

Hard Debt, Soft CEOs, and Union Rents

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by

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Keywords: capital structure, CEO compensation, corporate control, entrenchment, efficiency wages, hostile takeovers, and unions

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Abstract

Bond covenants may constrain managers from acquiescing to union wage demands. Yet, because high wages and high levels of worker discipline are substitutes, unions can win higher wages by raising the cost of detecting slack workers. In this case, shareholders may be better off delegating to a CEO with different objectives than their own. A top manager motivated to share surpluses with workers—a “soft” CEO—can encourage union members to adopt efficient production methods. In this context, shareholder value may be maximized by CEO incentive contracts with limited upsides, lower levels of pay, and some entrenchment protections.

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1. Introduction

Sometimes principals find it better to hand over control to an agent with different interests than their own. This paper gives an example in which shareholders can gain by appointing a top manager only partially concerned with shareholder value maximization. In some cases, the optimal contract for the CEO, from the point of view of shareholders, gives the CEO incentives to share rents with the firm's unionized workforce. We argue that dynamically inconsistent shareholders can sometimes maximize their returns by delegating control to a CEO with "soft" incentives, a "soft" CEO, whose payoff falls when the share price rises past the point of optimal rent sharing. Alternatively, a CEO with "hard" incentives, a "hard" CEO, has incentives that are perfectly aligned with those of shareholders. These latter "hard" incentives can lead the firm to incur deadweight losses that destroy shareholder wealth.

Unions seem to be very concerned with executive compensation. The AFL-CIO regularly uses executive compensation as a tool in its organizing and public relation efforts. (<http://www.aflcio.org/corporatewatch/paywatch/> tracks CEO pay and has case studies of "excessive" executive compensation.) High levels of CEO pay may make rank and file workers suspicious of management. Moreover, CEO pay may mean that union members have fewer rents to capture from the firm. From the perspective of union members, high CEO pay may give the top manager strong incentives to maximize shareholder value at the expense of union members. We argue here that union members also look to CEO pay in order to predict the actions of management in a sequential game. Union members will resist management attempts to monitor slack effort when they observe that the top manager is likely to force union members to accept a "hard" bargain.

Here we offer a novel explanation for why shareholders may want CEO pay to be lower and flatter in unionized firms. We argue in this paper that low levels of CEO pay are for strategic incentive purposes. Low levels of CEO pay are associated with weaker, “softer” incentives to increase the share price. When this is the case, union members are less likely to impose deadweight losses on the firm. Therefore, in this paper, lower CEO pay is a strategic pre-commitment made by the shareholders at the start of the game.

Recent empirical studies have confirmed that CEO pay is lower and flatter in unionized firms in the United States. Dinardo, Hallock, and Pische (2000) studies CEO pay and unionization in the United States from 1971-1974, 1975-78 and 1979-82. That study finds that CEO pay is significantly lower in unionized firms. Nevertheless, this result is not upheld for all specifications of their model.

Singh and Agarwal (2002) studies the relationship between CEO compensation and unionization in Canadian metal mining firms in 1996. In its regression results of 83 observations, that paper finds no significant difference between total CEO compensation in unionized and non-unionized firms. Because of the size and the scope of Singh and Agarwal (2002), it is hard to draw strong inferences from that study’s results.

Larger and more recent studies of CEO pay in the United States, since the explosion of share-based and option pay for CEOs in the 1990s finds that CEOs in unionized firms are paid significantly less than CEOs in non-unionized firms. Anderson, Boylan, and Reeb (2007) and Gomez and Tzioumis (2007) both find that CEOs of U.S. firms are paid significantly less and have significantly less performance based pay when the firm is heavily unionized. These results are consistent with the present paper’s primary equilibrium results that shareholders will find it

optimal to delegate to a “soft” CEO with lower levels of pay and lower levels of performance pay.

Anderson, Boylan, and Reeb (2007) study CEO pay from 2000 to 2003 in the 1048 largest industrial firms in the United States. Anderson, Boylan, and Reeb (2007) report that CEO pay falls by 6.15 percent as the percent of unionized employees rises by ten percent. Further, they find that bonus plus stock based compensation declines significantly as the percent of the workforce becomes more unionized.

Gomez and Tzioumis (2007) look at CEO compensation from 1992-2001 in firms that have at least one union establishment. They find that firms with a union present pay their CEOs significantly less total compensation. Further, they find that CEOs in firms with a union establishment receive significantly lower stock option compensation. This is consistent with both the magnitude and shape predictions of the present paper. Here it is argued that the upsidess of CEO pay will be capped in unionized firms with “soft” CEOs. Further, Gomez and Tzioumis (2007) find that the difference between total compensation for CEOs is the greatest for the highest paid 10 percent of non-unionized and unionized CEOs.

We consider a game where both the union and the firm’s owners will be eager to hide rents from one another before bargaining commences.¹ The CEO, acting on behalf of shareholders, uses bond covenants and costly bankruptcy to limit the union’s payoff. We assume that the firm must pay efficiency wages to counteract the moral hazard problems of its unionized

¹Much of the literature surrounding pre-bargaining commitments between a union and a firm has been developed with an eye to the “hold-up” problem. In this context, the returns from a firm’s investment may be partially or entirely appropriated by organized workers *ex post*. This will lead suppliers of capital to under-invest. Baldwin (1983), Grout (1984), Ippolito (1985), Bronars and Deere (1991) and (1993), Perotti and Spier (1993), Cavanaugh and Garen (1997), Matsa (2007) discuss ways in which the firm could avoid the hold-up problem with a monopoly union. Some form of debt covenants are often advocated in this context. Solving the hold-up problem has been the focus of studies about the pre-bargaining commitments of unions, too. For example, Ulph (1989) and Skåtun (1997) discuss ways that a trade union could constrain itself from taking *ex post* surplus in order to encourage the firm to invest *ex ante*.

employees, regardless of its debt constraints or the union's bargaining strength. In effect, the union members' incentive compatible, non-shirking, wages are the lower bound of any wage settlement. The union can secure higher wages by manipulating the non-shirking constraint. Increases in monitoring effectiveness translate into lower efficiency wages. Therefore, the union will attempt to make detection of slack effort very costly. In this way, the union can guarantee its members higher non-shirking wages. Nevertheless, raising the costs of monitoring leads to deadweight losses.

If workers can trust managers to share the firm's rents, then the union will minimize monitoring costs. The losses from the union's manipulation of the non-shirking constraint create potential gains from trade. Similarly, in Demski, Frimor, and Sappington (2004) principals adopt accounting systems that are easy to manipulate so that agents do not waste much effort rigging those schemes.²

Dessí (2001) argues that sometimes owners are better off delegating to a manager with different objectives than value maximization. We come to a similar conclusion, but for different reasons. In Dessí (2001) workers sometimes are not compensated for their efforts ex post if the firm holds risky debt.³ In contrast to that paper and similar studies about firm-specific investments, workers are always compensated for their efforts in our discussion here. Therefore, no implicit contracts are violated. Instead, we assume that the *extent* to which workers are compensated depends, in part, on the union's culture towards monitoring. This culture, in turn,

² Our rent-seeking explanation of why shareholders would want to delegate control to a "soft" CEO is also similar to Meyer, Milgrom, and Roberts (1992)'s "influence cost" theory of divestitures. Meyer, Milgrom, and Roberts (1992) attempt to answer the puzzle of why poorly performing divisions are often divested while profitable divisions are rarely sold. This does not square with efficient capital markets. The poor performers should sell for their expected cash flows just as the profitable divisions. They argue that poorly performing units are sold because managers of those divisions lobby the headquarters for more resources. This lobbying activity, by itself, is costly rent-seeking that will cease when the division becomes an independent entity.

depends on the union's beliefs about how much gains will be shared. To win the union members' trust the "soft" CEO must have some entrenchment protections along with incentives to share surplus with workers.

It is also interesting to compare the present paper to a couple of studies—Acemoglu and Newman (2002) and Pagano and Volpin (2005)—about the interrelationship between managerial pay and efficiency wages.

Acemoglu and Newman (2002) presents a macroeconomic model of managerial pay in an efficiency wage setting. That general equilibrium model is used to makes statements about managerial pay, unemployment, and unemployment levels across countries. Yet, unlike that study, here we consider efficiency wages and managerial pay in a partial equilibrium setting. Our results about CEO pay are driven by the union's ability to influence the non-shirking constraint. In Acemoglu and Newman (2002), labor market pressures in the market for managers causes managerial pay to rise in economies with low levels of unemployment benefits. Alternatively, in this paper, our conclusions about the pay of chief executives in unionized firms are driven by the shareholders' ex ante desire to commit to not capture union rents ex post.

