

# **Managerial Ownership with Rent-Seeking Employees**

by

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First Draft: April 2006  
This Draft: September 2008

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## Abstract

*The traditional agency problem advocates 100 percent share ownership when managers are risk-neutral, and managers either have enough wealth to buy the firm outright or have access to perfect capital markets. This paper says that delegation to the disinterested managers may sometimes explain the separation of ownership and control even before one considers diversification motives or credit market imperfections. High levels of managerial share ownership may induce rent-seeking employees to obstruct monitoring. Delegation to a disinterested manager with lower levels of share ownership makes firms more valuable than retaining a CEO-level agent that thinks like a 100 percent owner.*

*Journal of Economic Literature Classification:* D23 & G34

*Keywords:* CEO compensation, contracts, corporate control, shareholders, rent-seeking, and unions

## 1.0 Introduction

“The directors of such [joint stock] companies, however, being the managers rather of other people's money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance with which the partners in a private copartnery [partnership] frequently watch over their own.”  
--Smith (1776 [1791], Book IV, Chapter 1, Article 3, p. 33)<sup>1</sup>

“...the separation of ownership and control in the large corporation may in some cases not be a bad thing for owners. Indeed, the separation may be essential for the credibility of some threats, promises, and commitments.”  
--Vickers (1985, pp. 143-144)

The classic agency approach of Smith (1776) and Jensen and Meckling (1976) advocates aligning the incentives of managers and owners. In effect, managers who think like owners will maximize the value of firms and will seek the most efficient production methods. In a risk neutral world where there are no credit constraints, a top manager should optimally hold all the shares in an enterprise.<sup>2</sup> In contrast, this paper argues that managerial ownership will be driven by delegation motives. In some firms, owners may prefer to have a manager with a less than 100 percent ownership stake because the incentives of the manager will affect the rent-seeking motives of the firm's employees. A disinterested manager will discourage employees from engaging in rent-seeking activities. (In the present paper, employee rent-seeking takes the form of increasing the manager's

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<sup>1</sup> Brackets, “[ ]” are added by the present author.

<sup>2</sup> Risk neutrality facilitates 100 percent ownership because it allows the manager to be unconcerned about diversification. Lack of credit constraints allows the best manager to buy the firm from its original owners. These assumptions are sufficient for the optimal incentives, 100 percent ownership, to be transferred to the best manager without forcing the original entrepreneur to sell the firm at any discount. (One could also argue that symmetric information would be also necessary for such an ownership sale to be always efficiently consummated.)

cost of detecting slack work.) Owners can increase the value of the firm by eliminating rent-seeking costs. They achieve this if they give control to a CEO with an ownership stake strictly less than 100 percent.

These results are entirely caused by the by employee rent-seeking motives. Without endogenous levels of employee rent-seeking, which takes the form of obstructing the monitoring of slack work, it is demonstrated that we will revert to the standard agency problem where 100 percent managerial stakes are optimal.

Unionized firms are the most likely firms to have workers that have enough animosity towards management that workers would cover for the slack efforts of their colleagues. Further, job security and prestige in many unionized work places may be more a function of seniority than performance. This means that the competitive pressures among employees may be lessened when a given worker's job security rests more in their start date than their exceptional productivity. A worker is more likely to cover his or her union "brother" or "sister" than for an employee who is viewed as his competitor for promotion and retention. Therefore, with the exception of one-worker firms, we should expect that unionized firms will be the firms in which the cost of monitoring slack work may be significantly influenced by the work force.

There is some empirical support for the theoretical results of this study. CEO performance pay declines in the level of unionization according to Anderson et al. (2007). The present paper argues this. Anderson et al. (2007) find that long term performance pay for CEOs decreases as a percentage of total pay by 2.3 percent for every 10 percent increase in the percent of employees that are unionized. That is, on average, a completely unionized, publicly traded firm in the United States will have 23 percent

lower CEO compensation tied to stock, option, and performance pay related grants, than a completely non-unionized firm. These results are also confirmed by Gomez and Tzioumis (2007), which finds that total CEO compensation is lower in U.S. firms with unions present. This is predicted by Theorem 4 in the present paper. Further, Gomez and Tzioumis (2007) finds that CEOs of heavily unionized workforces receive significantly lower stock option grants. Lower levels of stock compensation are predicted in Theorem 3 of the present paper. These results are consistent with the delegation story whereby CEO incentives are weaker in order to minimize union member's incentives towards rent-seeking.

Shleifer and Vishny (1997) argue that the agency conflict is the main problem in corporate governance. Yet, Berle and Means (1932) observed that many of the largest corporations are widely held with little in the way of concentrated ownership. Most commentators assume that this occurs in large part because of diversification motives of Markovitz (1952).<sup>3</sup> Concentrated ownership is too costly for many investors with limited wealth. Therefore, small ownership stakes for managers may be seen as response to the problem of the tradeoff between creating efficient incentives and leaving managers with too little diversification. Vickers (1985) and the present paper argue that delegation may be in the interests of shareholders. For the purpose of this paper, “delegation” is the action whereby a principal prefers to give control to an agent with different objectives than the principal. In the present study, delegation to a risk neutral CEO with potentially

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<sup>3</sup> Diversification motives would only strengthen the results of this paper that low levels of CEO ownership are optimal.

unlimited wealth but a tiny stake in the enterprise is optimal because it positively affects the incentives of employees working underneath the manager.<sup>4</sup>

Strausz (1997) also writes about the value of delegation in a moral hazard model similar to this one. That paper, like this one, finds having a manager with different interests from the principal (shareholders) can be valuable. Yet the issue with Strausz (1997) is that the principal has incentives to hide the result of his monitoring. In Strausz the monitor (the manager) does not have the same incentive to hide the results of the audit as does the principal (the 100 percent shareholder). We assume in the present paper that the results of the manager's audit of workers is public knowledge; therefore, in the present paper it does not matter if the CEO is the principal, the 100 percent shareholder. In Strausz (1997) unlike the present paper, in which the union can raise the costs of monitoring, the worker being monitored in Strausz (1997) cannot affect the cost of the audit of effort. The similar results about the value of delegation in Strausz (1997) and the present paper are driven by different assumptions. In Strausz (1997) delegation is profitable because of the secrecy of the audit results. In the present paper, delegation is profitable because the workforce can raise the cost of auditing their effort.

