

Inducing Disagreement: External Finance and Internal Decision Making¹

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Abstract

This paper investigates the role of external finance in inducing disagreement between the CEO and the top management in firms. The induced disagreement affects how decision making is structured in firms. I investigate how the control structure of financial claims, such as external equity and debt, affects the design of decision structure, specifically the extent of centralization in top management groups. Managers working with the CEO face a tradeoff between revealing their true views, thereby creating possibilities for costly disagreement, and simply agreeing with the CEO, thereby reporting faulty inputs. The balance of control between external claimants and the CEO alters this tension. The model predicts that firms would be characterized by greater external control and decentralized decision making in high variance environments while dispersed shareholders and centralized decision making would prevail in simpler settings. The roles of management ability, debt, incentive compensation and corporate culture are investigated. Control in the hands of debtholders and shareholders provide contrasting empirical implications. The paper shows that external finance has a critical role to play in ensuring the primary objective of decentralization - that of utilizing all available information.

1 Introduction

This paper investigates the role of external finance in inducing disagreement between the CEO and the top management in firms. The induced disagreement affects how decision making is structured in top management teams. This paper shows how the control structure of financial claims, such as external equity and debt, affects internal decision making structure - specifically the relative importance of the CEO and the top management in decision making. External control structure imposes ex-post penalties on the CEO and the top management. This, in turn, affects the information acquisition and processing incentives of executives within firms.¹ Related literature, discussed in the next section, has focused on the link between finance and organizations through agency costs of stealing and shirking. However faulty decision making could have important implications for a firm's value as well.

Most organizations have top management teams that meet to decide on important issues. The balance of power between the CEO and the rest of the management however varies among organizations. In some organizations, the CEO can overrule the entire team while in some organizations the CEO relies on his management's judgment a lot more. Decisions are made in either centralized groups, where the CEO's decision is supreme, or in decentralized groups, where all the group members contribute comparably. The main aspect of internal decision making that I consider is the extent of formal or informal decentralization in top level management groups.

Before presenting the results, I will highlight the main features of the model. The primary feature is that agents are prone to errors. Consequently, decisions are made in groups and

¹Burkart, Gromb and Panunzi (1999) have shown how external control affects CEO's information acquisition incentives.

not individually. Diversification of judgment is one of the main reasons to rely on groups rather than individuals for decisions. The second crucial feature is that managers bear a cost of disagreeing with the CEO. The potential reasons for this cost of disagreement are discussed in Section 3.

To see how external control affects the extent of centralization in the top management, consider first a firm with no external claimholders.² Due to this cost of disagreement the manager would agree with the CEO.³ Therefore decentralization, or giving a higher importance to the manager's view, in a firm with no external claimholders would lead to magnifying the manager's faulty input. The CEO, aware of the inefficiency that is caused due to the manager's strategic behavior, appropriately chooses the extent of centralization. In a centralized firm, the manager's contribution to the decision making process is lower, and consequently the inefficiency is lower. The CEO will therefore choose a centralized structure.

This paper analyzes how the financial claim structure and the extent of decentralization can together reduce the inefficiency in decision making, caused due to the manager's tendency to agree with the CEO.

A controlling shareholder provides a threat of dismissing top management in case of poor performance, causing them to bear a cost.⁴ The cost can either be loss of reputation or the cost of finding a new job. I also allow for the possibility that the manager avoids this cost by showing ex-post that the CEO was wrong and he was right. A discussion of this feature and some examples can be found in Section 3. To sum, the model captures a (short term)

²The role of incentive contracts is analyzed in the extensions.

³It is important to note that this 'cost of a boss' is different in nature from the costs emphasized in Aghion and Tirole (1997) and Stein (2002). I discuss this further in the literature section. These papers would imply that the manager would have lesser incentives to create/produce information. In this paper I do not deal with agency costs arising from effort shirking.

⁴Evidence on large shareholders dismissing top management

cost to disagreement and a possible reward in the future.⁵

The presence of a controlling shareholder will provide the manager incentives to disagree since the boss now has a boss. This will in turn allow the CEO to use this new information by decentralizing the firm and giving greater importance to the manager's views.

Of course, the cost of removing this friction is that the CEO has to give up control to the external shareholder and face the threat of removal.

The main result of the paper arises from the tradeoff. I show that in high variance industries, where the value of information is high the CEO's value maximizing decision would make him more vulnerable to dismissal by large shareholders. This would create new information in the firm. Such firms would have large shareholders and decentralized structures. On the other hand in relatively simple industries, the CEO would control the firm and the management team would be centralized.

Another possible mechanism to enable decentralization is a combination of debt and managerial stock compensation. The paper shows that when explicit decision structure can be different from the implicit structure used by the CEO, the two mechanisms have different implications for the nature of formal centralization. The two mechanisms also have differing implications for stock ownership by managers inside firms. I use this fact to frame an empirical test.

An alternative possible solution to the problem, for certain parameter values, is the use implicit rewards. Borrowing Shleifer and Summers' (1989) argument, I show how this design is more probable in private companies than public companies. The public companies where corporate culture can solve this problem tend to have very high ability managements and

⁵I thank Raghu Sundaram for encouraging me to use this feature.

very high discretion environments.

The model produces some surprising results. It shows how selling a part of your firm to an external controlling shareholder can generate higher value. This effect goes against the value reducing moral hazard implications of the principal agent framework. It also shows that decentralization is optimal for intermediate management ability levels. For extremes, the firm remains centralized. In the extremes, the value addition due to decentralization is not high enough.

The model provides insights to why venture capitalists invest in particular kind of industries, the presence of large shareholders in mainly risky industries and the direction of internal reorganization accompanying financial restructuring. The results seem to support the existing empirical evidence and provides new testable implications.

The paper brings two facts to light. First, the fact that external finance plays an important role in ensuring that decentralization produces new information. Second, the fact that decentralization can fail due to the interactions among decision makers. The next section surveys relevant literature. The model and analysis follows. The issue of control and structure design is taken up next. Extensions and Discussion follow. Empirical Implications and tests are presented before concluding.

2 Literature

The central question that I investigate in this paper - that of how external finance affects information acquisition and processing incentives within firms - is related to several strands of earlier research.

The organizational design aspects of a firm have been investigated from many viewpoints. Sah and Stiglitz(1986), Radner (1992), Bolton and Dewatripont(1994), Harris and Raviv(1999) organize firms so that they are efficient at the processing and communication of various types of information ⁶ . Hart and Moore(2002) present a theory based on allocation of decision rights to agents. Aghion and Tirole(1997) present a theory of formal and real authority in organizations and how they should be allocated. All these papers abstract from any interaction with the financial structure of the firm.

Literature linking external finance and organization structure has focused on the capital allocation process. A notable example is Stein(2002) that links organization design and external capital markets⁷. Stein(2002) asks how organization design influences the capital allocation process. Stein(2002)(like Aghion and Tirole(1997)) deals with the agency issues that arise due to separation of authority and research incentives. This paper's focus is not on the capital allocation process. Instead I am concerned with the extent of control that shareholders and debt holders enjoy. Moreover, the paper is not concerned with the agent's research initiative, rather the issue investigated is that of the reporting behavior.⁸ Inderst and Mueller (2003) also consider how the structure of internal capital markets affects contracting with external capital markets.

In this paper, the strategic behavior of managers is motivated, among other reasons, through confirmation bias. There is strong evidence for confirmation bias. See Rabin and Schrag(1997) and the citations within.

Also, there is evidence of agents trying to conform. Such behaviour has been documented

⁶elaborate on this

⁷Marin and Verdier(2002) consider the interaction of internal design and the competitive environment

⁸In fact, if his reporting incentives are weakened, it would effect his incentives to produce the information as well.

in various other group decision making environments, with personal interactions. The literature on group polarization provides ample evidence and discussion.(See, for instance, Sunstein(1999).)

While this literature is yet to carry its insights to financial economics, there have been a few recent papers on the implications of lack of disagreement. Boot et al (2002) show how the 'consensus bias' arises if the CEO believes he is of superior ability and the manager's task to provide a second opinion on the CEO's decision. They see how this bias affects capital budgeting. This paper differs in a number of ways. First, the abilities of the CEO and the manager are known to each other. Second the objective is to design the control structure such that the friction can be removed rather than view this friction as a non-removable feature.

Finally, the paper adds to the literature on large shareholders, most notably Shleifer and Vishny(1987) and Maug(1998). It presents a new reason for the existence of large shareholders, and provides an explanation of non-monitoring shareholders, adding to our understanding of the role of large shareholders.