Pagano and Volpin (2005) is also similar to this study, but it has some key differences. Like this one, it considers corporate governance and labor relations in the context of a sequential game. Moreover, rank-and-file workers are motivated by efficiency wages. Nevertheless, unlike the present paper, in Pagano and Volpin (2005) the workers cannot affect the cost of detecting slack effort. That paper concludes, for many parameter values, that CEOs will use generous long-term contracts with workers as shark-repellent to deter efficiency enhancing hostile

³ Other examples of this line of thought are Garvey and Swan (1992) and Sarig (1998). They argue that risky debt is too costly when workers are competing in promotion tournaments or undertaking firm-specific investments, respectively.

takeovers. In contrast, here where monitoring costs are endogenous “soft” CEO incentives and entrenchment protections enhance efficiency and increase shareholder wealth ex ante.

In Pagano and Volpin (2005), the CEO’s moral hazard problems and that paper’s assumption that the CEO cannot be given options based pay (levered equity) as compensation make the first-best CEO compensation contract excessively costly. In the present paper, shareholders have no problem aligning the CEO’s incentives with their own with minimal cost. Instead, the present paper sometimes finds that shareholder wealth is higher ex ante if they design a compensation contract that makes the CEO’s interests diverge from maximizing shareholder wealth at later stages of the game.

Despite the papers’ different approaches, Pagano and Volpin (2005) and the present paper conclude that higher workers wages and entrenched managers complement one another. In that paper, to use the present paper’s terminology, shareholders find it too costly to pay “hard” CEOs. Instead, shareholders appoint less expensive “soft” CEOs who give excessive wages to rank-and-file workers. In contrast, the present paper argues that not only do shareholders find it less expensive to pay “soft” CEOs, but also, when shareholders face a potentially hostile unionized work force, they would prefer to appoint such a manager even if “hard” and “soft” CEOs required the same salary. In the present paper, “soft” incentives and entrenchment protections for the CEO is a commitment to pay above-market wages that reduce workers’ rent-seeking. This is consistent with a recent working paper by Cronqvist, Heyman, Nilsson, Svaleryd, and Vlachos (2008) that finds that CEO entrenchment is associated with higher wages for rank and file workers.

The present paper proceeds as follows. In section 2, we introduce the basic features of the model. In section 3, we solve the model. Ironically, when surpluses are large, shareholders

get no profits when the manager's interests are perfectly aligned with value maximization. Instead, the manager will return the most profit to shareholders when she has incentives to share rents with union members.⁴ In section 3, we consider how a "soft" incentive scheme maximizes value to shareholders for some parameter values. The "soft" manager achieves this by inducing workers to minimize costs. This is only possible because she is committed to share surpluses with union members. Further, we demonstrate how control changes can cause share prices to rise even when they create no value, *ex ante*. In addition, because the credibility of the "soft" CEO's commitment to sharing rents with workers comes into question if shareholders will almost certainly intervene, some entrenchment protections will be an equilibrium result when rents are large and a "soft" CEO is appointed. After solving the model, we finish section 3 by listing some testable hypotheses that come from the equilibrium results. In section 4, we conclude.

⁴ For the purposes of this paper the CEO will always be referred to as "she," regardless of whether her incentive scheme is "hard" or "soft."

2. Model

In this section we present the basic features of the model. First, we summarize the timing of the game. Next, in section 2.1, we discuss some simple compensation schemes for the CEO and the probability of managerial entrenchment, b , which shareholders can select at the start of the game. Then in section 2.2, the moral hazard problems of the workforce are discussed when the union can affect the cost of monitoring slack effort. Finally, in section 2.3, we discuss the capital structure choice of the CEO in the context of wage negotiations.

This paper presents a sequential game. Figure 1 summarizes its timing. The outcome of the game is decided by the time we get to period four when bargaining occurs and production takes place. First, the founding shareholders appoint a CEO of the all equity firm in period zero. They give this top manager an incentive package that can be altered in period two with a probability b , where $0 \leq b \leq 1$. The founding shareholders choice of b will be endogenously determined. All players observe the choice of the compensation package in period zero and know the probability, b , that shareholders will alter the compensation arrangement in period two. In period one, the union moves by altering monitoring costs. Then $b \cdot 100$ percent of the time shareholders get the opportunity to give the CEO new incentives in period two. The compensation package is public information in period two and all subsequent periods.

Because the CEO's incentives are not known to the union in period one, the solution concept of this game is perfect Bayesian equilibrium (PBE). The union in period one does not know the payoffs of the CEO in periods three and four. Therefore, the union must move in period one based upon conjectures about the incentives or payoffs of the CEO. When players

make conjectures about the payoffs of players in a sequential game, the relevant solution concept is perfect Bayesian equilibrium.

By period three, the firm is completely run by shareholders' agents. In period three, the CEO issues dividends and promises debt payments. In particular, the CEO can use debt and bankruptcy constraints to pre-empt bargaining.

Period four, the productive period, is broken down into five sequential sub-periods numbered *a* to *e*. In period four-*a*, first, the CEO gives the union a wage offer. In this sub-period, if the union rejects that offer, the uncommitted surplus is divided between shareholders and union members by means of the Nash bargaining solution (NBS).⁵ Next, in period four-*b*, the CEO decides on monitoring intensity after the wage bargain is struck. After that, in period four-*c*, workers decide individually whether to shirk or work productively. In period four-*d*, revenues are realized, workers not caught for shirking are paid, and monitoring costs are incurred. In period four-*e*, bondholders and the CEO are paid, and current shareholders receive dividend that liquidates the firm.

⁵ In equilibrium, we will find out that the Nash Bargaining Solution and the respective exogenous bargaining strengths of the union and CEO plays no role in the wages paid. Nevertheless, exogenous bargaining strength can affect the capital structure of the firm with a "soft" CEO. This is discussed in the appendix section 5.5.

period = 0	1	2	3	4
<p>Founding shareholders give control to a CEO with “hard” or “soft” incentives, and choose the probability $0 \leq b \leq 1$ that the CEO’s incentives will be changed in period 2.</p>	<p>The union chooses marginal monitoring costs, m.</p>	<p>Current shareholders are given the option of changing the CEO’s incentives $b*100$ percent of the time.</p>	<p>The CEO sets capital structure, choosing some combination of equity and debt.</p>	<p>a. Either the union accepts CEO’s wage offer or the wage is decided by the Nash bargaining solution. b. Monitoring intensity, q, is chosen by the CEO. c. Production takes place. d. Union members receive wages if they are not caught for shirking. e. All other factors are paid.</p>

Figure 1: The sequence of events

2.1 CEO pay and entrenchment

In period zero, founding shareholders appoint a CEO and give her a compensation package. The CEO has three main actions in this game. She alters the firm's capital structure in period three. In period four-*a*, she negotiates with the union; and, in period four-*b*, she sets the monitoring intensity, q , used to detect slack effort. Let us begin our discussion by contrasting the two types of incentives contracts that shareholders can give their CEOs:

Definition (CEO compensation)

All potential CEOs are of the same type and thus have identical preferences and capabilities. We will use the following terminology to refer to the incentive contracts given to the CEO:

- A “hard” CEO has incentives to maximize shareholder value in period four-*d*.
- A “soft” CEO has incentives to share some rents with union members in period four-*d*.

To make this more concrete, let us specify a couple of wage contracts that fit this description. The model below is meant to be reduced-form. Suppose that firm value over time is denoted by V_t . The subscript t denotes the firm's value at the end of period $t = 0, 1, 2, 3, 4a, 4b, 4c, 4d$, or $4e$. Firm value at time t is the sum of debt and equity claims at time t , $V_t = D_t + E_t$. Firm value does not change in response to predictable events such as production in period four-*c*, but it can change due to unpredictable events such as control changes in period two. Moreover, firm value goes to zero when liquidating dividends are paid to shareholders, and bondholders are paid in full at the end of period four-*e*. We will assume that the CEO must exert some effort,

$C(V_{4d})$, to increase the firm's period four- d value, V_{4d} . The firm's end of period four- d value will always be between zero and the firm's maximum revenues, R . Indeed, this is the case for all periods. Namely, $V_t \in [0, R]$.

$$C(V_{4d}) = \gamma V_{4d}, \text{ where } 1 > \gamma > 0. \quad (1)$$

In this model, the principal role of the CEO is to divide surplus between shareholders and the firm's unionized workforce. Driving a hard bargain with workers that raises shareholder value takes effort. Further, the CEO could become attached to the firm's employees, and she may prefer to share rents with them. Finally, it seems to be a standard assumption in the CEO compensation literature that strong incentives (that is, higher pay) are necessary to induce top managers to take costly actions that also increase shareholder value. Jensen and Murphy (1990) is one paper that presents this latter view.