Similar to the present paper, reducing rent-seeking costs is a rationale for divestiture of declining divisions in Meyer et al. (1992). Declining divisions are characterized by divisional managers who lobby the center for extra resources.

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<sup>4</sup> There are a few papers that explore how managerial biases can be commitments that ultimately firms value under different environments. One strand of literature pursues how managerial biases improve project selection when rewards for successful innovation are fixed. Empathy for lower level managers in Rotemberg and Saloner (1993), narrowness of firm scope in Rotemberg and Saloner (1994) and managerial vision in Rotemberg and Saloner (2000) can improve incentives for innovation in this incomplete contracting setting. The other approach of Van den Steen (2005) looks at how managerial biases or "vision" influences the recruitment of employees. In contrast to both these approaches the present paper is concerned less with project selection but cost minimization. Further, the present paper looks to design compensation to change managerial objectives. While the papers in this footnote focus on exogenous managerial traits that make them the "right man" (or woman) for the job.

Shareholders in these firms can avoid paying for these wasteful lobbying efforts by selling off their underperforming divisions. In Meyer et al. (1992), separation eliminates rent-seeking. In contrast, in the present study, delegation to a sufficiently disinterested CEO reduces rent-seeking by rank-and-file employees.

Scharfstein and Stein (2000) like this paper deals with executive compensation and rent-seeking employees. Nevertheless, the main focus of that study is on the misallocation of investment between divisions. The rent-seeking in that study takes the form of divisional managers “resume-polishing” activities that improve their outside option wage or “scorched earth,” entrenchment, activities that hurt the performance of their successor. In contrast, when workers engage in rent-seeking in the present paper, they affect the manager’s cost of detecting slack work. Another key difference between Scharfstein and Stein (2000) and the present paper is that the former does not have an endogenous level of share ownership for the CEO while the latter does. Instead, in the former the CEO is compensated by some exogenous private benefits which increase with the firm’s output. Scharfstein and Stein (2000, p. 2554) write that, if the CEO has private benefits that have her behave like a 100 percent owner, then their key result of the CEO misallocating investment across divisions largely disappears.

This paper also has some common features with Pagano and Volpin (2005), but it has some key differences. That study, like this one, examines managerial ownership and employee relations in the context of a sequential game. Yet, the present paper differs from that study in two respects. First, this paper allows the founder of the firm, the “entrepreneur,” to act as the CEO. Pagano and Volpin (2005) does not. For this reason, and because the manager is credit constrained with limited wealth, the founder in Pagano

and Volpin (2005) cannot sell the firm entirely to the manager and will never give away the optimal ownership stake of 100 percent to the manager. Secondly, this paper, in contrast to Pagano and Volpin (2005), allows employees to affect the manager's costs of monitoring workers. The latter study takes the manager's cost of monitoring as exogenous.

This paper is most closely related to Wilson (2007). Both papers come to similar conclusions about CEO pay. Much like Wilson (2007) this paper predicts that in order to maximize shareholder value, CEO incentives should be less sharp and top managers should have lower levels of pay when employees engage in rent-seeking. Nevertheless, that paper does not specifically discuss compensation in terms of share ownership as does this study. Wilson (2007) considers bonus schemes that do not always closely follow the share price. Nevertheless, the clear result in both is that CEOs should receive less share or incentive compensation in unionized firms, which is confirmed by the previously mentioned empirical studies.

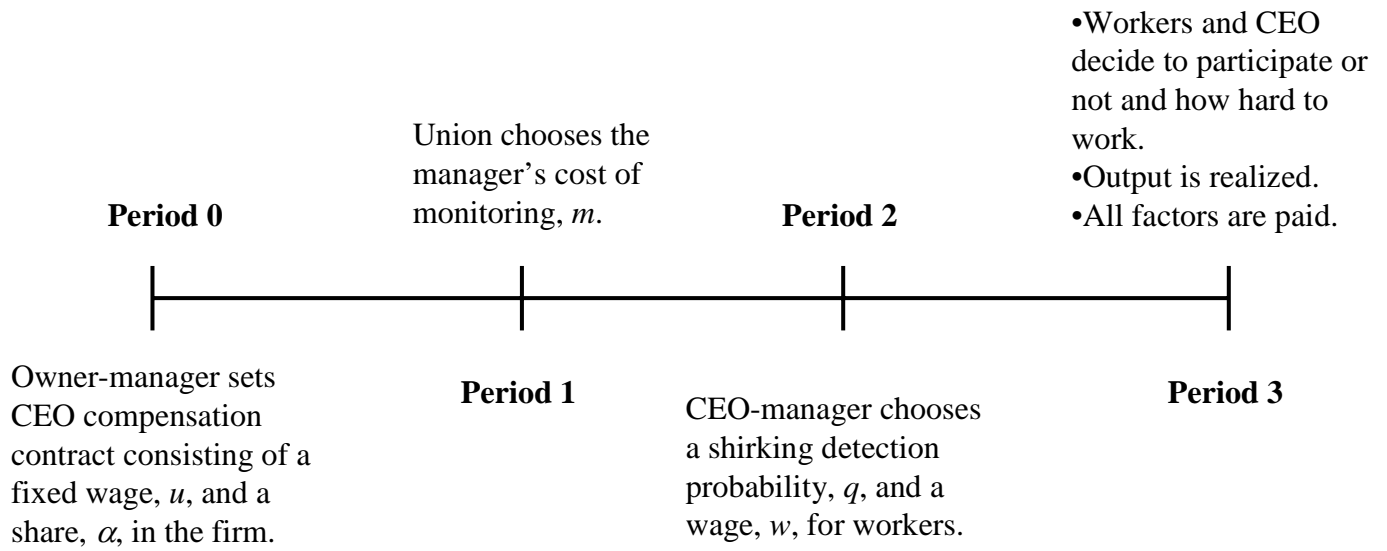
The results differ when we discuss the extent of rent-sharing between shareholders and rent-seeking workers. In the present paper, workers are prevented from sharing in the rents. Here, the top manager's efforts increase in the monitoring intensity. In Wilson (2007), the CEO's efforts increase in firm value, as opposed to the monitoring costs of rank-and-file workers in the present model. Shareholders could not afford to give the CEO a minimal merely, individually rational compensation package because in Wilson (2007) this would leave the firm worthless. In the present paper, the entrepreneur can endow the CEO with so little compensation that the union must cease in rent-seeking,

or the firm will fall apart. The take-it-or-leave-it result of this paper is in sharp contrast with the rent-sharing between workers and shareholders found in Wilson (2007).