Prior clinical work, such as Baker and Wruck (1990) and Wruck (1994), documents a connection between value creation and the nature of a firm's governance structure, organizational design, and compensation systems. Kaplan, Mitchell and Wruck (2000) identify organizational changes as a key factor contributing to the success(or failure) of a merger. These papers show that there is a link between external finance and top level centralization in organizations - that is made clear by concomitant financial and organizational restructuring.⁹

⁹For a description of recent trends in corporate organization see Holmstrom and Kaplan(2001).

3 Model

This section presents the framework used to analyze the interaction between external finance and internal decision structure. To start the analysis, consider a one period framework that repeats a finite number of times. Events unfold as depicted in the timeline (Figure 1). The management comprises of the CEO and the manager. The CEO initially determines the control structure and the decision making structure. A project then becomes available from a menu of projects. The CEO and manager receive private signals about the future state of the world based on which they form views. The views are incorporated into decisions based on the internal structure in place. The project is taken, if it meets the decision criteria. Finally, uncertainty is resolved, cash flows are observed and external claimholders exercise control. The external claimholder, is a large shareholder or, in cases considered later, a debtholder.¹⁰ A more formal description of the agents and the other building blocks of the model follows.

3.1 Agents

All agents are risk neutral. I abstract from the agency costs of stealing and shirking, in order to clearly emphasize the tradeoffs. A discussion of how these agency costs affects the problem can be found later.

¹⁰The theory only relies on control being transferred from ceo to external claimholders. Dispersed shareholders, potential bidders or large shareholders can all take advantage of this greater control.

3.1.1 CEO

The CEO/entrepreneur, hereafter CEO, decides on the organizational structure, specifically the extent of centralization in the top management. She also decides on how much control she gives up to the external claimants. Therefore the CEO is in charge of making the joint decision of external control¹¹ and internal decision making.¹² The CEO's payoff is $V(.) - C(.)$, where $V(.)$ is the value of the organization and $C(.) = p(.)R$ is the cost he bears if he is dismissed. $p(.)$ is the probability of dismissal and R is the cost incurred. This cost can be thought of as a reputation cost. In the absence of any external control $C(.) = 0$, since there is no possibility of CEO dismissal. Therefore the CEO is value maximizing and she cares about her reputation.

3.1.2 Manager

The manager, like the CEO, also bears a cost of reputation if dismissed. The reputation cost that the managers suffers in such cases is the same as the CEO, R . He receives a cash salary of C . The manager also faces a cost of disagreement, D .

Conflicts are impossible without disagreement and are costly. If there is a chance, however small, that the disagreement will lead to a conflict, the manager would not disagree. Another reason can arise due to the well documented feature of 'confirmative bias'¹³ of agents. Specifically, one can appeal to the CEO's 'confirmative bias'. Agents prone to confirmative bias tend to interpret ambiguous evidence in favor of their viewpoint. Also, it has been

¹¹Among other mechanisms an entrepreneur can place large blocks of shares with 'insiders' and effectively retain control.

¹²The extent of decentralization can be explicit as well as implicit. This allows for possibilities that the official positions might differ but they might be equally involved in decision making or vice versa.

¹³See Rabin and Schrag(1999) for an economic analysis of confirmative bias

documented that they either ignore contradictory evidence or discount it. In the context of organizational group decision making, the managers would have to expend extra effort to express his viewpoint if it contradicts the CEO. One can imagine a scenario where the CEO would require more justification from the manager if the manager's views oppose his. This extra effort could be the cost of disagreement.¹⁴ Anecdotes of 'yes-men' are ample.¹⁵

Another potential reason is pressure to conform with the group¹⁶ or simply the fear of losing out on non-pecuniary favors from the CEO if he disagreed and was wrong.¹⁷

3.1.3 Large shareholder

The external large shareholder's only role in the model is to provide the threat of dismissal. The shareholder dismisses the top management if the firm performs badly. The probability of dismissal, $p_s(c)$, depends on the control in the hands of the large shareholder. The manager is not dismissed if he can show that he had disagreed with the CEO and he was right. Faced with the threat of dismissal, the manager can do this with probability w .

This role is akin to what the popular press has termed the 'whistle blower'.¹⁸ Some examples of the feature that this captures are the cases of Christine Casey (Mattel), Barron Stone (Duke Power), Marta Andreasen (European Commission), Cynthia Cooper (WorldCom),

¹⁴A well documented empirical regularity in group psychology is the tendency of groups to move to extremes, a phenomenon termed as group polarization. One of the causes of group polarization is the pressure to agree with the norm, group leader, influential members of the group, otherwise termed conformity bias. (See Sunstein, 1999)

¹⁵Some comments in financial press include "Too many boards are stuffed with yes men who question little that their chief executives suggest" (Economist, Jan 2003) and "The CEO's Team: No "Yes Men"" (Businessweek, August 2002)

¹⁶Disagreeing, might for instance, put him at a risk of being viewed as a non team member.

¹⁷See discussion on implicit contracts on the problems with contracts where the CEO promises him large benefits if he disagrees *and* is right.

¹⁸The difference is that the popular press has focussed on managers who express their dissent to courts.

and Sherron Watkins (Enron). While the top management executives in these firms were later penalized for their decisions, the dissenters were not. In fact in some cases, as in Enron, the whistleblowers even grew in stature.¹⁹ Disagreement had *short term consequences* that ranged from being getting unfavorable performance reports, getting demoted and even getting fired.²⁰

3.2 Projects and Signals

3.2.1 States and Signals

There are two possible future states, $S = H$ and $S = L$, with an ex-ante probability of $\frac{1}{2}$ each. The CEO and the manager get independent information based on which they take stands on the future state of the world. They can believe that the future state is either good or bad. Their views are denoted by $\sigma = (\sigma_C, \sigma_M)$. $\sigma_i = 1$ represents the belief that the future state is good(H) and $\sigma_i = -1$, the belief that the future state is bad(L). The CEO and the manager are both prone to errors. They have similar abilities²¹ that are known to each other.

$$P(S = H \cap \sigma_i = 1) = P(S = L \cap \sigma_i = -1) = 1 - e_i$$

$$P(S = H \cap \sigma_i = -1) = P(S = L \cap \sigma_i = 1) = e_i$$

$$e_C = e_M = e, 0 \geq e \leq \frac{1}{2}$$

Therefore, with probability e , the CEO and the manager err. Their *reported views* are

¹⁹“Watkins is now co-authoring a book on Enron and plans to consult on governance issues”. Business Week, January 2003.”

²⁰Andreasen(EC) and Christine Casey(Mattel) are examples.

²¹I keep the ability of the CEO and the manager to be the same primarily to focus on other effects. It is clear that as manager ability decreases centralization is more desirable. Moreover, one can also argue that management teams in organizations tend to be around the same ability level.

denoted by σ^R . The reported views might or might not coincide with what they truly believe.

3.2.2 Projects

Projects appear at time 2 from a menu. All projects pay off only in the good state. Cashflows in the low state are 0. The projects are sampled from $[\underline{x}, \bar{x}]$. The management team observes the project payoff in the high state, x , and decides whether to invest or not. The investment required is I .

3.3 Reporting

The CEO and the manager discuss their views. The equilibrium reports are those final views that neither party has any incentive to deviate from. The point to note is that it is not important that the CEO speaks first. It is only important that he speak. The manager always has the option to change his view and so does the CEO.²² The final reports are accounted as their views. Consider the following the sequence -1,1,1,1 where the reports alternate. The first report (-1) is the manager's. The final inputs in the decision framework will be the last two views, (1,1).The structural assumption that I will maintain for the rest of the paper is that the CEO cannot lie to the manager and later use his correct information in decision making. The assumption, as reasonable as it is²³, is not critical for the results.

²⁴Also, agreement or disagreement is not publicly observable and therefore contracts based on this contingency are not enforceable.

²²Of course, the CEO has no incentive to change in the model

²³Reasons for not lying to managers and later using true value could be, but are not limited to, internal reputation.

²⁴It only helps in maintaining mathematical tractability by avoiding game theoretic considerations.