For the purposes of our discussion, the CEO exerts effort in period three. Once she exerts this effort, she can always trust that she will be paid for it. We introduce this cost of effort so that we can contrast how "hard" and "soft" incentives translate into pay levels for CEO's. In firms where shareholders do not have to commit to share rents with workers, especially non-unionized firms, "hard" incentive schemes and higher levels of performance pay may be optimal. In firms where shareholders benefit by committing to share rents with workers, "soft" incentive contracts with lower levels of pay maximize shareholder wealth.

We will assume that the CEO's utility is linearly decreasing in the firm's period four- d value and linearly increasing in her wage. The CEO's utility is given by her wage less her effort, $P = W_i - C(V_{4d})$, where $i = S$ or H . The CEO's outside option wage in employment where she

exerts effort equal to that needed to run the firm with $V = 0$ is normalized to equal zero, without prejudice to the actual (possibly substantial) size of the CEO's outside option employment. This normalization has no effect on our conclusions about CEO pay in subsequent sections, but it does save us from having to subtract the CEO's outside option from most calculations. Further, let us assume that the CEO will maximize shareholder value when it is weakly in her interests to do so. This is also a notation minimization device, which is not crucial to the analysis.

The “hard” incentive contract, W_H , will take the following form:

$$W_H = \gamma V_{4d}. \quad (2)$$

Let V_S^* be the maximum period four- d value for which a CEO with soft incentives will be compensated. All increases in V_{4d} above this target value, V_S^* , will receive no further compensation. V_S^* will be endogenously determined in the model. Let the “soft” CEO's wage contract, W_S , be the following:

$$W_S = \gamma \min[V_{4d}, V_S^*]. \quad (3)^6$$

When $V_{4d} > V_S^*$ then “hard” incentives will lead to higher CEO pay than “soft” incentives. Further, note that the “soft” CEO will strictly prefer to return no more than V_S^* to

⁶ In this model, there is no need to compensate the CEO for reaching values between zero and V_S^* . An equivalent contract for our purposes would involve the CEO being paid γV_S^* if she hit the target V_S^* and zero otherwise. The key feature is that the CEO is compensated for her efforts if she raises the terminal, period four- d value, of the firm to V_S^* , but the CEO is not compensated for her efforts if she raises firm value beyond V_S^* .

shareholders and bondholders in period four- d . The reason for this is that the CEO's disutility rises in V_{4d} but the "soft" CEO's compensation does not rise above γV_s^* .

Note that the CEO does not suffer from moral hazard problems. Her efforts are observable and verifiable from the market value of claims to the firm's profits. The "hard" or "soft" incentives adopted at the start of the game affect the CEO's primary actions—altering the firm's capital structure in period three and agreeing to a wage settlement in period four- d . Her incentives to alter capital structure and pre-empt bargaining affect the union's attitude towards monitoring, which is adopted in period one after the incentive contract is announced. Ironically, it is workers' moral hazard problems and the union's ability to manipulate the level of pay necessary to solve these moral hazard problems, which drive our subsequent conclusions about CEO compensation.

Finally, founding shareholders in period zero can choose the probability, $0 \leq b \leq 1$, that the CEO's incentive package will be changed in period two. (For the purposes of our discussion here, a change in the CEO's incentive contract has the same effect as replacing the old CEO with a new one who has different incentives.)

In practice, corporate charters can help shareholders commit to not replace the manager. There are various anti-takeover devices⁷ that can be built into corporate charters. Boards of directors can be made dependent on the CEO for their jobs. This is the case with inside directors. Further, external directors may have economic or social ties with the CEO. There is some debate whether or not anti-takeover provisions should be upheld by the Delaware courts, for example. (See Stout (2003) and Bebchuk (2003) for contrasting views.) Nevertheless, there

⁷ Poison pills, poison puts, fair price amendments, split voting rights, waiting periods, shark repellent, and staggered boards are a few anti-takeover devices that are defined by Brealey, Myers, and Allen (2006, 892), for example.

is little debate that corporate charters, especially for companies incorporated in Delaware, can be used to entrench managers.

A $b = 0$ means that managers are entrenched with a friendly board 100 percent of the time. A $b = 1$ means they can always be replaced by period two shareholders. Most of the concern of authors such as Bebchuk (2007) is that b is too distant from 1. CEOs and their boards of directors are too hard to replace. In practice, current shareholders may be unable to intervene against CEOs who have different objectives than their own. Indeed, Bebchuk (2007) argues that $b \approx 0$ for too many companies. In what follows, we will see that some of the equilibrium results of this paper require that b needs to be less than 1 and possibly close to zero. Yet, all of the equilibrium results that follow do NOT require b to be close to one.

2.2 *Moral hazard*

Let us discuss how workers' moral hazard problems are prevented in the last and final period of our game. In that period production takes place and factors are paid. Nevertheless, the efficiency wages that must be paid are a function of the union's resistance to monitoring. Therefore, after the CEO has been given "hard" or "soft" incentives in period zero, union members can make monitoring of slack effort more or less costly in period one. The union's choice of monitoring costs, m , in period one affects the non-shirking wage paid in period four- d .

The firm requires a workforce normalized to be of size 1. Workers must exert a minimum level of effort if any production will take place. It costs \underline{e} per non-CEO employee to put forth the minimum required effort. The firm will collect revenues of R if all workers exert this minimum level of effort. This is summarized below.

$$\text{Revenues} = \begin{cases} R, & \text{when } e \geq \underline{e} \ \forall \text{ workers.} \\ 0, & \text{when } e < \underline{e} \ \forall \text{ workers.} \end{cases} \quad (4)^8$$

Since all workers are identical, the cases where either all union members put forth the minimum effort, or all union members shirk their duties are the most important.

Further, we will assume that workers can take up alternative employment at a reservation wage and utility of zero. Therefore, the total economic rents are $R - \underline{e} > 0$. $R - \underline{e}$ is neither needed to compensate founding shareholders for their initial investment of zero nor is it needed to finance new investment. Therefore, it represents pure rents, which could accrue to founding shareholders or union members.

Monitoring union members' effort is costly. Unions could be either resistant or open to managerial efforts to monitor shirking. If union members are encouraged to resist management overtures and turn a blind eye to the slack effort of their co-workers, it will be harder for non-union supervisors to detect shirking. More supervisors will have to be hired for a given level of effort. Acemoglu and Newman (2002) explicitly model monitoring costs as the cost of employing supervisory managers. Here we argue that union members will actively attempt to hide their co-workers' indiscretions. (Passing notes in elementary school is a lot easier when there is not a "tattle-tale" in class!) On the other end of the spectrum, union members could reduce the cost of monitoring by actively reporting the slack efforts of co-workers to managers. Further, someone who does not "pull his weight" could face formal or, more likely, informal

⁸ If a fraction of workers, $\phi \in [0,1]$, exerted effort, revenues would be ϕR .

discipline from his fellow union members. In this way, the union's attitude and culture towards shirking will raise or lower the costs of monitoring.⁹

Let the total cost of monitoring be mq . Let q be the conditional probability that shirking is detected, given that shirking takes place. Further, $1 \geq q \geq 0$, and $m \in [0, \infty)$. m is the marginal cost of monitoring.¹⁰ As in Acemoglu and Newman (2002), mq could be the cost of employing non-union supervisors. Further, it may be the extra cost associated with firing a union member when that worker is caught working unproductively. For example, some sort of arbitration may be necessary to prove that the slack worker was fired for cause.

We will present the static efficiency wage model of Calvo and Wellisz (1979). Let us assume that all workers are risk-neutral with the separable utility function given below:

$$U = w - e \tag{5}$$

U is utility; w is the wage and e is the effort expended. Employees have outside opportunities or unemployment benefits that pay a wage that is normalized to be equal to zero.

Individual union members' effort levels are observed a percent of the time, q . If they are observed working with low effort, $e < \underline{e}$, then they will be fired. Alternatively, if they are observed working productively, $e \geq \underline{e}$, then they will be retained. If a union member shirks, he will only be fired with the probability q , and he will be retained with the probability $(1 - q)$.

Anyone who exerts effort of at least \underline{e} has no probability of dismissal. Moreover, let us assume

⁹ Kandel and Lazear (1992) argue that norms can be self-enforcing through peer pressure. Jones (1984) explores some evidence of conformity in workgroups and develops theories of how conformity becomes an equilibrium. Once the union adopts its culture towards monitoring, each individual union member finds it optimal to adhere to that culture.