Grout (1984) and Baldwin (1983) have argued that ex post appropriation of surplus by unions, in particular, leads to underinvestment. Rent-sharing in a dynamic context can be seen as a form of the “hold-up” problem, where investors’ returns are expropriated ex post. For this reason, the results of this paper should be encouraging because they do not imply, as does Wilson (2007), that the underinvestment associated with rent-sharing, may be an unavoidable result of having a workforce with the ability to affect the cost of monitoring. The present paper argues that rent-sharing, and underinvestment, may be avoided altogether.

The timeline is summarized in figure 1. First, an entrepreneur decides on the size of her fixed wage,  $u$ , and how large an ownership stake,  $\alpha$ , that she should retain in the firm. Then employees choose how high to set the manager’s cost of detecting slack effort,  $m$ . This choice can be seen as the level of efficiency-reducing rent-seeking that employees engage in. In period 2, the manager chooses the level of monitoring that maximizes her payoff. Next, in period 3, employees choose effort levels that maximize their payoffs. Then returns are realized, and all factors of production are paid.

In the next section, we describe the timing, technology, and preferences of the actors in more detail. In section 3, we solve the manager’s, employees’, and the entrepreneur’s problems in turn. In section 4 we conclude.



*Figure 1.* Timeline

## 1.0 Setup

### 2.1 Production Technologies

The firm can generate revenues of  $R \in \{0, \bar{R}\}$ . The probability that the firm can generate high revenues is  $P\{R = \bar{R}\} = e$ , where  $e$  is the aggregate effort of workforce normalized to be of size one. Likewise, the probability of low revenues is  $P\{R = 0\} = 1 - e$ . We can think of the workforce as an interval of identical atomistic agents; their total measure is normalized to one. Each worker can choose an effort level of either  $e = 0$  or  $e = \bar{e}$ . The cost of low effort is normalized to  $c(0) = 0$ , while the cost of high effort is  $c(\bar{e}) = \bar{c}$ . High effort work is efficient because the productive benefits of high effort outweigh its costs. Namely,  $(\bar{e} - 0)R > \bar{c}$ .

### 2.2 Preferences and Opportunities

Both the entrepreneur and the union members have linear utility in income. Nevertheless, their costs of effort are potentially non-linear. The costs of effort are linearly separable as is the benefit of income. Union members have two costs of effort. They first have the cost of performing productive work  $c(e)$ , and then they have the cost of obscuring shirking  $c(m)$ . Low  $m$  means that the manager, the CEO, can detect shirking at little cost. While high  $m$  means that the manager must incur great effort to detect slack work by union members.

The opportunity costs to the entrepreneur and the CEO are both  $U_M$ , that person's outside option wage. The best alternative investments for the entrepreneur are zero net present value. Further, the union member's outside option wage is zero.

The CEO and union incur their effort costs and receive their compensation in period 3, the productive period.

For production to be efficient and for their to be rents to be fought over, it must be the case that expected revenues under high effort,  $\bar{e}R$ , strictly exceed the union member's effort costs,  $\bar{c}$ , plus the managers outside option,  $U_M$ . That is,

$$\bar{e}R > \bar{c} + U_M \quad (1)$$

Union members are assumed to be credit constrained and have insufficient wealth to buy the firm outright. These credit constraints may stem from the fact that union members have conflicts of interest with outside investors. For example, Grout and Jewitt (1988) demonstrate how, in many instances, employees, if they gain control, will be tempted to raise their wages at the expense of other shareholders.

### 2.3 Monitoring Technologies

- The top manager can detect shirking at the cost to herself of  $c(q) = \frac{mq^x}{x}$ , where  $x$  is a non-negative, exogenous parameter. That is,  $x \in [0, +\infty)$ . Further, the parameter  $m$  is constrained to be non-negative. Namely,  $m \in [0, +\infty)$ . Monitoring

is at least weakly costly,  $c'(q) \geq 0$ . The results of the CEO's monitoring of workers is common knowledge. This is in contrast to Strausz (1997) where the person doing the monitoring can hide the results of the audit.  $q$  is the probability that low effort work will be detected. Since it is a probability,  $q$  is constrained to  $q \in [0,1]$ . The manager sets  $q$  in period 2.

- The union can obstruct monitoring at the variable cost per member

of  $c(m) = \frac{km^y}{y}$ . Both  $k$  and  $y$  are non-negative, exogenous parameters—

$y \in [0, +\infty)$ , and  $k \in [0, +\infty)$ . Therefore, obstructing monitoring is also weakly costly to union members,  $c'(m) \geq 0$ . If the union is indifferent between two strategies that yield the same expected payoff, union members will choose the strategy with the lower monitoring costs,  $m$ . This implies that the union will minimize monitoring costs if it is weakly in their interest to do so. The union chooses  $m$  in period 1.

## 2.4 Contractual Boundaries

- The CEO's fixed wage,  $u$ , cannot meet or exceed expected revenues, less total wages to union members,

$$u < E\{R\} - w = \bar{e}R - w \quad (2)$$

We can think of this as some prohibition against “excessive” self-dealing by the manager. From a practical point of view this may prevent the entrepreneur making take it or leave it offers to the union by paying herself a fixed wage the size of the net rents generated by the firm.