3.4 Decision Framework & Decentralization

The CEO weights his view and the manager’s view to come to a decision regarding project choice. The extent of centralization is reflected in the difference between the weight assigned to the CEO’s view, α_C , and that assigned to the manager’s view, α_M . If the CEO weights both views equally, the firm is decentralized. On the other hand, if he ignores the manager’s view the decision making structure is centralized. Without loss of generality, the decision framework is captured by the following scheme that the CEO uses. To see that this scheme captures all possible scenarios, see appendix.

$$P_C(S = H | \sigma^R = (\sigma_C, \sigma_M^R)) = \frac{1}{2} + \alpha_C \sigma_C + \alpha_M \sigma_M^R$$

and

$$P_C(S = L | \sigma^R = (\sigma_C, \sigma_M^R)) = \frac{1}{2} - \alpha_C \sigma_C - \alpha_M \sigma_M^R$$

These are the probabilities the CEO uses to make his decision. To illustrate, if the reported views are $\sigma = (1, 1)$, the CEO considers the good state to occur with probability $\frac{1}{2} + \alpha_C + \alpha_M$ and if the reported views contradict ($\sigma_C = 1, \sigma_M = -1$), the probability assigned to the high state is $\frac{1}{2} + \alpha_C - \alpha_M$. It is now clear that if the CEO assigns equal importance to the managers view as his own, the probability of the high state in case of disagreement will be $\frac{1}{2}$.

The extent of decentralization is captured by $\Delta = \alpha_C - \alpha_M$. For a perfectly decentralized firm $\Delta = 0$.

3.5 Analysis

We are now in a position to look at the model as a whole. This section, by way of some preliminary results, clarifies the interactions in the model. The following parametric assumption is required.

Assumption : $4D < R$

This ensures that the probabilities derived in the propositions don't exceed their natural bounds. The assumption appears to capture reality as well, as one would expect the cost of disagreement to be much lower than the costs of dismissal. The results presented here will be used later as well. Consider first the decision framework in place.

3.5.1 Project choice

The project that the firm faces has two possibilities, a payoff x or a payoff 0. The CEO updates the probability of the states based on the reported views and decides on cutoff levels for the project. For example, if the reported views are $\sigma = (1, 1)$, the expected payoff from the project is $x * (\frac{1}{2} + \alpha_C + \alpha_M)$. In such a case, the decision rule used by the CEO can be found by equating the expected payoff to the investment required, giving,

$$x > x_{1,1}^* = \frac{I}{\frac{1}{2} + \alpha_C + \alpha_M}.$$

Similarly, for

$$\sigma^R = (1, -1), x > x_{1,-1}^* = \frac{I}{\frac{1}{2} + \alpha_C - \alpha_M}$$

$$\sigma^R = (-1, 1), x > x_{-1,1}^* = \frac{I}{\frac{1}{2} - \alpha_C + \alpha_M}$$

$$\sigma^R = (-1, -1), x > x_{-1,-1}^* = \frac{I}{\frac{1}{2} - \alpha_C - \alpha_M}$$

Note that as the extent of centralization increases, $\alpha_C - \alpha_M$ increases. This causes $x_{1,-1}^*$ and $x_{-1,1}^*$ to move farther away from 2I. The following lemma summarizes the changes in project cutoff points. Figure 2 illustrates the directions.

Lemma 1 $\frac{dx_{1,-1}^*}{d\Delta} < 0, \frac{dx_{-1,1}^*}{d\Delta} < 0, \frac{dx_{-1,1}^*}{d\Delta} > 0, \frac{dx_{1,-1}^*}{d\Delta} > 0.$

Proof . The results are obtained by straight forward differentiation.

3.5.2 Probabilities

After the signals are observed, the true probability of the high state is as follows.

$$P(S = H|\sigma = (1, 1)) = \frac{(1-e)^2}{e^2+(1-e)^2}$$

$$P(S = H|\sigma = (1, -1)) = P(S = H|\sigma = (-1, 1)) = \frac{1}{2}$$

$$P(S = H|\sigma = (-1, -1)) = \frac{e^2}{(1-e)^2+e^2}$$

Similarly,

$$P(S = L|\sigma = (1, 1)) = \frac{e^2}{e^2+(1-e)^2}$$

$$P(S = L|\sigma = (1, -1)) = P(S = L|\sigma = (-1, 1)) = \frac{1}{2}$$

$$P(S = L|\sigma = (-1, -1)) = \frac{(1-e)^2}{(1-e)^2+e^2}$$

Table 3 shows the true probabilities and the probabilities generated by the decision structure for various reported views.

3.5.3 Range of Decision structures

In the absence of any frictions, the first best decision structure produces probability distributions that are the same as the true probabilities. Therefore, equating column 2 to column

3 in table 3, we get the first best structure.

Lemma 2 *The first best structure, when the CEO and the manager have same ability, e , is completely decentralized ($\Delta = 0$). The weighting scheme used by the CEO is $\alpha_C = \alpha_M = \frac{1}{4} \frac{(1-2e)}{(e^2+(1-e)^2)}$.*

Proof . The optimal weights are obtained by jointly solving $\frac{1}{2} + \alpha_C + \alpha_M = \frac{(1-e)^2}{e^2+(1-e)^2}$ and

$$\frac{1}{2} + \alpha_C - \alpha_M = \frac{1}{2}$$

The lemma shows that if the managers were to report their views honestly, the CEO would use a completely decentralized structure. The following lemma also shows that any other level of decentralization can be thought of as a first best structure for the ability levels $e = (e_C, e_M), e_M > e_C$.

Lemma 3 *In general for different ability levels, $e_C < e_M$, the first best structure is $\Delta = f(e_M - e_C, e_C)$. When $e_M = e_C$, $\Delta = 0$ and when $e_M = 1/2$, the solution is completely centralized ($\Delta = \frac{1}{2} - e_C$) with $\alpha_M = 0$ and $\alpha_C = \frac{1}{2} - e_C$. Also $d(\alpha_C + \alpha_M)/d\Delta < 0$.*

Proof . See Appendix.

Though we deal with only equal abilities, this lemma gives us the possible range of weights the CEO might want to use. Δ can vary from 0 (decentralized) to $\frac{1}{2} - e$ (centralized). This also confirms the intuition that the effect of ability difference only works towards centralization. Finally it shows that as the CEO reduces his manager's weights, he has lesser potential information and therefore the total weights ($\alpha_C + \alpha_M$) lower as well.

4 Designing External Control and Internal Decision Making

4.1 In the absence of external control

In the absence of a large shareholder, the top management faces no threat of dismissal. The manager faces a cost of disagreement, D . His payoff if he disagrees is $C - D$ and if he agrees is C . Therefore it is clear that he would always agree with the CEO, regardless of his own view. The result that equity based compensation cannot solve the problem either will have to wait till I discuss extensions of the model. Due to this friction the reported input of the manager is $\sigma_M^R = 1$ if $\sigma_C = 1$, or $\sigma_M^R = -1$ if $\sigma_C = -1$. The following simple result is stated below.

Proposition 1 *In the absence of any external control or incentive compensation, the manager will always agree with the CEO.*

4.1.1 Decision making

The CEO realizes that in the absence of external control, the manager will agree with him. He takes this into account when determining the decision making structure at time 0.

The errors made in decision making are of two types. The team could erroneously reject positive net present value projects (Type I). It could also accept negative net present value projects (Type II). If the CEO chooses a level of decentralization to be Δ the type I error, relative to the first best structure, is given by the following expression.

$$TI = \int_{x_{1,1}^*(0)}^{x_{1,1}^*(\Delta)} [x.p(S = H|\sigma = (1, 1)) - I]f(x)dx +$$

$$\begin{aligned} & \int_{x_{-1,1}^*(0)}^{x_{-1,-1}^*(\Delta)} [x.p(s = H|\sigma = (-1, 1)) - I]f(x)dx \\ \implies TII = & \int_{x_{1,1}^*(0)}^{x_{1,1}^*(\Delta)} [x.\frac{(1 - e)^2}{e^2 + (1 - e)^2} - I]f(x)dx + \int_{x_{-1,1}^*(0)}^{x_{-1,-1}^*(\Delta)} [x.\frac{1}{2} - I]f(x)dx \end{aligned}$$

The first error in the expression occurs when the true signals are (1,1). The manager reports his signal truthfully. However, unless the firm is completely decentralized, the CEO does not account for it completely. If the firm is completely decentralized, this term vanishes as the limits on the integral converge. However, now the second term is magnified. This is the error made when the true inputs are (-1,1). The manager, to avoid disagreement, reports $\sigma_M^R = -1$ as well. There the reported views are (-1,-1). This cause the CEO to be too cautious as compared to the first best scenario.