¹⁰ Earlier drafts considered the effect of a variety of cost functions on the non-shirking constraint and union rents. Only the marginal costs of monitoring were relevant to the CEO's choice of detection probabilities, q . For ease of exposition, the present discussion only considers the case where the union affects the marginal costs of monitoring.

that no one will quit. In equilibrium, no one will exert more effort than e . Everyone not fired for shirking is paid in period four- d . The maximum expected benefits from working productively and never being fired for shirking is $w - e$. This must exceed the expected benefits of shirking, $(1 - q)w$. (Recall that if someone is fired, his wage is 0.) This leads us to the following non-shirking condition (NSC), in the terminology of Shapiro and Stiglitz (1984), or incentive compatibility constraint, which is familiar to students of contract theory:

$$w \geq \frac{e}{q} \equiv w^N \quad (6)$$

2.3 *Optimal capital structure*

Let us recall the timing of the game. In period zero, a “hard” or “soft” CEO is selected. Then, the union selects the monitoring cost function. In period three, the CEO selects financial structure. In period four- a , the union has the opportunity to bargain with equity holders over the remaining surplus. The CEO can always avoid dividing the residual profits with the union in the fourth period. Increasing leverage can tie managers’ hands before they waste surpluses.¹¹ The CEO can avoid high bargained wages by issuing a pre-bargaining, debt-financed payout to shareholders in period three.

Efficiency wages, w^N , are the lower bound of any wage settlement. Whatever surplus remains can be auctioned off to bondholders. w^N in (6) can be considered the minimum wage at which labor is supplied (at least, in this case, the minimum wage necessary for productive labor).

¹¹ Hart (1995, p. 129) and Hart and Moore (1995), in another context, emphasize how senior debt is a “hard” budget constraint, which managers cannot easily violate. Here, we assume that debt is “hard” in the sense that payments

Nevertheless, because labor is organized, there can be a range of possible settlements. The maximum wage that the firm will pay for labor is simply R , revenues, less the direct costs of monitoring, mq , incurred by the firm. Therefore, the set of possible wage bargaining outcomes is the following:

$$w \in \left[\frac{e}{q}, R - mq \right] \quad (7)$$

Note that the first-best for the shareholders, when the union wage bill is minimized, is achieved when the $w = w^N$.

To give the bankruptcy threat some bite, we will assume that in the event of a default, defined as negative net profits, operations would be shut down and union members would take up reservation employment at the wage zero. In particular, we are assuming that bond covenants cannot be renegotiated prior to default. Further, it is sufficient that shutdown would occur when the restructuring costs exceeded the maximum payments to investors.¹² (The maximum

cannot be postponed. In many contexts, debt will most likely be a binding constraint if it is diffusely held, public debt. With many small creditors, the bond issue will probably be difficult to renegotiate.

¹² There are a couple of assumptions that are needed here to make the bankruptcy threat have force.

First, debt cannot be renegotiated just prior to default. Otherwise, costly bankruptcy can always be avoided after the bonds are issued. If bankruptcy can be avoided, the bonds have no strategic value as modeled. Gertner and Scharfstein (1991) argue that exchange offers, where equity is given in exchange for public debt, often fail because the Trust Indenture Act in the United States requires that such an exchange is only possible with the consent of each and every bondholder. Every bondholder has an incentive to “hold-out” because the value of the debt will rise after the costly financial distress is avoided. Therefore, current shareholders will resist transferring wealth to bondholders, and in many cases costly bankruptcies will occur in equilibrium. By contrast, once a firm enters United States Chapter 11, for example, bankruptcy, debt can be transformed into equity with far less than unanimous consent of a given creditor group.

Second, we have assumed that bankruptcy leads to shutdown. That would be the case if the restructuring costs of bankruptcy exceed the future surpluses of a restructured firm. Modigliani and Miller (1958) argue that bankruptcy has no effect on the firm’s value. Yet, this paper assumes that there are no costs of financial distress. By violating their assumption, default affects the firm’s value. Bronars and Deere (1991) point out that for strategic debt policy to have some power, the restructuring costs merely need to be positive. It is the *cost* of reversing the commitment to bondholders that improves the bargaining position of managers, who are acting in shareholders’ interests. Indirect bankruptcy costs can be substantial. Weiss (1990), for example, estimates that in the United

payments to investors are revenues, R , minus the minimum possible wages paid to union members, w^N , less the minimum wage paid to the CEO for her efforts, γV , less monitoring costs. That is, $V = R - \underline{e}/q - mq - \gamma V$ or equation (8) below.)

$$V = \frac{1}{1+\gamma} \left(R - \frac{\underline{e}}{q} - mq \right) \quad (8)$$

From the point of view of current shareholders, the optimal debt policy after the union has committed to some level of monitoring costs, m , involves setting the face value of the debt equal to the present value of profits in the final period. That is, $V = D$. Then the value of the bond is dispersed to shareholders in period three by way of a pre-bargaining, debt-financed dividend, share buy-back, or debt-for-equity swap. In this way, no surplus would remain over which the union can bargain with shareholders.

In practice, public, arms-length, debt is most useful in bargaining with the union. Arms-length debt will be hard, if not impossible, to renegotiate. Renegotiable, bank debt has little value as a strategic commitment unless the bank is a tougher negotiator than management. Shareholder value is maximized in period three if the debt cannot be renegotiated at all prior to costly bankruptcy.

States the costs of bankruptcy are approximately three percent of book assets and 20 percent of market value of equity a year prior to a bankruptcy filing.

If bankruptcy itself does not entail large costs, excessive leverage probably does. Certainly, Myers (1977) illustrates how excessive levels of debt can lead to firms forgoing profitable new investments. For example, Myers' prediction is confirmed by Chevalier (1995). Chevalier found that supermarket retailers, who underwent a leveraged buyout (LBO), were slow to invest relative to their less leveraged competitors.

3. Analysis

So far we have described all the essential features of the model. Nevertheless, we still have to solve for several variables. Let the subscripts “ S ” or “ H ” denote actions or endogenous values when a “soft” or “hard” CEO is appointed, respectively. We will denote equilibrium actions and values that are part of a perfect Bayesian equilibrium (PBE) with asterixes in the superscript, *, as well as “ S ” or “ H ” in the subscript. The union can solve for the “hard” CEO’s reaction function for a given level of monitoring costs, m . Once we find the union’s choice of monitoring costs when a “hard” CEO is appointed, m_H , founding shareholders’ choice of both the type of CEO incentives—“hard” or “soft”—and the level of entrenchment— b —becomes relatively easy.

This model is solved by backwards induction. First, we solve the CEO’s monitoring decision in period four- b and capital structure decision in period three. Then, we discuss what shareholders would do if they are given the opportunity to replace the CEO in period two. Finally, we solve the union’s problem of picking the level of monitoring costs that maximizes its members’ payoffs.

“Hard” CEO’s problem in periods four and three

When the minimum non-shirking wage is paid, the “hard” CEO will choose the detection probability, q , to maximize her stake in the firm. The “hard” CEO’s stake is γW .

$$\begin{aligned} \arg \max_q \quad & \gamma V = \frac{\gamma}{1+\gamma} \left(R - \frac{e}{q} - mq \right) \\ \text{s.t.} \quad & q \in [0, 1] \end{aligned} \quad (9)$$

This implies q_H , which we will use to denote the “hard” CEO’s optimum choice of monitoring. We derive q_H in appendix section 5.1

$$q_H = \min \left[\sqrt{\frac{e}{m}}, 1 \right] \quad (10)$$

Equation (10) reflects the constraint that the detection probability, q , cannot exceed 1.

Therefore, for very low levels of marginal monitoring costs, $m < \underline{e}$, all shirkers will be detected with certainty.

With bond finance, the firm can ensure that it pays the minimum incentive compatible wage, maximizes profit, and returns the maximum value to shareholders. Nevertheless, it is essential that the proceeds of the bond are distributed to shareholders prior to negotiations. Otherwise, the bond is irrelevant.

Note that with debt, the “hard” CEO chooses q_H . Final period profit and, thus, the value of the debt is reduced by $m_H q_H$. The proceeds from the sale of bonds are distributed to the founding shareholders. Therefore, if there is a monitoring cost in expectation, this cost is entirely borne by the firm’s original owners.

The minimum efficiency wage, w^N , is paid when the bond is maximized. In this case, combining (5) and (6), union members’ payoffs are merely the following:

$$U = \frac{e}{q_H} - \underline{e} \geq 0, \text{ where } 0 \leq q_H \leq 1. \quad (11)$$

Therefore, with bond finance, the union only derives surplus through the non-shirking constraint.

Shareholders' problem in period two

$(1 - b)$ *100 percent of the time, shareholders are passive; but, if period two shareholders are lucky, which happens b *100 percent of the time, they are given the opportunity to give the CEO a new incentive contract. This new incentive contract is public knowledge once it is in place in period one.

Proposition 1 (control changes)

If period 2 shareholders are given the opportunity to replace the CEO in period two, they will always weakly prefer to give the new CEO “hard” incentives.