- The shareholder can credibly commit to pay fixed wages of  $u$  and  $w$  in period 3, even if revenues are insufficient to cover expenses. (This will be the case  $(1 - \bar{e}) * 100$  percent of the time even if union members exert high effort.) In effect, we relax the limited liability constraint. Shareholders can have negative payoffs in low output realizations. One simple way to work within the limited liability constraint would be to envision shareholders making an upfront, binding, investment to pay wages  $u$  and  $w$  prior to the state of the world being realized. Shareholders’ net payoff is negative in the bad output realizations, but their ex post net payoffs are positive in the good states of the world when workers exert high effort.
- $\alpha \leq 1$ . The share of profits,  $\alpha$ , which is granted to the CEO cannot exceed one.
- Union members pay a non-negative penalty if they are caught shirking. This penalty is  $P \geq 0$ . The penalty is an exogenous parameter of the legal environment.

## 2.0 Model

The model will be solved by backwards induction. This will give us closed form solutions for the unconstrained, best-response solutions for monitoring intensity,  $q$ , monitoring costs,  $m$ , and ownership stakes,  $\alpha$ .

The program that is followed is to maximize the returns to the entrepreneur, given the best responses of the union and the CEO, respectively. That is,

$$\arg \max_{\alpha, u} V_o = (1 - \bar{e})0 + \bar{e}R - w(q(m)) - \frac{mq^x}{x} - U_M$$

The entrepreneur only cares about the expected revenues, less union wages, less her own cost of monitoring when she is the CEO, less her opportunity cost of serving as the CEO.

There are several incentive and rationality constraints of the players that must be satisfied. In particular, the entrepreneur has to worry about the incentive compatibility constraints for the union members in period 1 and herself when she is acting as the CEO in periods 2 and 3. Further, she must satisfy her individual rationality constraints in period 0 as the entrepreneur and in periods 2 and 3 as the manager. In addition, the union members' participation constraints in period 3 must also be met. Given that high effort,

$\bar{e}$ , maximizes the value of the firm, the  $IR$  and  $IC$  constraints<sup>5</sup> are the following for the entrepreneur, union members, and the CEO:

$$\begin{aligned}
IR_O : \quad & V_O \equiv E\{R\} - w - c(q) - U_M \geq 0 \\
& \bar{e}R - w - \frac{mq^x}{x} \geq U_M \\
IR_U : \quad & V_U \equiv w - c(e) - c(m) \geq 0 \\
& w - \bar{c} - \frac{km^y}{y} \geq 0 \\
IC_U : \quad & w - c(e) \geq (1 - q)w + q(-P) \\
& w \geq \frac{\bar{c}}{q} - P \\
IR_M : \quad & V_M \equiv \alpha(E\{R\} - w - u) + u - c(q) - U_M \geq 0 \\
& \alpha(\bar{e}R - w - u) + u - \frac{mq^x}{x} \geq U_M \\
IC_M : \quad & \alpha(E\{R\} - w - u) + u - c(q) \geq u \\
& \alpha(\bar{e}R - w - u) - \frac{mq^x}{x} \geq 0
\end{aligned}$$

LEMMA 1. If the  $IR_M$  constraint is satisfied, then the  $IR_O$  constraint must be satisfied.

A formal proof of this is left for appendix 5.1. This follows from the fact that the CEO's base wage cannot exceed the expected profits of the firm. Therefore, the entrepreneur has more incentive to participate because she benefits from equity sales of  $(1 - \alpha)$  of the firm's shares. This, of course, simplifies the problem to two incentive and two rationality constraints.

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<sup>5</sup> The  $IC_U$  constraint is much like an efficiency, or non-shirking wage, as proposed by Shapiro and Stiglitz (1984).

The union's program in period 1 is to choose an “ $m$ ” that both maximizes its utility and satisfies the manager's and its own rationality and incentive constraints. Let  $w(q)$  be the SPE wage schedule, and  $q(m)$  be the SPE monitoring intensity.

$$\arg \max_m V_U = w(q(m)) - \bar{c} - \frac{km^y}{y}$$

The manager's problem in period 2 is to choose a monitoring intensity,  $q$ , which maximizes her payoff.

$$\arg \max_q V_M = \alpha[(1 - \bar{e})0 + \bar{e}R - w(q(m)) - u] + u - \frac{mq^x}{x} - U_M$$

The wage schedule,  $w(q(m))$ , will depend on whether or not  $IC_U$  or  $IR_U$  binds. The discussion begins by considering the CEO's problem when the union member's incentive constraint is the most difficult to satisfy. For example, when  $P = 0$  and  $k = 0$ , the satisfaction of  $IC_U$  implies that  $IR_U$  is also satisfied. Let us begin by solving the model by backwards induction when the  $IC_U$  binds and  $IR_U$  is slack. Backwards induction requires that we first solve the manager's problem because the CEO moves last after both the entrepreneur, who moves in period 0, and the union, which moves in period 1.

### 3.1 The CEO's Problem

#### 3.1.1 The manager's problem when $IC_U$ binds

Suppose that the union members' incentive compatibility constraint implies that working is also individually rational for all union members. Then we can substitute in the non-shirking incentive compatible wage into the CEO's program. The CEO's payoff is the following when the  $IC_U$  binds:

$$V_M = \alpha \left( \bar{e}R - \frac{\bar{c}}{q} + P - u \right) + u - \frac{mq^x}{x} - U_M \quad (3)$$

The CEO chooses the shirking detection probability to maximize her payoff:

$$\arg \max_q V_M = \alpha \left( \bar{e}R - \frac{\bar{c}}{q} + P - u \right) + u - \frac{mq^x}{x} - U_M$$

$$\frac{dV_M}{dq} = \frac{\alpha \bar{c}}{q^{*2}} - mq^{*x-1} = 0$$

The second order condition is unambiguously negative at  $q^*$ :

$$\left. \frac{d^2V_M}{dq^2} \right|_{q=q^*} = -[(\alpha \bar{c})^{x-2} m^3]^{\frac{1}{x+1}} (x+1) < 0$$

The manager's payoff is therefore maximized at

$$q^*(m) = \left( \frac{\alpha \bar{c}}{m} \right)^{\frac{1}{1+x}}. \quad (4)$$

Since  $q$  is a probability, there will be many instances where the constraint that  $q \in [0,1]$  will bind. In particular,

$$q^*(m) = \min \left\{ \left( \frac{\alpha \bar{c}}{m} \right)^{\frac{1}{1+x}}, 1 \right\}.$$

Since some positive monitoring is needed to ensure the incentive compatibility of effort, it may also be the case that  $q$  is determined by the union members' incentive compatibility condition and not the manager's unconstrained best response given by Equation (4).