Similarly type II errors are

$$\begin{aligned} TIII = & \int_{x_{1,1}^*(\Delta)}^{2I} [x.p(S = H|\sigma = (1, -1)) - I]f(x)dx + \\ & \int_{x_{-1,-1}^*(\Delta)}^{x_{-1,-1}^*(0)} [x.p(s = H|\sigma = (-1, -1)) - I]f(x)dx \\ \implies TIII = & \int_{x_{1,1}^*(\Delta)}^{2I} [x.\frac{1}{2} - I]f(x)dx + \int_{x_{-1,-1}^*(\Delta)}^{x_{-1,-1}^*(0)} [x.\frac{e^2}{(1 - e)^2 + e^2} - I]f(x)dx \end{aligned}$$

The first term here is the error when the true inputs are (1,-1). The report is however (1,1) as discussed earlier, causing the firm to take a more favorable view than desirable. The second term is the error when the true input is (-1,-1). Again as in the type I error scenario this term vanishes as the firm moves towards complete decentralization.

In the absence of a large shareholder, the CEO chooses Δ to minimize $TII - TIII$.

Proposition 2 *In the absence of any external control, the optimal structure for decision making is completely centralized. $\Delta^* = \frac{1}{2} - e$.*

Proof The first order condition for the minimization leads to the simple expression $1 - 2e = 2(\alpha_C + \alpha_M)$. Using [?], the solution is given by $\alpha_M = 0$ and $\alpha_D = \frac{1}{2} - e$.

The intuition for the result is clear by noting that if the manager always agrees with the CEO, he is providing no new information. Therefore using his information as an incremental input can only lead to errors. This proposition shows that in the absence of any external control the best structure is a centralized one. The empirical implications of this proposition (and others) will be discussed in Section 7. For now, it is useful to note that examples of firms that are devoid of any external control might include family firms, and small businesses run by mom and pop managements.

4.2 In the presence of external control

As discussed earlier, by giving up control to the external shareholder the CEO makes the top management vulnerable to dismissal in cases of poor performance. For the large shareholder, poor performance can happen in two ways. The first is when the cash flows are 0. The second is when the state is high but the management left funds uninvested, thus getting I at the end of the period.²⁵

Dismissal is expensive for both the manager and the CEO. However, the manager can avoid this cost of reputation by proving that he had disagreed with the CEO and was right. To word it differently, he bears no cost if he can show that the CEO was wrong and that he was right. Recall that the probability of this scenario, conditional on dismissal, is w and that the cost of reputation is R . The large shareholder thus provides incentives for the manager

²⁵See Hadlock and Lumer(1997), Huson, Parrino and STarks(1998), Denis and Kruse (2000) and Mikkelson and Partch(1997) for a discussion on management turnover and performance.

to disagree.

Consider the case when the true views are (1,-1). The manager will report his true view only if

$$\begin{aligned}
 & C - D - Rp_s(c)(1 - w)p(S = L|\sigma = (1, -1))p(x > x_{1,-1}^*) - \\
 & \quad Rp_s(c)p(s = H|\sigma = (1, -1))p(x < x_{1,-1}^*) \geq \\
 & C - Rp_s(c)p(S = H|\sigma = (1, -1))p(x < x_{1,1}^*) - \\
 & \quad Rp_s(c)p(S = L|\sigma = (1, -1))p(x > x_{1,1}^*)
 \end{aligned}$$

If the manager reports the truth and disagrees with the CEO, he bears a cost, D , and he bears the threat of dismissal as well. He will be dismissed with probability $p_s(c)(1 - w)$ in case of poor performance when he is right and with probability $p_s(c)$ when he is wrong. Of course project availability affect the probabilities as well. If he agrees, he does not bear the cost of disagreement but his expected reputation costs are higher. This is due to the fact that faulty decisions are now made by the team and that he can no longer avoid the cost of reputation in case of dismissal. Note that the cutoff points change depending on the manager's inputs, as is highlighted by the boldface subscript on the cutoff points in the condition above. The condition above simplifies to

$$\implies p_s(c) > \frac{2D}{Rw(1 - F(x_{1,-1}^*))}$$

Now, however if the threat of dismissal is too high the manager might be tempted to disagree all the time. The other conditions need to be met as well. The condition for the case when the true inputs are (1,1) is

$$C - Rp_s(c)p(S = L|\sigma = (1, 1))p(x > x_{1,1}^*) -$$

$$Rp_s(c)p(s = H|\sigma = (1, 1))p(x < x_{1,1}^*) \geq$$

$$C - D - Rp_s(c)p(S = H|\sigma = (1, 1))p(x < x_{1,-1}^*) -$$

$$Rp_s(c)(1 - w)p(S = L|\sigma = (1, 1))p(x > x_{1,-1}^*)$$

Other conditions for the scenario (-1,-1) and (-1,1) can be written down and the following proposition summarizes the condition under which the manager will reveal his true input in all scenarios.

Proposition 3 *In the presence of a large shareholder who can dismiss the management, the manager reveals his true view if one of the following two constraints are met.*

$$\frac{2D}{Rw(1 - F(x_{1,-1}^*))} \leq p_s(c) \leq \frac{(e^2 + (1 - e)^2)D}{R[we^2(1 - F(x_{1,-1}^*)) - (1 - 2e)(F(x_{1,-1}^*) - F(x_{1,1}^*))]}$$

or

$$\frac{2D}{RwF(x_{-1,1}^*)} \leq p_s(c) \leq \frac{(e^2 + (1 - e)^2)D}{R[we^2F(x_{-1,1}^*) - (1 - 2e)(F(x_{-1,-1}^*) - F(x_{-1,1}^*))]}$$

Proof: See appendix.

The relevant constraint will be determined by the distribution. As a special case, if the distribution is symmetric around 2I they collapse to the same constraint. Before we proceed it is interesting to note that the control required is higher for lower reputation costs, higher cost of disagreement and lower probability of being a whistle-blower as expected. It is however also higher for a higher level of decentralization. With higher level of decentralization, the manager's correct input is weighed higher, therefore reducing the chances of failure. A lower chance of failure also implies a lower chance of large shareholder intervention. Thus the probability of dismissal in poor performance scenarios needs to be higher to make up for

the reduced chance of intervention. The incentives to disagree arise from the fact that if he where right he could save himself the reputation cost with some probability.

It is also interesting to note that if control is completely given to the external claim holders, the manager is tempted to disagree all the time. This shows that for an optimal internal structure there has to be a balance of control between the CEO and the external claimants.

4.2.1 Decision making

The previous proposition gives us condition under which the manager always reports his true view. The CEO, as before, will choose the decision making structure that will maximize value and given the manager's truthful reporting the optimal structure is the first best structure. Therefore leading us to the following proposition.

Proposition 4 *In the presence of a controlling large shareholder the optimal internal structure is complete decentralization. $\Delta = 0$ and $\alpha_C = \alpha_M = \frac{1}{4} \frac{(1-2e)}{(e^2+(1-e)^2)}$*

Proof : See Lemma.

4.3 CEO's choice problem

Now we can analyze under what scenarios the CEO will give up control and decentralize the firm. The cost of giving up control is the threat of dismissal. The benefit is increase in the value of the firm due to additional information provided by the manager. Note that the CEO is maximizing firm value minus a private cost. This is equivalent to a pareto optimal solution by a social planner.²⁶

²⁶See Hart.(1997)

The optimal solution to the problem is

$$\max(\max_{\Delta} V(\Delta), V_{LS})$$

where

$$V_{LS} = \max_{\Delta,c} V(\Delta) - Rp_s(c) [\Sigma_{\sigma} P(S = H|\sigma) * P(\sigma) * P(x < x_{\sigma}^*) + \Sigma_{\sigma} P(S = L|\sigma) P(\sigma) P(x > x_{\sigma}^*)]$$

We have already found the optimal structures. In the absence of external control the optimal structure is centralization and in the presence of an external claimholder, the optimal structure is complete decentralization. Using this the CEO's problem is now

$$\max(V(\Delta^*), V_{LS})$$

where

$$V_{LS} = \max_c V(0) - Rp_s(c) [\Sigma_{\sigma} P(S = H|\sigma) * P(\sigma) * P(x < x_{\sigma}^*) + \Sigma_{\sigma} P(S = L|\sigma) P(\sigma) P(x > x_{\sigma}^*)]$$

such that $p_s(c)$ satisfies the conditions in proposition 4.

Therefore a decentralized firm with external control is preferable when $V(0) - V(\Delta^*) \geq$ the probability of dismissal. The following propositions state the scenarios where this would occur.

Proposition 5 *The CEO will design a decentralized firm and give up control to the large shareholder depending on the the distribution of the available projects. For mean preserving spreads around $2I$, she will maintain a centralized structure for very low and very high variances (σ^2). For $\underline{\sigma}^2 < \sigma^2 < \overline{\sigma}^2$, she will decentralize the firm and give up control.*

Proof: See Appendix.