The purpose of giving the CEO “soft” incentives was to induce union members to minimize monitoring costs in period one. In period two, it is too late for the union to change their decision. Therefore, shareholders will at least weakly prefer to give control to a CEO who would set the pre-bargaining payouts to shareholders to the maximum. A formal proof of this is left for the appendix 5.2.

In short, current shareholders, given the opportunity, will always give the CEO “hard” incentives ex post in period two.

Union's problem in period one

To solve the union's problem we must inspect two alternative scenarios. Either the union observes the appointment of a "hard" CEO or a "soft" CEO in period zero. Yet, the union in period one is still unsure whether or not the incentives of the CEO will be "hard" or "soft" in periods three and four because there is a chance, b , that the incentives of the CEO will be changed in period two.

Let us consider the first period of the game where the union chooses the marginal costs of monitoring, given that a "hard" CEO has been selected in period zero. When the "hard" CEO is in charge, the union only gets its payoff through efficiency wages. The "hard" CEO will give away any surplus above the non-shirking condition as a pre-bargaining dividend. Therefore, the union's payoff comes from the non-shirking condition. Union members' utility is declining in the probability of detection for shirking, q_H . Therefore, the union will want to raise monitoring costs to encourage the "hard" CEO to choose lower detection probabilities. Lower detection probabilities translate into higher efficiency wages and union rents. Therefore, in this simple dynamic game, the union chooses the monitoring cost technology that will maximize the post-dividend, non-shirking condition wage paid in period four- d .

The unions' choice of monitoring costs depends on the magnitude of rents. In particular, if high effort revenues, R , are sufficiently small relative to the required effort levels for production, e , then the union cannot win rents by raising the costs of monitoring. This is the case when $R \leq 2e$. In this case, the union cannot profitably raise monitoring costs and will weakly prefer to minimize m . This relationship is derived in appendix 5.3. Yet, if revenues are large

relative to minimum productive effort levels, then raising the cost of monitoring to the maximum becomes a profitable strategy. This is when $R > 2\underline{e}$.

$$R \leq 2\underline{e}$$

Consider the following proposition:

Proposition 2 (PBE of “hard” CEO)

*When total rents are small, $R \leq 2\underline{e}$, it is a perfect Bayesian equilibrium (PBE) for founding shareholders to give the CEO “hard” incentives in period zero and for the union to minimize monitoring costs in period one. If shareholders are given the opportunity to replace the CEO in period two, they will always prefer to give the CEO “hard” incentives. All rents that do not compensate the CEO for her efforts go to founding shareholders.*¹³

We have assumed that the union will minimize monitoring costs when it is weakly in its interests to do so. Therefore, when rents are small relative to the minimum productive effort, the union cannot induce the “hard” CEO to select a q_H below one. In this case, monitoring costs are set to the efficient level of zero.

From our derivations in appendix 5.3, when $R \leq 2\underline{e}$, there existed no $m > \underline{e}$ such that profits were strictly positive. Therefore, $q_H^*(m_H^*) = 1$. This follows from equation (10). From

¹³ Earlier versions of this paper used a continuous time efficiency wage model, which had some nice features at the cost of a longer explanation and less intuitive interpretation of parameters. Shapiro and Stiglitz (1984) interpret the parameter of detection technology, q , as a rate. Therefore, q in those instances can take on any non-negative value. One of the “nice” features of a q which was unconstrained from zero to positive infinity was that we would not have this corner solution. The union could always credibly select positive levels of monitoring costs and drive profits to

equation (11) we see that the union earns no rents when $q_H^* = 1$. Therefore, it will weakly prefer to minimize monitoring costs. Only \underline{e} needs to be left to pay union members to prevent shirking. In that case $w_H^* = \underline{e}$, and $U_H^* = 0$. Therefore, what little rents there are to be fought over can be captured by founding shareholders with the “hard” CEO who pushes debt to the maximum, $D_H^* = (1 + \gamma)^{-1} (R - \underline{e})$, in period two. Therefore, founding shareholders will always want to give the CEO “hard” incentives in period zero.

Finally, Proposition 1 tells us that period 2 shareholders will always weakly prefer to have a CEO with “hard” incentives. *Q.E.D.*

When $\underline{e} \geq R/2$, the following are the equilibrium values for the actions taken by the union and the CEO (m, q), the wages paid (w, W), the bonds raised and distributed to founding shareholders (D), the payoffs to founding shareholders and the union (V, U), and the probability of a control change (b):

$$m_H^* = 0 \quad (12a)$$

$$q_H^* = 1 \quad (12b)$$

$$w_H^* = \underline{e} \quad (12c)$$

$$W_H^* = [\gamma / (1 + \gamma)] (R - \underline{e}) \quad (12d)$$

$$D_H^* = (1 + \gamma)^{-1} (R - \underline{e}) \quad (12e)$$

$$V_H^* = R - \underline{e} - \gamma V_H^* = (1 + \gamma)^{-1} (R - \underline{e}) \quad (12f)$$

$$U_H^* = 0 \quad (12g)$$

zero. If q was unconstrained from zero to positive infinity, the low-rent ($R \leq 2\underline{e}$) region would disappear and “soft” incentives would always be optimal.

$$b_H^* \in [0, 1] \quad (12h)$$

This result, when rents are small, is the benchmark case where employees cannot affect their payoffs by organizing. Therefore, when rents are small, workers get no benefit from their ability to adopt a culture that hinders monitoring.

$R > 2\underline{e}$

From (10) when monitoring costs are sufficiently high, $q_H < 1$, q_H is strictly falling in the marginal costs of monitoring, m . We can substitute m and q_H into the union members' objective function. When $q_H < 1$, utility is the following: $U = (\underline{e}m)^{1/2} - \underline{e}$.

$$\left. \frac{dU}{dm} \right|_{q_H < 1} = \frac{1}{2} \sqrt{\frac{\underline{e}}{m}} > 0 \quad (13)$$

Thus, when $m > \underline{e}$, we can see from (13) that utility is strictly increasing in the marginal costs of monitoring. This is because the non-shirking wage is increasing as the shirking detection probability, q_H , falls. Let m_H denote the union's optimal choice of marginal monitoring costs when the "hard" CEO will maximize profits. Since the union's payoff is increasing in m , it will push the marginal costs of monitoring to the maximum. That is the point where maximum profits are driven to zero— $V(q_H[m_H]) = 0$.

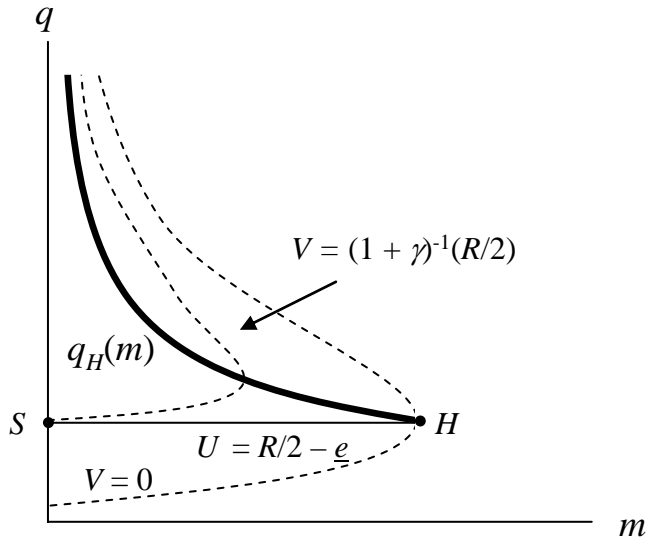


Figure 2: The “hard” CEO’s reaction function

Figure 2 represents the game when rents are large, $R > 2\underline{e}$, or equivalently $R/2 > \underline{e}$. This diagram shows the isoprofit curves for the firm—the thin dashed lines. The thin horizontal line, the union’s indifference curve, represents all combinations of m and q where the union’s expected utility is $U = R/2 - \underline{e} > 0$. The union derives no utility from higher monitoring costs directly. For this reason the union’s indifference curves are horizontal. Yet, higher monitoring costs do affect the CEO’s choice of wages. Union members do prefer higher wages. This is illustrated by the thick black curve. This curve is the “hard” CEO’s reaction function, $q_H(m)$. It is the “hard” CEO’s optimal choice of q for a given level of marginal cost, m . As with all reaction functions, it passes through the highest profit isoprofit curve for a given level of costs. Higher levels of monitoring costs, m , induce the “hard” CEO to pay higher wages.