### 3.1.2 The Manager's Problem when the $IR_U$ binds

The manager's problem when the  $IR_U$  binds is almost trivial. When the  $IR_U$  binds, it must be the case that the monitoring intensity falls between  $q \in [\bar{c}/(\bar{c} + P), 1]$ . Otherwise, the  $IC_U$  will not be satisfied. Further, the union members must be paid at least for their monitoring costs. Therefore, the manager's problem is as follows:

$$\max_{w \& q} \underline{V}_M = \alpha(\bar{e}R - w - u) - \frac{mq^x}{x} - U_M, \quad (5)$$

where  $q \in [\bar{c}/(\bar{c} + P), 1]$  and  $w \in [\bar{c}, \infty)$ .

$$\frac{dV_M}{dw} = -\alpha \leq 0$$

$$\frac{dV_M}{dq} = -mq^{x-1} \leq 0$$

Therefore, the manager will weakly prefer to both minimize the union members' wages and minimize the monitoring intensity when the  $IR_U$  constraint binds. The manager will choose the following:

$$\underline{w} = \bar{c}$$

$$\underline{q}(m) = \frac{\bar{c}}{\bar{c} + P}, \quad \forall m > 0, \quad (6)$$

$$\text{else } \underline{q}(0) \in \left[ \frac{\bar{c}}{\bar{c} + P}, 1 \right]$$

Further, the wage paid and the monitoring intensity does not depend on the CEO's compensation package  $\{\alpha, u\}$ .

## 3.2 The Traditional Agency Problem

### 3.2.1 The Owner's Problem when the $IC_U$ binds

We can easily verify that 100 percent ownership is the unconstrained optimum stake when the union cannot affect the marginal costs of monitoring  $m$ . We will denote this exogenous level of monitoring costs as  $m^A$ . Plugging  $q^*(m)$  from Equation (4) into the entrepreneur's program, we get the following problem:

$$\arg \max_{\alpha \& u} V_o^A = \bar{e}R - w^*(q^*) - \frac{mq^{*x}}{x} - U_M,$$

$$\text{where } V_o^A = \bar{e}R - \left( \frac{m\bar{c}^x}{\alpha} \right)^{\frac{1}{1+x}} + P - \frac{(m\bar{c}^x \alpha^x)^{\frac{1}{1+x}}}{x} - U_M.$$

Since this function does not depend on the manager's base wage, the entrepreneur is indifferent over the entire feasible set of possible fixed wages,  $u$ .

The first order condition with respect to  $\alpha$  is as follows:

$$\left. \frac{dV_o^A}{d\alpha} \right|_{\alpha=\hat{\alpha}} = \left( \frac{(m\bar{c}^x)^{\left(\frac{1}{1+x}\right)}}{x+1} \right) \left[ \hat{\alpha}^{-\left(1+\frac{1}{1+x}\right)} - \hat{\alpha}^{-\left(\frac{1}{1+x}\right)} \right] = 0$$

The stationary point implied above is  $\hat{\alpha} = 1$ .

The second order condition of  $\alpha$  is negative, and we can easily check that this is a maximum:

$$\left. \frac{d^2V_o^A}{d\alpha^2} \right|_{\alpha=\hat{\alpha}=1} = - \left( \frac{(m\bar{c}^x)^{\left(\frac{1}{1+x}\right)}}{x+1} \right) < 0$$

Therefore, the compensation package that maximizes the entrepreneur's payoff below involves 100 percent share ownership for manager. That is,

$$\hat{\alpha} = 1 \tag{7}$$

THEOREM 1. 100 percent managerial ownership is optimal when workers cannot affect the manager's cost of monitoring.

*Proof.* This follows from the derivation of  $\hat{\alpha}$  in equation (7). *Q.E.D.*

This interior solution should come as no surprise to the reader. One hundred percent equity ownership is the solution to the classic agency problem result of Jensen and Meckling (1976) and Smith (1776).<sup>6</sup> The agency problem emerges when less than 100 percent of the equity is owned by the manager. We will find in Theorem 3, that 100 percent equity ownership is generally NOT the subgame perfect Nash equilibrium (SPE) level of managerial share ownership when the union engages in rent-seeking activities.

### 3.2.2 The Agency Problem when the $IR_U$ binds

With an exogenous level of monitoring costs,  $m^A$ , the entrepreneur's payoff when the  $IR_U$  binds is as follows:

$$\underline{V}_O^A = \bar{e}R - \bar{c} - \frac{m^A}{x} \left( \frac{\bar{c}}{\bar{c} + P} \right)^x - U_M \quad (8)$$

The entrepreneur's payoff is the expected wages,  $\bar{e}R$ , less the  $IR_U$  wage,  $\bar{c}$ , from Equation (6), less the costs of monitoring, less the opportunity cost of managing the firm,  $U_M$ . Nevertheless, none of these values depends on the level of managerial share

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<sup>6</sup> Further,  $\hat{\alpha} = 1$  is not a corner solution because a 100 percent share maximizes the value of the firm in the unconstrained problem. Higher percentages,  $\alpha > 1$ , even if they would be feasible, would strictly decrease the value of the firm.

ownership,  $\alpha$ , or managerial wages,  $w$ . As long as the CEO gets some positive, though possibly vanishingly small share of the firm it will be strictly in her interests to choose union wages and monitoring intensity given in (6). This will give the entrepreneur a payoff of (8).

