ is decreasing in monitoring costs.

Next, we differentiate (19) with respect to firm risk.

$$(A2)\quad \frac{\partial s_u^{2*}}{\partial s_e^2} = \frac{2s_e^2\left[mr+\sqrt{2mr}\right]+2m\left(1+rs_e^2\right)-2rs_u^{2*}\left[s_e^2-2m\left(1+rs_e^2\right)\right]}{rs_e^4-2m\left(1+rs_e^2\right)^2},$$

which after some tedious but straightforward manipulations yields

$$(A2')\quad \frac{\partial s_u^{2*}}{\partial s_e^2} = (-2m)\frac{r\left(s_e^2\right)^2+2m\left(1+rs_e^2\right)^2+2s_e^2\left(1+rs_e^2\right)\sqrt{2mr}}{\left[rs_e^4-2m\left(1+rs_e^2\right)^2\right]^2} < 0,$$

i.e. the optimal level of monitoring is higher in more risky firms.

Finally, differentiating (19) with respect to r yields

$$(A3)\quad \frac{\partial s_u^{2*}}{\partial r} = \frac{\left(s_e^2\right)^2\left[2+\frac{1}{\sqrt{2mr}}\right]-s_e^2\left[s_e^2-4m\left(1+rs_e^2\right)\right]s_u^{2*}}{rs_e^4-2m\left(1+rs_e^2\right)^2},$$

which after some more manipulations results in

$$(A3')\quad \frac{\partial s_u^{2*}}{\partial r} = \left(2\sqrt{2mr}-1\right)\left(s_e^2\right)^2 m\frac{\frac{r}{\sqrt{2mr}}\left(s_e^2\right)^2+2s_e^2\left(1+rs_e^2\right)+\frac{2m\left(1+rs_e^2\right)^2}{\sqrt{2mr}}}{\left[rs_e^4-2m\left(1+rs_e^2\right)^2\right]^2}.$$

(A3') will be negative and more managerial risk aversion will lead to more monitoring iff the first term on the RHS is negative, i.e. iff $mr < \frac{1}{8}$.