The union always prefers lower detection probabilities because its members’ rents are derived through the non-shirking condition when the “hard” CEO is appointed. Utility in (8) is declining in the probability that an individual will be caught for shirking, q . The union chooses the corner solution, point H , where its highest expected utility indifference curve, $U = R/2 - \underline{e}$, intersects the firm’s reaction function at the expected zero-profit isoprofit curve. Note that on figure 2 the indifference and isoprofit curves that are closer to the horizontal and vertical axes, respectively, are more preferred.

If shareholders can commit to give union members expected rents of $U = R/2 - \underline{e}$, shareholders can earn rents, and a more efficient split of the surplus is possible. The point S with zero monitoring costs would lead to an efficient split of the surplus and no deadweight losses.

To reach the efficient point S , a “soft” CEO must promise union members expected rents of $U = R/2 - \underline{e}$. In period one, union members commit to a level of monitoring costs. In period

two, there is a $b * 100$ percent probability that shareholders will give control to a “hard,” shareholder-value-maximizing CEO. In period three, the CEO alters capital structure with her incentive contract being public knowledge. Nevertheless, the union, when it moves in period one, is unsure about the payoffs of the CEO against whom it is playing. To induce union members to minimize costs, given there is a $b * 100$ percent chance of a control change occurring, a “soft” CEO must be committed to give union members utility of $(R/2 - \underline{e})/(1 - b)$. That is, the “soft” CEO must offer a wage:

$$w_s^* = \frac{R/2 - \underline{e}}{1 - b} + \underline{e} \geq R/2$$

Suppose that $b = 0$. The “soft” CEO will always be retained. Shareholders, get rents of $(1 + \gamma)^{-1}(R/2)$ in all states because they need to have the “soft” CEO committed to offer union members wages of $R/2$. Union members that are assured that the “soft” CEO will be retained do not need to raise monitoring costs. They know that it is the “soft” CEO’s interest to offer them wages of w_s^* in period 4-d. Union members find it weakly in their interest to minimize monitoring costs when they are sure the “soft” CEO is retained because, in expectation, they cannot earn higher utility from raising monitoring costs.

Control changes can increase the share price without increasing the ex ante value of the firm. If the all equity firm is composed of just one share at the start of the game, the share price will be $(1 + \gamma)^{-1}(R/2)$. If $b > 0$ and the union minimizes monitoring costs, then the value of the firm after a control change is $V_H^* = (1 + \gamma)^{-1}(R - \underline{e})$. Therefore, $[(1 - b) V_S^* + b V_H^*] = (1 + \gamma)^{-1}(R/2)$:

$$\frac{1}{1+\gamma} \left[\left((R-\underline{e}) - \frac{R/2-\underline{e}}{1-b} \right) (1-b) + (R-\underline{e})b \right] = \frac{R/2}{1+\gamma} \quad (14)$$

Therefore, the ex ante value of the firm is unchanged by the presence of a control change.¹⁴ When it becomes apparent that the control change does, in fact, occur in period two, the share price should rise from $(1+\gamma)^{-1}(R/2)$ to $(1+\gamma)^{-1}(R-\underline{e})$. Likewise, when it becomes apparent that the “soft” CEO will be retained at the end of period two, the share price will fall from $(1+\gamma)^{-1}(R/2)$ to equation (15f) below. Therefore, a rising share price does not demonstrate that a control change creates ex ante value.

Shleifer and Summers (1988) dispute whether event studies of shareholder returns after hostile takeovers measure the true social gains and losses by such activity. They argue that many of shareholders’ gains from hostile takeovers come from the losses by workers in target companies ex post. This paper agrees with that observation. Period zero shareholders gain nothing ex ante by having control changes ($b > 0$) in period two, but period two shareholders ex post benefit from being able remove the CEO’s “soft” incentives.

Moreover, if one inspects w_s^* , it becomes clear that the credibility of the “soft” CEO’s promise to workers will come into question when b becomes too large. The “soft” CEO will have to promise to drive the firm into negative profits in the last period to compensate union members for minimizing costs. Since this is not feasible, the “soft” CEO’s promises will be unheeded when

¹⁴ Suppose that hostile bids are costly but profitable. Then ex ante shareholder surplus will be strictly destroyed by the potential control changes from a “soft” to a “hard” CEO. Further, if we assumed that employees were risk-

$$b > \frac{R/2}{R - \underline{e}} \equiv \bar{b}_S^*.$$

Since $R/2 > \underline{e}$ when a “soft” CEO is appointed, it must be the case that $1/2 < (R/2)/(R - \underline{e}) < 1$. Appendix 5.4 gives the out-of-equilibrium solutions when $b > \bar{b}_S^*$. In short, founding shareholders’ payoffs are zero. Shareholders could do better when rents are large if they appoint a “soft” CEO, whose incentives are less likely to be changed. That is, founding shareholders will gain ex ante if they choose a $b \leq \bar{b}_S^*$.

A “soft” CEO will weakly prefer to increase the value of the firm up to the point V_S^* given below. If the “soft” CEO wants to pre-empt bargaining, she can set debt equal to V_S^* . Alternatively, she could choose to take on lower levels of debt, depending on the union’s bargaining strength. In the appendix 5.5, we consider the range of debt levels that the “soft” CEO can select, based on the union’s index of bargaining strength, β . For weak unions, the “soft” CEO sometimes can avoid taking on any debt. Nevertheless, the “soft” CEO can reach her target by taking on debt commitments as high as V_S^* , regardless of the union’s bargaining strength.

Suppose that the union maximizes monitoring costs. They will not be able to earn expected rents in excess of $U = R/2 - \underline{e}$. Since this is exactly the payoff that the union will get if they set monitoring costs to zero with a “soft” CEO. The union will weakly prefer to minimize monitoring costs. Because the union minimizes monitoring costs when it is weakly in its interest

averse, the possibility of a hostile bid would destroy shareholder value ex ante for any positive probability of a bid, b . Yet, in both cases, hostile bidders may increase share prices ex post.

in doing so, $m_s^* = 0$ and union members receive expected wages of $w = R/2$ and an expected payoff of $U = R/2 - \underline{e} > 0$. This discussion leads us to the proposition below:

Proposition 3 (PBE of “soft” CEO)

When $R > 2\underline{e}$, it is a perfect Bayesian equilibrium (PBE) for founding shareholders in period zero to give the CEO “soft” incentives and some entrenchment protections. Further, it is a PBE that union members will minimize monitoring costs in period one. In this case, founding shareholders and union members share rents in expectation.

Below is a summary of several endogenous values when rents are large and the “soft” CEO is retained until the end of the game:

$$m_s^* = 0 \tag{15a}$$

$$\frac{\underline{e}(1-b)}{R/2 - b\underline{e}} \leq q_s^* \leq 1 \tag{15b}$$

$$w_s^* = \frac{R/2 - \underline{e}}{1-b} + \underline{e} \tag{15c}$$

$$W_s^* = \frac{\gamma}{1+\gamma} \left((R - \underline{e}) - \frac{R/2 - \underline{e}}{1-b} \right) \tag{15d}$$

$$\frac{1}{1+\gamma} \left((R - \underline{e}) - \frac{R/2 - \underline{e}}{1-b} \right) \geq D_s^* \geq \frac{1}{1+\gamma} \left((R - \underline{e}) - \frac{1}{\beta} \left(\frac{R/2 - \underline{e}}{1-b} \right) \right) \tag{15e}^{15}$$

$$V_s^* = R - w_s^* - \gamma V_s^* = \frac{1}{1+\gamma} \left((R - \underline{e}) - \frac{R/2 - \underline{e}}{1-b} \right) \tag{15f}$$

¹⁵This is derived in appendix 5.5. The RHS can be negative. This is the case when the firm has cash surpluses.

$$U_s^* = \frac{R/2 - \underline{e}}{1 - b} \quad (15g)$$

$$b_s^* \in [0, \bar{b}_s^*], \text{ where } \bar{b}_s^* \equiv \frac{R/2}{R - \underline{e}}. \quad (15h)$$

100*b percent of the time the “soft” CEO will be replaced in period two. After the union has minimized the monitoring costs, the new “hard” CEO can return the maximum rents to shareholders, $\frac{1}{1 + \gamma}(R - \underline{e})$, and union rents are zero. The results in equations (12a) to (12g) reported earlier double as the ex post values when shareholders give “hard” incentives to the CEO in period two and rents are large, $R > 2\underline{e}$. The ex ante renegotiation probability in (15h) is unaffected by whether shareholders can intervene ex post in period two.

CEO pay levels

For a given set of parameter values $\{R, \underline{e}\}$, there is a unique equilibrium. Nevertheless, we have described two perfect Bayesian equilibria, which may occur, depending on the parameter values. In both of the equilibria, the union always minimizes monitoring costs.