### 3.3 The Union's Problem

Suppose that the rank-and-file employees can affect the cost to the manager of detecting slack effort. If the  $IR_U$  binds, the union will weakly prefer to minimize monitoring costs. If the  $IC_U$  binds, the union may be able to win rents from obstructing monitoring. In the following subsection, section 3.4, it will be shown that the entrepreneur need not share rents. (The entrepreneur can set CEO compensation so low that the union's  $IR_U$  constraint must bind for the CEO to work at the firm.) In that case, the  $IC_U$  constraint is slack and the  $IR_U$  constraint binds. When the  $IC_U$  is slack the union cannot win higher compensation by increasing the costs of monitoring,  $m$ .

The unions' choice of  $m$  is  $\underline{m} = 0$  when its wage does not depend on its incentive constraint. The manager will always pay the union for its efforts both productive,  $\bar{c}$ , and unproductive,  $\frac{km^y}{y}$ . The union's payoff in these circumstances is payoff is denoted by  $\underline{V}_U$  below, where  $\underline{V}_U = 0$ . Obviously, the union's payoff does not depend on the monitoring costs that it imposes on the manger. Therefore, it will be indifferent between any feasible  $m \in [0, +\infty)$ , when the  $IR_U$  binds but the  $IC_U$  is satisfied. By assumption, the

union will take the action that both maximizes the value of the firm and does not worsen its payoff. That means it will choose  $m = \underline{m} = 0$ .

### 3.4 The Entrepreneur's Problem

Here we go to the first step of the game, in period 0, where the owner-manager chooses the optimal wage contract to motivate the manager in periods 2 and 3. Suppose that the firm is wholly owned by an entrepreneur. Let us assume that the entrepreneur can tap perfect capital markets where outside investors are price takers. The entrepreneur would like to pick some combination of managerial share ownership and fixed wages such that she maximizes ex ante value when she acts ex post as the CEO.<sup>7</sup> The value of the firm to this actor is both her wages from being the CEO, and the returns from selling an equity stake worth  $(1 - \alpha)$  of the expected returns.

There are two types of strategies that the entrepreneur can pursue. First, the entrepreneur can attempt to minimize the union's payoff with the choice of the set  $\{u, \alpha\}$ . Second, the entrepreneur can maximize her payoff with her choice of the manager's compensation package. Deadweight losses drive a wedge between the strategy of minimizing the union's payoff and maximizing the owner's payoff with the choice of  $\{u, \alpha\}$ . Therefore, these two strategies are not necessarily equivalent. We will find that the former strategy of minimizing the union's payoff always leads zero deadweight losses and the maximum payoff to the entrepreneur.

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<sup>7</sup> It is equivalent to envision the entrepreneur selling the firm to an outside manager. The price of the sale to the outside manager would be  $V_M$ .

The former strategy of minimizing the union's payoff,  $\min_{w.r.t. u \& \alpha} V_U$ , which we will refer to as min union strategies, only dominates the latter,  $\max_{w.r.t. u \& \alpha} V_O$ , which we will refer to as max owner strategies, if minimizing the union's payoff means that the  $IR_U$  binds and the union chooses to minimize monitoring costs,  $\underline{m} = 0$ . The min union strategy is always effective when the entrepreneur has the CEO and union operating on the manager's and union's  $IR_M$  and  $IR_U$  constraints, respectively. These latter subgame perfect equilibrium (SPE) strategies are pursued here.

Alternatively, the entrepreneur can attempt to maximize her own payoff. This latter strategy would be pursued if it induces the union to minimize monitoring costs  $\underline{m} = 0$ , or if the min union strategy allows the union to earn some rents by choosing an  $m > 0$ . Enumerating strictly or weakly dominated strategies would be very time consuming, but not be a very good guide to equilibrium behavior of the entrepreneur. Because the max owner strategy is strictly dominated for many parameter values and weakly dominated for all others, it is not pursued in this paper.

It is the entrepreneur's ability to set CEO pay at the beginning of the game that ultimately dooms the union to earn no rents. We will demonstrate below in section 3.4.2 that there is one way to minimize the union's payoff that will always lead to the  $IR_U$  constraint to bind. In particular, it will be shown below how a binding  $IR_M$  constraint with managerial ownership strictly above zero percent and strictly below 100 percent can be sufficient to induce the union to be passive and minimize monitoring costs. For this reason, min union strategies will always be weakly preferred to the max owner strategy.

### 3.4.1 Passive Workers

In general,  $m = \underline{m} = 0$  will form a subgame perfect Nash equilibrium (SPE) strategy by the union for a range of  $u$ 's and  $\alpha$ 's that the entrepreneur may choose. In such a case, the entrepreneur merely has to choose a combination of  $\{\alpha', u'\}$  that causes  $V_U(\alpha', u', m') \leq 0$ , where  $m' > 0$  is defined as the union's best response positive level of monitoring costs when CEO pay takes the form of  $\{\alpha', u'\}$ . In this case, the union's best response will be to minimize monitoring costs and obstruction costs by choosing a  $m = \underline{m} = 0$ . The CEO now bears no monitoring costs. The level of obstruction, detection probability, wages paid, and payoffs to the entrepreneur are as follows:

$$\begin{aligned}
\underline{m} &= 0 \\
\underline{q}(\underline{m}) &\in [\bar{c}/(\bar{c} + P), 1] \\
\underline{w}(\underline{q}) &= \bar{c} \\
V_U(\alpha', u', \underline{m}) &= 0 \\
V_O(\alpha', u', \underline{m}) &= \bar{e}R - \bar{c} - U_M
\end{aligned} \tag{9}$$

$IC_U$  will be satisfied for any detection probability high enough such that  $w = \bar{c} \geq \frac{\bar{c}}{\underline{q}} - P$ . Nevertheless, even when the union members engage in no obstruction,  $\underline{m} = 0$ , union members must always be paid for their effort cost of  $\bar{c}$  for  $IR_U$  to be satisfied. The CEO will weakly prefer to give the union rents of zero, when  $\alpha' = 0$ . Otherwise, when  $\alpha' > 0$ , she will strictly prefer to give all the rents to the entrepreneur.