Proposition 6 *The CEO's incentive to decentralize the firm and give up control depend on the top management ability level. Decentralization is optimal for intermediate ability levels, $\underline{e} < e < \bar{e}$.*

Proof : See Appendix.

An outline of the proof will be helpful in understanding the underlying dynamics of the result. The entire project range can be distributed into three regions - 1. that within the CEO ability span²⁷ 2. that within the ability span of the decentralized team but outside the CEO's ability and 3. outside the management teams ability span. The proof shows that as more projects move from region 1 to region 3, the CEO's utility drops from maintaining a decentralized structure. However as more projects move out of his ability span into the management's ability span, decentralization is more attractive.

The two propositions above together characterize the region in which the CEO would decentralize. In general, as environment gets more volatile the CEO chooses to decentralize. The intuition for the first of the two propositions is that for very low variance, the value addition due to an additional input is very low. This increase in value is not high enough for the CEO to face the threat of dismissal. On the other extreme, when variance is very high, even getting new information is of little help. Combined with the fact that the high variance increases the possibility of dismissal, the CEO chooses to remain centralized. This second part of the proposition should however be interpreted with care, since in the framework considered there is only one manager. As the variance increases, the CEO can hire more managers and keep the firm decentralized.

²⁷What I mean by ability span is the range of project cut off points used for decision making based on the information available. The CEO's ability span ranges from $\frac{I}{(1-e)}$ to $\frac{I}{e}$.

As noted in the outline of the proof, the top management ability plays a crucial role. To interpret the result note that the ability of the manager and the CEO is the same in the framework presented here. For very high ability levels, the CEO does not need much help and chooses to keep the firm centralized. When the abilities are low, the CEO gains little by decentralizing the firm and therefore chooses to remain centralized.

Figure 4 provides a rough outline of the region in which decentralization with an external shareholder is preferred.

5 Discussion

In the model presented above, the large shareholder's incentives have not been discussed. As mentioned earlier, the large shareholder is just one of the possible external agents who can dismiss the management if he has the control. A potential bidder is another. The motives in both cases, can be viewed as value creation. A simple way to understand the model would be to consider a world where information about management ability is not known to others. Large shareholders infer management ability from cash flows. A poor performance will lead them to adjust their priors on management ability downwards, to a_l . By hiring a new management team with the average ability they can get a benefit of $V(a) - V(a_l)$. The costs to make this change depends on the control given. The paper considers a world where large shareholders will dismiss the management team for poor performance if CEO gives up control and will not dismiss if the control rests in the hand of the CEO. A similar argument can be made for potential bidders.

Another aspect of the model that requires comment is that the CEO and the manager receive independent signals. Literature in management has paid attention to the issues of

homogeneity and heterogeneity in top management teams.²⁸ In the framework considered here homogenous teams only move the firm in the direction of centralization.

Finally, decentralization can be explicit or implicit. In the case examined here, as extent of decentralization increases the manager's incentives to report the truth reduce. Thus if explicit decentralization is what the manager bases his reporting behaviour on, it is beneficial for the CEO to implicitly decentralize while keeping the formal structure of the firm centralized. This is in contrast to the case with debtholders, which we will discuss shortly. This is an important point to consider while testing the model.

The main message that the paper seeks to convey is that decentralization can be made ineffective by behavioral features and that control rights held by external claimants plays a critical role in design of internal structures. The decision framework can easily be extended downward within the firm where decision at each level is made by a group, one of whom reports to the next higher level. However that is not the focus of this paper. The main result, that firms are decentralized as the variability of projects increase, is robust. As mentioned, changing the size of the management team will change the upper variance bound. Another interesting aspect of the model is that the truth reporting conditions show that there are limits to external control that can be helpful. If the control exerted by the external claimant increase, the manager will tend to disagree now. The problems that external control intended to solve in this case will return in another form. With the Sarbanes-Oxley Act being converted into rules, managers are more protected from CEOs. In terms of the model this can be viewed as effectively increasing the probability of finger-pointing the CEO, w. Control exerted by external claimant is also currently a high point in the financial

²⁸See Finkelstein and Hambrick(1996).

press. An implication of the model is that all this might lead to a greater desire for the CEO/entrepreneur to go private again, as the benefits of having external claimholders are now lost.

In what follows I will consider other possible mechanisms to encourage disagreement.

6 Extensions

This section considers other possible mechanisms that might remove the friction analyzed. I begin with control exercised by debtholders. Ownership and Implicit contracts are considered as well and agency costs of shirking and stealing are discussed.

6.1 Debt and ownership

6.1.1 Debt

To see how effective an external debt-holder can be, consider that the firm has outstanding debt of face value $B(< I)$ due at the end of the period. Debt-holders gain control of the firm in case of default, which will occur when the cash flows are 0. The management faces dismissal when the firm defaults. All other features of the model remain the same. The cash flows are 0 when the management invests *and* the state turns out to be bad. The other possibility in the low state is that the firm has uninvested cash I . This does not entail default. Note that the difference between the shareholder's and the debt-holder's control rights is captured in the dismissal threats they provide. The shareholder can dismiss the manager in all cases of poor performance whereas the debt-holder is only concerned about the state where the cash flow is 0. Another difference is that the large shareholders provide a softer threat of dismissal than the debt holders. In the case of a controlling external

shareholder, poor performance does not entail sure dismissal.

To see that debt cannot completely remove the problem consider the scenario when the true views are (-1,1). The manager's incentive constraint for truthful reporting is

$$\begin{aligned}
 C - D - Rp(S = L|\sigma = (-1, 1))p(x > x_{-1,1}^*) &\geq \\
 C - Rp(S = L|\sigma = (-1, -1))p(x > x_{-1,-1}^*) & \\
 \implies \frac{2D}{R} &\leq (F(x_{-1,1}^*) - F(x_{-1,-1}^*))
 \end{aligned}$$

The right hand side of this expression is negative, since $x_{-1,1}^*$ is lower than $x_{-1,-1}^*$. Consequently the condition can never be met. The result arises since debt makes the manager too cautious. He would never want to disagree with the CEO, when the CEO himself views the future as bleak. He receives no rewards for disagreeing and in case of default, he has no way out since he was wrong in the first place. This naturally leads to question "Why not give him a reward in the high states"? It is precisely this that equity based compensation does. But before proceeding to the role of incentive compensation let us summarize the effects in the presence of debt.

Proposition 7 *In the presence of a debtholder, who dismisses the management in case of default, manager reveals his true view in three out of the four cases if the following condition is met.*

$$\begin{aligned}
 \frac{e^2}{(e^2 + (1 - e)^2)}Z < \frac{D}{R} < \frac{Z}{2} \text{ where} \\
 Z = (F(x_{1,-1}^*) - F(x_{1,1}^*)) + w(1 - F(x_{1,-1}^*))
 \end{aligned}$$

When their true views are $\sigma = (-1, 1)$, the manager continues to agree with the CEO.

Proof :

The condition for truth reporting in the scenario (1,-1) gives us

$$\implies \frac{2D}{R} \leq (F(x_{1,-1}^*) - F(x_{1,1}^*)) + w(1 - F(x_{1,-1}^*))$$

The condition when $\sigma = (1, 1)$ is

$$\frac{(e^2 + (1 - e)^2)D}{Re^2} \geq (F(x_{1,-1}^*) - F(x_{1,1}^*)) + w(1 - F(x_{1,-1}^*))$$

Combining these two we get the stated condition. The condition in scenario $\sigma = (-1, -1)$ is always fulfilled since

$$\frac{(e^2 + (1 - e)^2)D}{R(1 - e)^2} \geq (F(x_{-1,1}^*) - F(x_{-1,-1}^*))$$

Note that the incentive to disagree with the manager in the scenario (1,-1) depends on the extent of decentralization. $(F(x_{1,-1}^*) - F(x_{1,1}^*))$ captures the effect. Greater the cost of disagreement, D, greater is the need for decentralization to elicit truth. It is useful to note that in this case the incentives to disagree come from a punishment in the low state, that of a possible reputation cost. Thus one kind of error is being punished more than other. This explains the different effect of centralization in the presence of large shareholder and debt-holder. In the case of the large shareholder the incentives to disagree were higher with greater centralization whereas here incentives to disagree are higher with greater decentralization. Consider now the role of incentive compensation.

6.1.2 Incentive Compensation

If the manager is awarded a fraction, β of the profits, he can be made less cautious and he might report truthfully even in the scenario (-1,1). It is easy to note that equity compensation

without debt, makes him overly optimistic and he will never disagree with the CEO when the scenario is (1,-1).