Consider figure 3. There are two regions of interest. When rents are small, revenues, R , are less than or equal to two times the minimum cost of productive effort, \underline{e} . That is, $R \leq 2\underline{e}$. For these parameter values, a “hard” CEO is appointed, and the union earns no rents. When rents are large relative to efforts required for production, revenues, R , exceeds two times the minimum efforts required for production, $2\underline{e}$. That is, $R > 2\underline{e}$. In this region, the “soft” CEO is appointed. In the high rent region where the “soft” CEO is appointed, founding shareholders and union members share expected rents of $[1/(1 + \gamma)](R/2)$ and $R/2 - \underline{e}$, respectively.

Let us consider how our results relate to the equilibrium levels of CEO pay for organized and unorganized workforces. First, let us confine ourselves to the case where rents are large.¹⁶ This is when $R > 2\underline{e}$. When rents are large, the expected “soft” CEO pay is less CEO pay when workers are unorganized. On the left hand side of the inequality below is expected “soft” CEO pay. On the right hand side of the inequality is the pay of a CEO of an unorganized workforce. Mathematically,

$$\frac{\gamma}{1+\gamma} \left(\frac{R}{2} \right) < \frac{\gamma}{1+\gamma} (R - \underline{e}), \quad \text{when } R/2 > \underline{e}.$$

¹⁶ When rents are small in relation to \underline{e} , CEO pay would be identical for unionized and non-unionized firms because shareholders do not have to share any rents.

If managers must exert greater effort to raise the value of the firm, CEOs of unionized firms will exert less effort and need to be paid lower wages. This is because when rents are sufficiently large, only a CEO with weaker or “softer” incentives can convince union members to minimize monitoring costs. “Soft” incentives mean that the CEO incentive contract will have a limited upside in order to encourage rent sharing between shareholders and union members.

Recent empirical work by DiNardo, Hallock, and Pischke (2000), Andersen, Boylan, and Reeb (2007), and Gomez and Tzioumis (2007) concerning the relationship between CEO compensation and unions, seems broadly consistent with our results here. Our discussion and hypothesis three in figure 3 predicts that CEO pay will be lower in unionized firms. Therefore, her absolute levels of pay will be lower to participate in rent sharing when rents are sufficiently large, $R/2 > \underline{e}$. Therefore, we would predict that CEO pay would be lower in unionized firms.¹⁷ This is what DiNardo, Hallock, and Pischke (2000), Andersen, Boylan, and Reeb (2007), and Gomez and Tzioumis (2007) find in the United States. The “soft” CEO will need weaker incentives and exert less effort. Andersen, Boylan, and Reeb (2006) and Gomez and Tzioumis (2007) confirm this paper’s prediction number two in figure 3 that CEO pay will be “softer” with less performance and stock-based pay in unionized firms. As figure 3 illustrates, there are many other testable hypotheses. Hypotheses two (“soft” incentives), three (CEO pay), five (rent-sharing), six (entrenchment), and seven (debt-to-value ratios)¹⁸ have some empirical support.

¹⁷ Consider unionized firms when rents are large, $R > 2\underline{e}$. Let us define a parameter α , where $0 \leq \alpha < 1$. The result that CEO pay will be, on average lower in unionized firms, still holds if there exists a fraction of firms, α , where the CEO moves first. In alpha firms, CEOs would set debt constraints prior to the union choosing its culture towards monitoring. In these firms, the CEO would always be “hard” and set debt to the maximum. Yet, in $(1 - \alpha)*100\%$ of the firms the union moves in period 1 and the CEO sets capital structure in period 3 as in figure 1. In those firms, the CEO originally appointed would be “soft”. In the $(1 - \alpha)*100\%$ of the firms the CEO pay would be on average $[\gamma/(1+\gamma)](R/2)$. Therefore, on average, across all firms CEO pay will be lower when $\alpha < 1$. That is, when $\alpha < 1$ and $R > 2\underline{e}$, average CEO pay is $[\gamma/(1+\gamma)]\{\alpha(R - \underline{e}) + (1 - \alpha)(R/2)\} < [\gamma/(1+\gamma)](R - \underline{e})$.

¹⁸ Cronqvist, Heyman, Nilsson, Svaleryd, and Vlachos (2008) lends some support to hypotheses five and six. Hypothesis seven has been for the most part confirmed by Bronars and Deere (1991) and (1993), Cavanaugh and Garen (1997), and Matsa (2007) who find that unionized firms tend to have higher debt-to-value ratios.

Nevertheless, more work could be done on hypotheses five and six. The author knows of no studies that formally test hypothesis four (CEO pay-to-value ratios) or eight (control changes).

4. Conclusion

In this paper, we show that shareholders can maximize their payoffs by appointing a “soft” CEO in the beginning of the game. “Soft” incentives encourage the manager to share surpluses with workers. Nevertheless, “soft” incentives will encourage the CEO to take actions that, from the point of view of shareholders later in the game, will seem overly generous to union members. Hostile takeovers, top management re-shufflings, and debt workouts may create value after-the-fact. Yet, when the union can behave strategically, the potential for control changes and the strategic use of bankruptcy constraints may lead to poor labor relations and inefficiencies that destroy shareholder value *ex ante*.

When union members must be paid non-shirking wages to prevent moral hazard problems, high union rents can be maintained even if shareholders can auction off the entire surplus prior to bargaining. If the union can commit to a costly monitoring technology before financial structure changes are enacted, then debt constraints are ineffective tools for transferring rents from the union members to shareholders. Worker hostility to managerial monitoring of slack effort serves a useful purpose from the point of view of workers, if not from the point of view of society. Union members’ resistance to monitoring may affect the non-shirking constraint and can raise union members’ wages. Yet, if they can win rents another way, union members may help minimize monitoring costs. For this reason, a top manager committed to sharing surpluses with workers, a “soft” CEO, may be in the best position to preserve shareholder wealth.

This paper gives a novel justification for top management contracts with limited upside potential and some degree of entrenchment protection. “Softer” incentives and, thus, lower CEO pay are needed to induce union members to minimize monitoring costs. This is consistent with the empirical findings by DiNardo, Hallock, and Pischke (2000), Andersen, Boylan, and Reeb (2006), and Gomez and Tzioumis (2007) that CEO pay is lower in unionized firms. Therefore, here we have argued that top manager incentive contracts cannot be viewed as just affecting the behavior of the manager for whom they were designed. CEO incentive contracts also affect the behavior of other actors within the firm. Finally, this model generates new, testable hypotheses that have, as of yet, not been brought to the data.

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5. Appendix

5.1 Derivation of equation (10)

The first order condition of the unconstrained objective function in equation (9) is as follows:

$$\left. \frac{d(\gamma V)}{dq} \right|_{q=\hat{q}} = \frac{\gamma}{1+\gamma} \left(\frac{e}{\hat{q}^2} - m \right) = 0.$$

It is easy to verify that the second order condition of the unconstrained equation (9) is negative for all feasible values of q — $q \in [0, 1]$.

$$\frac{d^2(\gamma V)}{dq^2} = -\frac{2e}{q^3} \frac{\gamma}{1+\gamma} < 0, \forall q \geq 0.$$

When $\hat{q} > 1$ the constraint $q \in [0, 1]$, is violated. The “hard” CEO cannot catch shirkers more than 100 percent of the time! Therefore, equation (9) can be maximized, at q_H , which is either the \hat{q} implied by the first order condition above, when $\hat{q} \in [0, 1]$, or the maximal value of q , $q = 1$. Thus, the optimal choice of the “hard” CEO for any given monitoring cost m is given by q_H in equation (10).

5.2 Proof of Proposition 1

We need to show that period two shareholders are always weakly better off with a CEO with “hard” incentives if they can change the CEO’s incentives in period two.

Suppose that the union chooses a monitoring cost parameter, m' , in period 1. Let us define the value of the firm in period four- d under a “hard” CEO, given the union’s choice of monitoring costs, m' , as V'_H .

$$V'_H \equiv V(q_H, m') = V_{4d} \quad (\text{A1})$$

Where $V(q, m)$ is defined in equation (8) and q_H is defined in equation (10). V'_H is also the maximum value of the firm, given that m' is chosen by the union.

Combining equations (1), (2), and (A1), the “hard” CEO’s payoff, P'_H , is

$$P'_H \equiv W_H - C(V'_H) = \gamma V'_H - \gamma V'_H = 0. \quad (\text{A2})$$

Equation (A2) tells us that a “hard” CEO will weakly prefer to increase the value of the firm.

Suppose that “soft” CEO takes actions that maximize the value of the firm and lead to $V_{4d} = V'_H$.

