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HARD DEBT, SOFT CEO'S AND UNION RENTS

Linus Wilson

Manor Road Building, Oxford OX1 3UQ

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Linus Wilson [a]
Keble College
Oxford University
Oxford OX1 3PG
ENGLAND
+44 (0) 1865 272 770
linus.wilson@economics.oxford.ac.uk

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Abstract

Sometimes shareholders are better off delegating to a CEO with different objectives than their own. A top manager motivated to share surpluses with workers can encourage union members to adopt efficient production methods. Bond covenants may constrain managers from acquiescing to union wage demands. Nevertheless, we argue that unions can win higher wages by altering the non-shirking constraint. Resistance to monitoring leads to deadweight losses that a "soft" CEO can prevent. In this context, managerial retrenchment and incentive contracts with limited upsides are advocated.

1.   Introduction

Sometimes principals find it better to hand over control to an agent with different interests than their own. For example, Rogoff (1985) argues that society is better off delegating control of monetary policy to a central banker with objectives that diverge from social welfare. Moreover, sometimes a principal may give control to an agent who is unable to comply with the principal's wishes.   Almazan and Suarez (2003) show that shareholders may find it profitable to delegate the CEO replacement decision to a "weak" board that is unable to maximize profits *ex post*. Nevertheless, much of the effort within the financial agency literature has focused on aligning managers' interests with maximizing investor wealth.[1]

Our discussion here gives an example where shareholders can gain by appointing a top manager only partially concerned with value maximization. In some cases, the optimal CEO needs incentives to share surplus with the firm's unionized workforce. This "soft" CEO leads to the socially efficient solution. Alternatively, a "hard" CEO whose incentives are perfectly aligned with those of shareholders not only leads the firm to incur deadweight losses, but she may also destroy shareholder wealth *ex ante*.[2]

Much 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

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[1] For example, Jensen and Murphy (1990) assert that CEO compensation inadequately ties top manager incentives to shareholder returns. Schliefer and Vishny (1997) provide a partial review of the agency problems created by having professional managers control firms that are financed by outside investors.
[2] 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."

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.[3]

Nevertheless, the hold-up problem may not be an issue when investment opportunities are limited. Sometimes firms have extra-normal returns, but few good prospects for expansion. Jensen (1986), for example, discusses how many oil companies in the 1970's and 1980's had large cash flows, but they had few good investment outlets for their cash.

Here we consider a firm with a unionized workforce with free cash flow, but few investment opportunities. In this case, both the union and the firm's owners will be eager to hide this surplus from one another. Bond finance is a way of doing just that. Increasing leverage can tie managers' hands before they waste surpluses. In another context, Hart (1995, p. 129) and Hart and Moore (1995) emphasize how senior debt is a "hard" budget constraint, which managers cannot easily violate. One way shareholder value can be destroyed is when managers agree to union demands for above-market wages.

Here we argue that the union can alter the constraints faced by the firm and its managers before capital structure decisions have been undertaken. We assume that the firm must pay efficiency wages to counteract the moral hazard problems of its unionized employees, regardless of its debt constraints or the union's bargaining strength. In effect, the non-shirking wage is 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.

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[3] Baldwin (1983), Grout (1984), Ippolito (1985), Bronars and Deere (1991) and (1993), Perotti and Spier (1993), and Cavanaugh and Garen (1997) 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*.

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.

Because the firm's managers can transfer the gains from efficient monitoring technology to shareholders through pre-bargaining, debt-financed dividends or share buybacks, unions will want to raise the marginal cost of monitoring. Unions will want to foster an adversarial relationship and mistrust of management,[4] even if that means slack effort and certain bankruptcy. In that way, the reporting of lazy co-workers becomes unthinkable even when the financial situation of the firm is desperate.

Yet, if workers can trust managers to share the firm's rents, 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 (2003) principals adopt accounting systems that are easy to manipulate so that agents do not waste much effort rigging those schemes.