The following proposition summarizes the conditions under which a combination of debt and equity ownership can together elicit truthful reporting.

Proposition 8 *The CEO can use stock based compensation in combination with debt to elicit the manager’s true views, only for high enough ability levels. For these levels, the fraction of profits, β is given by .*

$$\max \left\{ \frac{-(e^2 + (1 - e)^2)D + e^2R(F(x_{1,-1}^*) - F(x_{1,1}^*)) + Re^2w(1 - F(x_{1,-1}^*)))}{(1 - e)^2(E(x|x > x_{1,1}^*) - E(x|x > x_{1,-1}^*) - I(F(x_{1,-1}^*) - F(x_{1,1}^*)))}, \right. \\ \left. \frac{2D + R(F(x_{-1,-1}^*) - F(x_{-1,1}^*))}{E(x|x > x_{-1,1}^*) - E(x|x > x_{-1,-1}^*) - I(F(x_{-1,-1}^*) - F(x_{-1,1}^*))} \right\}$$

Proof : See Appendix.

It is useful to note that for very high abilities, the second term is higher. Therefore there is a lower bound to the incentive compensation required to solve the problem.

In cases where the management is of very low ability, probability of default is not changed much with the manager’s input. Consequently, agreeing and taking on a project, is better for the manager as he not only saves the cost of disagreement but he also has a chance of getting gains from his ownership.

Also, it is useful to note that the required incentive compensation is increasing in the cost of reputation. The dependence of incentive compensation on risk would depend on the magnitude of the reputation cost. With increasing risk, the probability of default is higher and hence the manager needs to be motivated more. At the same time the possible benefits of taking a project are much higher. The end effect will depend on the relative magnitudes of the cost of reputation and the conditional means of the project payoffs.

It is now interesting to see under what general conditions the CEO would prefer to use the debt and compensation mechanism over the large shareholder mechanism.

Proposition 9 *Given that the CEO wants to decentralize the firm, he would choose the shareholder mechanism over the debt and compensation mechanism based on the project distribution. In general the large shareholder mechanism is more desirable as firm value increases, and for high ability management teams.*

: See Appendix.

The differentiating factor under the two mechanisms is the probability of dismissal. Under the shareholder mechanism the CEO faces a possibility of dismissal under *both* the poor performance scenarios. Under the alternate mechanism, the CEO faces dismissal only if the cash flow is 0. However, dismissal is now certain. Assuming reputation costs are high enough²⁹, with reducing variance, the debt-ownership mechanism becomes more desirable. Recall that as variance reduces, benefits of decentralization reduce and the value of the firm reduces as well. Of course as the probability of default becomes very low the debt-holder mechanism appears even more attractive, but under these conditions the CEO no longer has incentives to decentralize the firm, as noted in proposition 5.

Another factor is in the scenario with debt is that the manager needs to be motivated with incentive compensation as well. This is more and more expensive for the CEO as the firm value increases. It is interesting to note that firms that went through a leveraged buy out transaction were often split up into smaller firms. These firms also prominently featured high debt and managerial ownership.

We can now roughly demarcate regions of the alternate mechanisms. See Figure 5.

²⁹This also ensures that β is reducing with risk.

6.2 Implicit Contracts

I investigate in this section if implicit contracts can sustain truth reporting behavior from the manager.³⁰ The use of implicit contracts as a solution poses a few problems. Lets consider an implicit contract between the CEO and the manager. The contract specifies that the CEO will pay the manager IC if the manager disagrees and is right. The initial concern is that, in a rational model, unless the horizon is infinite, such contracts cannot be sustained. While an infinite horizon is not reasonable in the case considered here, I will nevertheless analyze it to highlight the other issues with such contracts. The second significant issue is that by keeping up his promise to honor such contracts, the CEO reveals to the world (who observe the payoffs) that the manager was right. More importantly he reveals to the world that he was wrong. This creates a reputation cost due to a perceived lower ability now, in exactly the same way as she faced a reputation cost (say R_I) due a perceived lower ability when faced with dismissal. Third, a public firm faces the threat of a hostile takeover, however small, which changes the CEO's incentives to uphold such promises.

Consider, initially, an infinite horizon setting where the firm is private.

The manager will reveal his true information in case of disagreement if

$$C - D + \frac{1}{2}IC > C \implies IC > 2D.$$

The probability $\frac{1}{2}$ is probability that the manager is right in case of disagreement.

The CEO's will ex-post keep his promise if

³⁰Robbins(1990) notes how certain firms promote *functional conflict*. Examples mentioned include Innovis Technologies, IBM, GE.

$$\begin{aligned}
 IC + R_I + \frac{V(\Delta^*)}{r} &< \frac{V(0) - IC}{r} \\
 \implies IC &< \frac{V(\Delta^*) - V(0)}{1 + r} - R_I
 \end{aligned}$$

Combining the two conditions above, implicit contracts can be sustained to promote disagreement in a private firm if

$$\frac{V(\Delta^*) - V(0)}{1 + r} > R_I + 2D$$

Now consider this firm to be public. The probability that a raider attacks it is p_r .³¹

Now the manager's truth revealing condition becomes $IC > 2D/(1 - p_r)$ and the CEO's incentive to renege becomes

$$IC < \left(\frac{V(\Delta = 0)(1 - p_r)}{p_r + r} - \frac{V(\Delta^*)}{r} \right) \frac{r + p_r}{1 + r} - R_I$$

Note that for $p_r = 0$ this collapses to the reneging constraint in the private firm. Also note that in case of a hostile takeover the management bears no reputation costs. The hostile takeover is not contingent on performance and therefore it does not reveal any bad news about the management. The motive, as mentioned earlier, could simply be the breach of implicit contracts.

Once these constraints are combined, the daunting condition for implicit contracts to be sustained in a public firm emerges. The result is summarized below.

³¹See Shleifer and Summers(1989) for an explanation why raiders might specifically attack to break implicit contracts between employees and other stakeholders of the firm and in the process transfer the wealth to the shareholders.

Proposition 10 *Implicit contracts to promote disagreement can be sustained in a public firm only if*

$$V(0) - V(\Delta) > \left[\frac{2D}{1 - p_r} + R_I \right] (1 + r) + \frac{p_r(V(0) + V(\Delta))}{r}$$

. *In contrast the condition to be met in a private firm is*

$$V(\Delta^*) - V(0) > (1 + r)(R_I + 2D)$$

This condition is more likely to be met as the benefits of decentralization increase tremendously. In the framework presented here it is not met. Recall the result that for high management ability the firm remains centralized. However one can think of a structure where one high ability CEO works with many high ability managers in a very volatile environment to produce large benefits from decentralization. As mentioned earlier, in Section 4, adding more managers would provide more incentives for the CEO to decentralize in high ability environments. Corporate culture might be a possible solution in these cases if the internal reputation costs are low enough.

To sum the discussion on implicit contracts, it is a possible solution in public firms with high ability workers operating in high variance environments or in scenarios where the probability of a hostile takeover is very low, with the usual caveat that they are rational *long living* agents.³²

³²Note that many firms that promote such a culture do appear to be very large firms or high innovation firms.

6.3 Agency costs

The agency cost that is focused here is that of disagreement. Other agency costs such as stealing and shirking are not incorporated in the framework for the sake of clarity. It is now useful to discuss how the presence of such costs would alter the framework here.

In the framework presented, manager receives information and forms a viewpoint. If this information were to be produced by him, and effort was costly, he would be prone to shirking. His incentives to work are now driven through his private incentives to be right, in order to avoid the cost of dismissal.

Note that when the firm is centralized, his views count less. Consequently, in the absence of other mechanisms, the CEO has lesser incentives to motivate his manager by way of compensation or monitoring. Note that incentive to produce information now combines two tools - 1. incentive compensation 2. external control. In the presence of external control by a shareholder, the CEO does not need to motivate the manager through incentive compensation. In the presence of external control through debtholders, we have seen how equity ownership is part of the optimal mechanism.

In simple settings, where the costs of getting new information outweigh the benefits, the CEO has no incentives to reward the managers through high amounts of incentive compensation. Manager will not report his views truthfully, and consequently compensation does not help. This highlights a complementary role for incentive compensation and external control.