From equations (1) and (3),

$$P'_S \equiv P = \begin{cases} P_S^0 \equiv \gamma \min\{V'_H, V_S^*\} - \gamma V'_H = \gamma(V'_H - V'_H) = 0, & \text{when } V_S^* \geq V'_H \\ P_S^- \equiv \gamma \min\{V'_H, V_S^*\} - \gamma V'_H = \gamma(V_S^* - V'_H) < 0, & \text{when } V_S^* < V'_H \end{cases} \quad (\text{A3})$$

Given that V'_H is the value that maximizes the value of the firm, the “soft” CEO will choose this point when it is weakly in her interest. She will only choose V'_H when $V_S^* \geq V'_H$. Choosing V'_H leads to a negative payoff when $V_S^* < V'_H$. Thus, the “soft” CEO will never take actions that lead to a firm with a value V'_H when $V_S^* < V'_H$. Therefore, we can conclude that the soft CEO will only take actions that raise firm value to V_S^* when $V_S^* < V'_H$.

Since period two shareholders’ payoff is the firm’s value, period two shareholders’ payoff is increasing in firm value. The difference between firm value with a CEO with “hard” versus “soft” incentives is

$$\begin{aligned} V'_H - V'_H &= 0, \text{ when } V_S^* \geq V'_H, \\ \text{and } V'_H - V_S^* &> 0, \text{ when } V_S^* < V'_H. \end{aligned} \quad (\text{A3})$$

From equation (A3), when $V_S^* < V'_H$, then endowing the CEO with “hard” incentives leads to a strictly, higher payoff for period two shareholders. In all other instances, period two shareholder would be indifferent to either set of incentives. Therefore, since there is no cost to changing the CEO’s incentives, period two shareholders will always weakly prefer to replace “soft” incentives with a “hard” incentives. *Q.E.D.*

5.3 *Derivation of the parameter values for which the union can profitably raise monitoring costs*

The union will maximize monitoring costs, m , if it can earn any rents by doing so. The m_H selected by the union must be both low enough that the CEO will be willing to participate if monitoring costs are maximized, $\gamma V(q_H(m_H)) \geq 0$, and high enough such that $q_H(m_H) < 1$. (Only when $q_H(m_H) < 1$ will the union earn some positive payoff from raising m .)

The “hard” CEO’s participation constraint is

$$\frac{\gamma}{1+\gamma} \left(R - \frac{e}{q_H} - mq_H \right) \geq 0. \quad (\text{A4})$$

Substituting $q_H = \sqrt{e/m}$ from equation (10) into equation (A4), the maximum m , m_H , is given below:

$$m \leq \frac{R^2}{4e} = m_H \quad (\text{A5})$$

From equation (11), we know that the union only gets a strictly positive payoff when $q_H(m_H) < 1$. Let us substitute m_H in (A5) into $q_H < 1$ in (10). q_H is less than one when the following relationship holds:

$$R > 2e \quad (\text{A6})$$

This means that when revenues are large, relative to the minimum effort costs, the union can win rents by raising the marginal costs of monitoring slack effort. Otherwise, when rents are small, $R \leq 2\underline{e}$, then the union will weakly prefer to minimize monitoring costs.

This is what we wanted to show. *Q.E.D.*

5.4 Out of equilibrium solutions when $R > 2\underline{e}$ and $b > \bar{b}_S^*$

It is conceivable that a “soft” CEO cannot credibly promise the union members wages high enough to compensate them for their expected losses when control changes occur. This is because the “soft” CEO cannot pay union members wages that push the firm into bankruptcy. In this case, union members would maximize monitoring costs.

When $b > \bar{b}_S^*$ and $R/2 > \underline{e}$, let us denote the out-of-equilibrium values by the superscript b :

$$m_H^b = R^2 / 4\underline{e}$$

$$q_H^b = 2\underline{e} / R$$

$$R \geq w_H^b \geq R/2$$

$$W_H^b = 0$$

$$D_H^b = 0$$

$$V_H^b = 0$$

$$U_H^b = R/2 - \underline{e}$$

$$b_H^b \in (\bar{b}_S^*, 1]$$

A high probability that the “soft” CEO will be replaced by a “hard” CEO may generate the “bad” result for founding shareholders. These values are consistent with point H in figure 2. Namely, union members will always raise monitoring costs to the maximum. Workers would respond in this way because the expected benefits that a “soft” CEO can credibly promise are less than expected losses that the union will incur when a control change occurs. Therefore, in this model, a high probability of a control change may completely wipe out shareholder value. For this reason, founding shareholders will always partially entrench the manager in equilibrium, as in equation (15h), and get the higher expected payoff of $\frac{R/2}{1+\gamma}$, which is given in equation (14).

5.5 *Optimal capital structure with a “soft” CEO*

We assumed that union members in the fourth period could either accept the CEO’s wage offer or divide whatever surplus had not been committed to bondholders. If the union rejects the CEO’s offer, any remaining surplus in period four- a would be divided between shareholders and union members, according to the Nash bargaining solution. A “soft” CEO could always induce union members to accept her wage offer if she proposed to give them the entire uncommitted surplus. That is, if she sold bonds worth $D_S^* = V_S^*$ in the third period and distributed the proceeds to shareholders, then the “soft” CEO would want to offer the union a wage of w_S^* in the fourth period. The union would accept this offer because it would give union members the remaining surplus, U_S^* . Recall that default on bond covenants, by assumption, means that the entire surplus vanishes.

By assumption, the capital structure for the firm would be all equity in periods zero, one, and two. Then the firm could convert to all debt in period three. Given the “soft” CEO is retained, the total value in any given period would be $V_t = D_t + E_t$. The subscript “ t ” denotes value of the firm or security class at the end of a time period. At the end of period four- e , the securities are worthless because their cash flows have been distributed to their respective claimants. Note that payments (flows) are only made once. Yet, values of securities (stocks) only change when uncertainty is resolved (in period two) or those assets are exchanged for other securities or cash flows. For example, one exchange of securities that the “soft” CEO may choose is a debt-for-equity swap, where the equity was exchanged for debt worth $V_2 = E_2 = D_3 = V_3 = V_s^*$. This “optimal” capital structure is not unique. At the end of period three the firm could hold some equity along with some “hard,” non-postponable debt.

The CEO is allowed to make a wage offer to the union in period four- a . If it is accepted, then bargaining ends and production takes place. Yet, if the CEO’s wage offer is not accepted, the division of the surplus between equity holders and the union is agreed on in period four- a according to the Nash bargaining solution (NBS). Similar to Grout (1984), the NBS is assumed to take the following Cobb-Douglas form where union bargaining strength is indexed by a parameter $0 \leq \beta \leq 1$. β represents the union’s share of the joint surplus. U is the payoff to the union. E is the payoff to remaining equity holders in period four after the NBS is struck. The firm has unbreakable commitments to pay the “soft” CEO and bondholders at the end of period four. Therefore, $V - D = E = (1 + \gamma)^{-1}(R - w) - D$. $U = w - \underline{e}$. The NBS would satisfy:

$$\arg \max_w = [w - \underline{e}]^\beta \left[\frac{1}{1 + \gamma} (R - w) - D_s^* \right]^{1-\beta}$$

Let us denote the NBS wage with beta in the superscript. The NBS wage would be $w^\beta = \beta [R - D_s^* (1 + \gamma)] + (1 - \beta) \underline{e}$. Ideally, the “soft” CEO would like to offer a wage of $w_s^* = (R/2 - b_s^* \underline{e}) / (1 - b_s^*)$. Therefore, she would like to take on at least enough debt such that the union would weakly prefer to accept her wage offer w_s^* over getting the outcome of the NBS. Therefore, she must select some positive level of debt such that the inequality $(R/2 - b_s^* \underline{e}) / (1 - b_s^*) \geq \beta [R - D_s^* (1 + \gamma)] + (1 - \beta) \underline{e}$ is satisfied. If we interpret D as net-debt, then negative values of D mean that the firm holds more cash than debt. For very low levels of union bargaining strength, the “soft” CEO can afford to hold cash reserves in excess of borrowing. Rearranging, we see that the “soft” CEO will set debt levels to the following:

$$\frac{1}{1 + \gamma} \left((R - \underline{e}) - \frac{R/2 - \underline{e}}{1 - b_s^*} \right) \geq D_s^* \geq \frac{1}{1 + \gamma} \left((R - \underline{e}) - \frac{1}{\beta} \left(\frac{R/2 - \underline{e}}{1 - b_s^*} \right) \right) \quad (A7)$$

It is easy to see that when the union has all the bargaining power, $\beta = 1$, the “soft” CEO will choose to set levels of non-postponable debt to D_s^* . As before, $\{D_t, E_t\} = \{0, V_s^*\}$. Yet, at the end of period three the value of equity, or debt, could be between zero and the upper bound of D_s^* , depending on the union’s bargaining strength. Further, note that union bargaining strength only affects capital structure, but not the final division of surplus.