In general, Equation (9) will be a SPE set of best responses and payoffs if there exists any  $\{\alpha', u'\}$  that causes  $V_U(\alpha', u', m') \leq 0$ , and is credible in the sense that  $IR_M$  and  $IR_C$  are satisfied. This is summarized in the Theorem below:

**THEOREM 2.** When the union's best response,  $m' > 0$ , leads to a weakly negative payoff for union members,  $V_U(\alpha', u', m') \leq 0$ , then the union will minimize the manager's monitoring costs and earn no rents.

*Proof.* This follows from our assumption that the union will minimize monitoring costs when it is weakly in the workers' interests. *Q.E.D.*

### **3.4.2 The Subgame Perfect Equilibrium (SPE) of a Binding $IR_U$ and $IR_M$ Constraint**

One strategy will induce the union to minimize monitoring costs for all sets of parameter values  $\{R, P, \bar{e}, \bar{c}, k, U_M\}$  and also for all  $\{x, y, \phi\}$ . By making the CEO's participation constraint bind when rent-seeking costs,  $\underline{m} = 0$ , the union is faced with the stark choice of either minimizing monitoring costs or allowing the firm to fall apart.

To push the union into this stark choice the CEO must earn some of her reservation wage through share compensation. Therefore, the CEO's fixed wage must be less than her opportunity cost. Let us define this wage as

$$\underline{u} \in [0, U_M) \tag{10}$$

If the  $IC_U$  constraint does not bind, then union members could be paid the  $IR_U$  wage,  $\bar{c}$ , and earn no rents. In this case, the absolute lower bound of share ownership

when the manager only gets a fixed wage,  $\underline{u}$ , is given by the following binding  $IR_M$  constraint:

$$\underline{\alpha}(\bar{e}R - \bar{c} - \underline{u}) + \underline{u} = U_M \quad (11)$$

The upper and lower bounds of Equation (12) are derived in the appendix section 5.2.

$$1 > \underline{\alpha} = \frac{U_M - \underline{u}}{\bar{e}R - \bar{c} - \underline{u}} > 0. \quad (12)$$

The set  $\{\underline{u}, \underline{\alpha}\}$  is sufficient to both minimize the union's rent-seeking and payoff as well as maximizes the entrepreneur's payoff. Obviously,  $\underline{u} < U_M$  and  $\alpha < \underline{\alpha}$  are a recipe for the firm to fall apart. Since the union members' payoff is zero in alternative employment, the union will weakly prefer to accept a wage of  $\bar{c}$  for a net payoff of zero from the manager who is compensated with  $\{\underline{u}, \underline{\alpha}\}$ . If union members demanded a higher wage or obstructed monitoring at all, the CEO's participation constraint would be violated and the firm would fall apart.

**THEOREM 3.** When monitoring costs are endogenously chosen by workers, the entrepreneur will find it to be a weakly dominant strategy to give the CEO ownership stake strictly less than 100 percent and a fixed wage less than the manager's opportunity cost. This strategy set is  $\{\underline{u}, \underline{\alpha}\}$ .

*Proof.* The entrepreneur earns all the rents by choosing the compensation package  $\{\underline{u}, \underline{\alpha}\}$ . Since the entrepreneur gets all the surplus in her payoff in equation (9), she cannot do strictly better by choosing another set of actions. That is, all alternative strategies for the entrepreneur are weakly dominated by  $\{\underline{u}, \underline{\alpha}\}$ . Finally, equation (12) shows that the optimal level of share ownership is strictly less than unity. *Q.E.D.*

Comparing Theorem 3 with Theorem 1, we have found that delegation leads to the CEO getting levels of share compensation, which are given in Equation (12), that are lower than in the agency model where monitoring costs are exogenous. In particular, the “agency” model advocates that the CEO gets 100 percent of the shares. That is what we found in Equation (7). The present, “delegation,” model advocates that she gets strictly less than 100 percent of the shares in the enterprise. That is, “delegation” model advocates that the manager gets  $\underline{\alpha} < 1$  in Equation (12).

Further, to the extent that most CEO pay is about creating incentive to work hard, one would tend to think that the CEO’s binding constraint would generally be the incentive compatibility constraint. If both the participation and incentive compatibility constraints are satisfied and the  $IC_M$  binds, then it must be the case that the CEO is earning weakly more than her opportunity cost,  $U_M$ . Yet, a binding  $IR_M$  means that the manager is just getting her outside option wage,  $U_M$ . To the extent that the delegation model makes it more likely that the  $IR_M$  binds while monitoring costs are minimized in equilibrium, one would think that a unionized workforce would also mean that the CEOs in unionized firms with rent-seeking employees will earn lower wages than in a firm where delegation is less important than motivating the CEO to be a good agent. Such

firms are generally where the  $IC_M$  binds as in section 3.2. This intuition is confirmed in the following Theorem.

**THEOREM 4.** For a given level of monitoring costs and managerial opportunity cost, CEO pay will be strictly lower when the  $IR_M$  binds and the  $IC_M$  is slack than when the  $IR_M$  is slack and the  $IC_M$  binds.

The proof is in the appendix section 5.3.

It seems reasonable to conclude from Equation (12) and section 3.2 that the conditions leading to lower CEO pay are more likely to occur in unionized firms, which can affect the cost of managerial monitoring. Union members, by virtue of being organized, are more likely to have a culture that allows them to coordinate at the expense of managers than unorganized workers. Therefore, the manager's incentive constraint is more likely to bind, and CEO pay will be higher, when employees are unorganized and unlikely to influence the manager's cost of detecting slack work.

## **4.0 Conclusion**

This paper has demonstrated that the traditional solution of strong incentives proposed by agency theory may not always maximize shareholder value. When the costs of monitoring are affected by the workforce, motivating managers to think exactly like shareholders may be less than optimal. Here, we have shown that optimal delegation to a risk-neutral CEO involves giving the CEO strictly less than 100 percent of the shares. Low levels of managerial shareholding eliminates employees' incentives to obstruct monitoring. Fewer shares and lower pay for the CEO avoids deadweight losses and thereby maximizes shareholder value. In short, the delegation model of corporate governance may deserve a second look when this form of employee rent-seeking is a major concern.