When the agency costs take the form of stealing, as in Jensen-Meckling (1976), incentive compensation and(or) monitoring are required. If ownership is required to ameliorate the agency problems of stealing and shirking, the relative benefits of the shareholder regime over

the debt-incentive regime reduce. The incentive compensation that is awarded with debt as part of the solution presented here will also help in reducing these agency cost. The large shareholder mechanism will however have to bear the additional cost of managerial ownership. Therefore the relative benefits will decrease. Any discussion of this will have to first determine on the extent of stealing by managers within firms.

7 Empirical Implications

The model produces the following testable implications. In cases where there is related evidence, they are mentioned along with the implication.

7.1 Centralization, Control and CEO Power

1. Family owned firms and other closely held private firms will have centralized structures.
2. External control and centralization in decision making are negatively related.

This is a new and very robust implication. It is important to note that centralized decision making can be explicit or implicit. Additionally, the paper shows how the incentive to formally decentralize differ when control is in the hands of debtholders versus shareholders. When the shareholder mechanism is used, formal decentralization is optimal, as it increases the chances of truth reporting. Combining this with our discussion on agency costs, managers in such firms will also have lower ownership. On the other hand when the debt-ownership mechanism is used, formal centralization is optimal. This increases the potential impact of the manager's decision and increases his incentives to report his view. Also by nature of the mechanism, managers in such firms have large ownership. This leads us to two hypothesis, which we test in the next section.

Hypothesis I : In firms with high shareholder control, the top management team is formally decentralized whereas in firms with high leverage, the top management team is formally decentralized.

Hypothesis II : In firms with high shareholder control, the executives working with the CEO have low ownership relative to executives in firms with high leverage.

3. Centralized firms either have very low ability management teams or very high level management teams.

Almeida et al (2003) show that firms with high power CEO's either underperform or outperform firms with low power CEO's. While their definition of power includes both external control and internal power, the result can be interpreted in support of the implication above.³³

4. Large shareholders hold controlling blocks in high variance industries. Entrepreneurs in volatile firms would raise capital through venture capitalists or other controlling large shareholders.

There is considerable anecdotal evidence that high risk firms go to venture capitalists and low risk firms choose other means of financing that give up lesser control. While alternate explanations exist, most notably simply the lack of other financing opportunities, this is consistent with the implication.

Amihud and Lev(1998) present evidence in their survey that manager controlled firms are less risky than shareholder controlled firms. Ownership concentration and risk are related.

³³Since this paper has showed that they are both related negatively, high collective power would mean high internal power and low external control. Similarly, low collective power would mean low internal power and high external control.

This is in line with the theory. Theories based on diversification have to convincingly explain why then do we not find large shareholders in low risk industries and why is the shareholder bearing the cost of non-diversification. Theories based on agency costs, while deserving some merit, cannot explain the presence of non-monitoring large shareholders. Shareholder activism is limited to very few institution types, most notably public pension funds. There are also theories based on liquidity considerations(Maug, 1998) that explain the existence of large shareholders.

7.2 Financial and Organizational Restructuring

The model provides directions for organizational restructuring accompanying drastic financial changes.

Leverage increasing transactions will be accompanied with increase in managerial ownership and decentralization. As noted earlier this was an essential part of the leveraged buy-out phenomena that took place in the 1980's.

The paper shows that smaller firms will tend to have high debt and ownership structures. An implication of this is that financial restructuring that increase leverage considerably will be accompanied by asset sales or spinoffs.

Leverage reducing transactions will be accompanied by a transfer of control from the CEO to the external shareholders, if the decision structure remains the same or in greater centralization. Many firms have recently issued equity through transactions known as PIPEs (Private investment in a Public Entity). The equity holders are typically large institutions like conglomerates, venture capital firms and hedge funds. One of the reasons is to retire debt. This implication would suggest that firms that retire debt by issuing equity to a large

shareholder would perform better than firms doing the same through a dispersed offering, such as a secondary equity offering. While there has been no systematic study of the effects of PIPE's, the announcement effects are often positive providing support for the implication.

In general, any transaction that would reduce external control should be accompanied by a move towards centralization.

Organizational changes post mergers would depend on the control structure of the merged firm. The paper shows why there will be information problems if two firms, different in their nature of projects, are under the same control structure. This highlights the difficulty in executing value creating mergers.³⁴

Another area the theory can provide some guidance is organizational restructuring at various stages of the business cycle. The theory would argue that as effective external control on the firm changes through a business cycle, the firm's internal structure should change. However, if internal variable in a firm cannot be changed easily, there are efficiency implications as external control changes. Tests for all these implications will have to wait for a large scale study on organizational and financial restructuring.

8 Conclusion

The paper shows how the balance of control between external claimants and the CEO affects the reporting incentives of managers in the hierarchy. By designing external control appropriately, the CEO is able to elicit information from the manager and hence able to decentralize the firm. This paper highlights a new role for external finance - that of facilitating new information to be produced in firms. Empirical implications are presented, one

³⁴Kaplan et al(1999) come to a similar conclusion from their clinical study.

of which is that firms subject to higher external control are more decentralized. The formal nature of centralization is of opposite nature when control is in the hands of debtholders versus shareholders.

This paper presents a theoretical step in explaining why financial and organization structure are linked and how they are related. A more complete version of such a theory would guide us in value creation in organizations through concomitant financial and organizational restructuring.

Appendix

Proof (Lemma 3)

The decision structure is obtained by solving

$$2(\alpha_C + \alpha_M) = \frac{(1 - e_c)(1 - e_M) - e_C e_M}{(1 - e_c)(1 - e_M) + e_C e_M}$$

and

$$2(\alpha_C - \alpha_M) = \frac{e_m(1 - e_C) - e_C(1 - e_M)}{e_c(1 - e_M) + e_M(1 - e_C)}$$

when $e_M = 1/2$ the solution is $\alpha_M = 0$ and $\alpha_C = \frac{1}{2} - e$. Also, as $e_M - e_C$ increases, $\alpha_C - \alpha_M$ increases, since $\frac{d(\alpha_C - \alpha_M)}{d(e_M - e_C)} = \frac{2e_C(1 - e_C)}{(e_c(1 - e_M) + e_M(1 - e_C))^2} > 0$. Also, $\frac{d(\alpha_C + \alpha_M)}{d(e_M - e_C)} = \frac{-e_C(1 - e_C)}{((1 - e_c)(1 - e_M) + e_M e_C)^2} < 0$

Proof (F.O.C for the no external control case)

The first order condition, after manipulation, becomes

$$-4f'I^2(1 - 2e - 2f)\left[\frac{p(\frac{2I}{1-2f})}{(1 - 2f)^3} + \frac{p(\frac{2I}{1+2f})}{(1 + 2f)^3}\right]$$

where $f = \alpha_M + \alpha_C$. The second order condition satisfies the positive condition. Note that f' is negative, since as Δ increases $f(\cdot)$ decreases. A simpler proof is as follows. In the absence of any new information produced by the manager, the true ex-post probabilities are $p(S = H|\sigma = (1, \cdot)) = 1 - e$ and $p(S = H|\sigma = (-1, \cdot)) = e$. The first best structure then is obtained by setting $\alpha_M = 0$ and $\alpha_C = \frac{1}{2} - e$. This is the same as complete centralization.

Q.E.D.

Proof: Proposition 3 (Sketch)

The conditions in the text give the first constraint. The conditions for the scenario $(-1, 1)$

and $(-1,1)$ together produce the second constraint.

$$\frac{2D}{RwF(x_{-1,1}^*)} \leq p_s(c) \leq \frac{(e^2 + (1 - e)^2)D}{R[we^2F(x_{-1,1}^*) - (1 - 2e)(F(x_{-1,-1}^*) - F(x_{-1,1}^*))]}$$

For all $e < \frac{1}{2}$, the Right hand side of both constraints are greater than the respective left hand sides. Therefore there is a feasible region.

Thus a feasible solution always exists. It remains to be shown that only one of these conditions bind. If $F(x_{-1,1}^*)$ is greater than $1 - F(x_{1,-1}^*)$, then the left hand side of the second condition is lower than the left hand side of the first. Also, the right hand side of the second condition is larger than the right hand side of the first. Note that we^2 is less than 1. Therefore the binding condition is the first. Similarly, if $F(x_{-1,1}^*)$ is lower than $1 - F(x_{1,-1}^*)$, the second condition is the binding one. **Q.E.D.**

Proof : (Proposition 4)

With control designed optimally, as per proposition 3, the CEO receives the manager's true views. The structure should therefore be the first best structure. From Lemma 2, the first best structure is that where $\Delta = 0$.

Proof : Proposition 5 and 6 (Sketch)

Divide the region of payoffs into three regions. Region I is the region that is spanned by the CEO's ability alone. Therefore Region I is $\frac{I}{1-e}$ to $\frac{I}{e}$. Region II is the region spanned by the management team together but not by the CEO alone. The region II is from $\frac{I}{\frac{1}{2} + \alpha^* + \alpha^*} = \frac{I((1-e)^2 + e^2)}{(1-e)^2}$ to $\frac{I}{1-e}$ and from $\frac{I}{e}$ to $\frac{I}{\frac{1}{2} - \alpha^* - \alpha^*} = \frac{I((1-e)^2 + e^2)}{e^2}$. Region III is beyond the management ability span, i.e., all other possibilities that don't fall into region I and region II. Note that 2I is in region I.

I first show how a mean preserving shift of probabilities from one region to another affect

the gains from decentralization and how it effects the costs.

As probability mass moves from region I to region III (say a symmetric probability shift of ϵ from $2I + d_1$ to $2I + d_3$ and from $2I - d_1$ to $2I - d_3$.), the benefits of decentralization reduce. The loss in the benefits can be shown to be $-d_1e(1 - e)\epsilon$. The costs of dismissal also increase. The increase is by amount $Rp_s(c)e^22\epsilon$. Therefore the incentives to decentralize decrease as the probabilities shift from region I to region III.

Similarly it can be shown that as probability mass moves from region I to region II, the benefits of decentralization increase and the costs remain unchanged. The costs remain unchanged because $(F(x_{-1,-1}^*) - F(x_{1,1}^*))$ remains unchanged. Therefore, incentives to decentralize increase as a mean preserving spread shifts probabilities into region II.

Combining these two results, we have the proposition that as the distribution gets riskier (in a mean preserving sense), it initially increases the CEO's incentives to decentralize and, as probabilities start shifting into region III, later decreases the incentives to decentralize.

Now let us keep the project distribution fixed and look at how abilities affects incentives to decentralize. Note that the regions are determined by the abilities. With higher abilities, the region III reduces. However, the difference between region II and region I reduces as well. For very low abilities, region III is so large is that there is no incentive to decentralize. For very high abilities, region III is very small. So most projects lie in either region I or region II. The difference between region II and region I is so small that incentives to decentralize are low.

Region III is increasing in e . Region II - REgion I is increasing in e as well. Therefore decentralization is beneficial only in some intermediate range of ability $\underline{e} < e < \bar{e}$.

Proof: Proposition 8 (Sketch)

The truth revealing constraint for the scenario (1,-1) is

$$\beta < \frac{-2D + R(F(x_{1,-1}^*) - F(x_{1,1}^*)) + Rw(1 - F(x_{1,-1}^*))}{E(x|x > x_{1,1}^*) - E(x|x > x_{1,-1}^*) - I(F(x_{1,-1}^*) - F(x_{1,1}^*))}$$

The truth revealing constraint for the scenario (-1,1) is

$$\beta > \frac{2D + R(F(x_{-1,-1}^*) - F(x_{-1,1}^*))}{E(x|x > x_{-1,1}^*) - E(x|x > x_{-1,-1}^*) - I(F(x_{-1,-1}^*) - F(x_{-1,1}^*))}$$

The constraint for the scenario (-1,-1) is

$$\beta < \frac{(e^2 + (1 - e)^2)D + R(1 - e)^2(F(x_{-1,-1}^*) - F(x_{-1,1}^*))}{e^2(E(x|x > x_{-1,1}^*) - E(x|x > x_{-1,-1}^*) - I(F(x_{-1,-1}^*) - F(x_{-1,1}^*)))}$$

and for the scenario (1,1) is

$$\beta > \frac{-(e^2 + (1 - e)^2)D + e^2R(F(x_{1,-1}^*) - F(x_{1,1}^*)) + Re^2w(1 - F(x_{1,-1}^*))}{(1 - e)^2(E(x|x > x_{1,1}^*) - E(x|x > x_{1,-1}^*) - I(F(x_{1,-1}^*) - F(x_{1,1}^*)))}$$

For $R > 4d$, the conditions are obtained by coupling the first two constraints. The other condition is obtained by coupling the last two constraints together. To see if a feasible solution exists always, I check if the R.H.S of the second constraint can combine with the L.H.S of the first constraint to give a region that is non-overlapping with the region given by the L.H.S. of the second constraint and the R.H.S of the first. This can happen for low abilities (high e 's). For $e=0.5$, this is the case ($R.H.S (2) = L.H.S (1)$ and $R.H.S(1) = L.H.S.(2)$) and for $e=0$, there is a feasible solution. The functions are also monotonic in e . Therefore, for some $e < e^*$ there is a feasible solution. The CEO chooses the lower bound to give the value of β .

Q.E.D.

Proof (Proposition 9)

The CEO's utility, when using debt and incentive compensation, is

$V_D = (1 - \beta)V(0) - \frac{R}{2}[e^2(1 - F(x_{1,1}^*)) + (1 - e)^2(1 - F(x_{-1,-1}^*)) + e(1 - e)(2 - F(x_{1,-1}^*) - F(x_{-1,1}^*))]$ When using the large shareholder mechanism, his utility is

$$V_{LS} = V(0) - \frac{Rp}{2}[[e^2(1 + F(x_{-1,-1}^*) - F(x_{1,1}^*)) + (1 - e)^2(1 + F(x_{1,1}^*) - F(x_{-1,-1}^*)) + e(1 - e)2]$$

Therefore using large shareholder is a preferred mechanism for the CEO when,

$$\begin{aligned} \beta V(0) &> R\{e(1 - e)(F(x_{1,-1}^*) + F(x_{-1,1}^*) - 2(1 - p_s(c))) \\ &+ e^2(p_s(c)(1 - F(x_{1,1}^*) + F(x_{-1,-1}^*)) - (1 - F(x_{1,1}^*))) + \\ &(1 - e)^2(p_s(c)(1 + F(x_{1,1}^*) - F(x_{-1,-1}^*)) - (1 - F(x_{-1,-1}^*)))\} \end{aligned}$$

It is easy to see that a greater the value of the firm, $V(0)$, makes the debt and ownership mechanism more expensive. **Q.E.D.**

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Figure 1: Timeline

The time line depicts the sequence of events, as considered in the model.

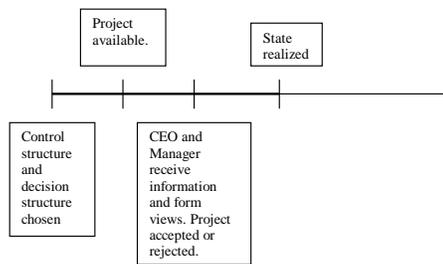


Figure 2: Project cutoffs and Centralization

The figure shows how decentralization affects decisions made regarding project choice.

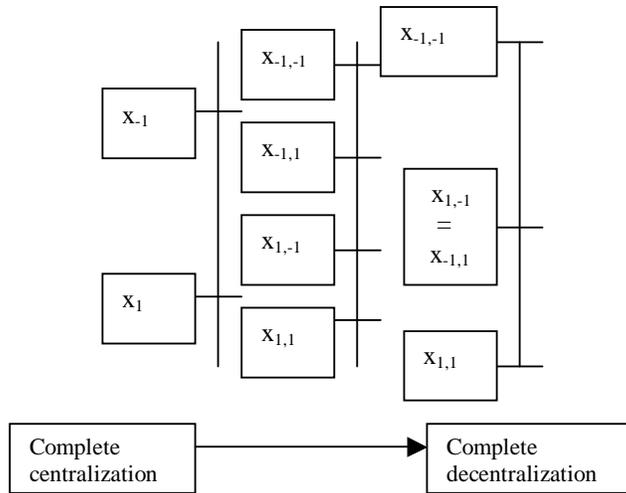


Figure 3: Probabilities used in decision making.

The table shows how the probabilities assigned is decision making change.

Scenario (σ_c, σ_m)	True probability of high state.	Probability assigned to high state through decision structure
(1,1)	$(1-e)^2 / \{e^2 + (1-e)^2\}$	$1/2 + \alpha_c + \alpha_m$
(1,-1)	$1/2$	$1/2 + \alpha_c - \alpha_m$
(-1,1)	$1/2$	$1/2 - \alpha_c + \alpha_m$
(-1,-1)	$e^2 / \{e^2 + (1-e)^2\}$	$1/2 - \alpha_c - \alpha_m$

Figure 4: Optimal Regions

The graph shows the optimal regions. The x-axis denotes errors (abilities). The y axis is the risk of a project. The graph is for mean preserving spreads around the mean $2I$. The graph is drawn by estimate.