## 5.0 Appendix

### 5.1 Proof of Lemma 1

The Lemma says that a satisfied  $IR_M$  constraint implies that the  $IR_O$  constraint is also satisfied. The right hand side (RHS) of both constraints are identical; therefore, the left hand side (LHS) of  $IR_O$  must be greater than or equal to the (LHS) of  $IR_M$ . If we subtract the two constraints,  $IR_O - IR_M \geq 0$ .

To prove that  $IR_O - IR_M \geq 0$  is the case, it is sufficient to show that the complement  $IR_O - IR_M < 0$  is impossible. The following is a proof by contradiction:

$$IR_O - IR_M = E\{R\} - w - c(q) - \alpha(E\{R\} - w - u) - u + c(q) < U_M - U_M$$

$$IR_O - IR_M = (1 - \alpha)(E\{R\} - w) - (1 - \alpha)u < 0 \quad (13)$$

The LHS above will be smallest when  $u$ , the manager's base wage is the largest. The maximum  $u = E\{R\} - w$  from section 2. If we substitute this into (13) above, we get the contradiction,  $0 < 0$ . This is what we wanted to show. *Q.E.D.*

## 5.2 Deriving the Upper and Lower Bounds of $\underline{\alpha}$ in Equation (12)

Rearranging Equation (11) we get the following expression for the optimal level of share ownership under the min union strategy.

$$\underline{\alpha} = \frac{U_M - \underline{u}}{\bar{e}R - \bar{c} - \underline{u}} \quad (14)$$

If we rearrange Equation (1), we know that  $\bar{e}R - \bar{c} > U_M$ . If  $U_M$  approaches but does not reach its upper bound,  $\bar{e}R - \bar{c}$ , then  $\underline{\alpha}$  approaches 1. This allows us to conclude that the upper bound of  $\underline{\alpha}$  is less than unity. That is,  $\lim_{U_M \rightarrow (\bar{e}R - \bar{c})^-} \underline{\alpha} \rightarrow \left( \frac{(\bar{e}R - \bar{c})^- - \underline{u}}{\bar{e}R - \bar{c} - \underline{u}} \right) = 1^- < 1$ .

We know that  $\underline{u}$  in Equation (10) is non-negative and is strictly less than  $U_M$ . If either  $U_M$  approaches zero, or  $\underline{u}$  approaches, but does not reach  $U_M$ , then  $\underline{\alpha}$  approaches but does not reach zero. That is, either  $\lim_{U_M=0^+} \underline{\alpha} \rightarrow 0^+ > 0$ , or

$$\lim_{\underline{u} \rightarrow (U_M)^-} \underline{\alpha} \rightarrow \left( \frac{0^+}{\bar{e}R - \bar{c} - \underline{u}} \right) = 0^+ > 0. \text{ This allows us to conclude that } \underline{\alpha} \text{ is greater than 0.}$$

This is the justification for the upper and lower bounds in Equation (12) being strictly less than unity and strictly greater than zero, respectively. *Q.E.D.*

### 5.3 Proof of Theorem 4

The compensation of the manager consists of expected share compensation and wages. Suppose there are two identical firms where each manager faces the same total monitoring costs of  $\underline{C}$ . In the firm denoted by the superscript “A”, where the  $IC_M$  binds and  $IR_M$  is slack, expected share compensation is denoted  $S^A$  and the CEO’s fixed wages are  $u^A$ . (The superscript “A” denotes a firm in which controlling managerial agency costs are the most important concern.) That is,

$$IC_M^A : S^A - \underline{C} = 0 \quad (15)$$

$$IR_M^A : S^A - \underline{C} > U_M - u^A \quad (16)$$

Total compensation for the manager is defined as

$$T^A \equiv S^A + u^A. \quad (17)$$

Further, substituting the right hand side (RHS) of Equation (15) into the left hand side (LHS) of Equation (16) and rearranging, it becomes clear that the manager’s wage must exceed her opportunity cost. That is,

$$u^A > U_M. \quad (18)$$

In contrast, in the firm where  $IR_M$  binds and  $IC_M$  is slack we will denote the share and fixed wage components of compensation by the superscript “D.” This is consistent with the “delegation” solution given by Equation (12). The managerial constraints are the following:

$$IC_M^D : S^D - \underline{C} > 0 \quad (19)$$

$$IR_M^D : S^D - \underline{C} = U_M - u^D \quad (20)$$

Total “delegation” compensation for the manager is defined as

$$T^D \equiv S^D + u^D. \quad (21)$$

Further, substituting the right hand side (RHS) of Equation (20) into the left hand side (LHS) of Equation (19) and rearranging, it must be the case that

$$U_M > u^D. \quad (22)$$

Subtracting the binding constraint in Equation (20) from the binding constraint in Equation (15), we get the following:

$$S^A - S^D = u^D - U_M$$

Rearranging this relationship, we derive the following relationship:

$$S^A + U_M = S^D + u^D \quad (23)$$

Equation (23) allows us to compare the total compensation when the  $IC_M$  binds given in Equation (17) and the total compensation when the  $IR_M$  binds given by Equation (21). Since  $u^A > U^M$  according to Equation (22), then the LHS of (23) is less than total compensation in Equation (17). In short,

$$T^A \equiv S^A + u^A > S^A + U_M = S^D + u^D \equiv T^D. \quad (24)$$

This is what we wanted to show. For identical monitoring costs and identical opportunity costs for each manager, the total compensation,  $T^A$ , in a firm where the manager is compensated with a binding  $IC_M$  constraint and a slack  $IR_M$  constraint *exceeds* the total compensation,  $T^D$ , of a manager whose  $IR_M$  constraint binds and the  $IC_M$  constraint is slack. In short, Equation (24) shows that  $T^A > T^D$ . *Q.E.D.*

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