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. Dessí (2001) considers a variant of the hold-up problem where workers are sometimes not compensated for their efforts *ex post* if the firm holds risky debt.[5] In contrast to that paper and similar studies about firm-specific investments, in our discussion here workers are always compensated for their efforts. 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, depends on the union's *ex ante* beliefs about how much gains will be shared.

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[4] For example, the AFL-CIO regularly reports on CEO pay and executive scandals. See http://www.aflcio.org/corporateamerica/.

We assume that there are no problems with motivating managers. Residual claimants could give control to someone perfectly aligned with their *ex post* interests at little or no cost. Yet, we will find that shareholders are better off when they delegate to a manager whose interests are aligned with their *ex ante* but not *ex post* welfare.[6] Here the conflict stems from the fact that shareholders *ex ante* would like the union to behave in a way that minimizes monitoring costs, but *ex post* shareholders could gain by having managers "exploit" the union for being so cooperative.

This paper presents a sequential game. Table 1 summarizes its timing. The founding shareholders appoint a CEO of the all equity firm in period zero. They give this top manager an unalterable compensation package. If her compensation scheme is "soft," she will be entrenched. In period one, the union moves by altering monitoring costs. Then the manager sets debt payments in period two. In period three, the CEO gives the union a wage offer. If the union rejects that offer, the uncommitted surplus is divided between shareholders and union members by means of the Nash bargaining solution. Finally, in period four, workers decide individually whether or not to shirk or work productively. If they exert the minimum effort, production takes place, and they are paid their efficiency wages.

In section 2, we introduce an efficiency wage model, because at the last stage shirking must be prevented regardless of the type of CEO incentives that are adopted. In section 3, we consider the outcome of the game if the CEO incentive contract is

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[5] 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.

[6] Jensen and Meckling (1976) identify this conflict when shareholders would like to sell claims to bondholders for a high price *ex ante*, but they would like to induce managers to invest in speculative ventures *ex post*, appropriating some value from bondholders after the fact.

"hard." We find that the appointment of a "hard" manager is only a subgame perfect Nash equilibrium when the surplus is sufficiently small.

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 her payoff positively depends on the payoff of union members. In section 4, we consider how a "soft" incentive scheme maximizes value to shareholders. 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. Nevertheless, a "soft" CEO may want to hold some "hard" debt if the union is sufficiently strong.

Finally, in section 5, we consider what happens if there is some chance that the "soft" CEO will be removed. We demonstrate how hostile takeovers can cause share prices to rise even when they create no *ex post* value. Further, a high probability of hostile takeovers may make it impossible to convince workers to minimize costs in period 1.

Figure 1

period = 0	1	2	3	4
Founding shareholders give control to a CEO with "hard" or "soft" incentives.	The union chooses monitoring costs.	The CEO sets capital structure, choosing some combination of equity and debt.	• Either the union accepts CEO's wage offer, • or the Nash bargaining solution divides surplus between shareholders and union members.	•Production takes place. •Union members receive wages if they are not caught shirking. •Final dividends and coupons are issued to stockholders and bondholders, respectively.

2.   Efficiency wages

2.1   Production and market power

Here we will assume that there exists an incumbent monopoly union. The union supplies labor to a firm with market power. The firm earns extra-normal profits on the goods it sells. Therefore, there are rents over which to be fought.

Production and market conditions are as simple as possible so that in subsequent sections we can focus our attention on the firm's and the union's manipulation of the bankruptcy and non-shirking constraints, respectively. We will use the simple one-to-one production function below, where L is the number of workers employed:

$$f(L) \quad = \quad \begin{cases} L, \text{ when } e \geq \underline{e} \\ \\ 0, \text{ when } e < \underline{e} \end{cases} \qquad (1)$$

If workers do not exert effort greater than or equal to $\underline{e}$, then no output takes place.

Let us assume that the firm sells its product for a price, p. The firm maximizes revenues and profits by selling $f(L^*) = L^* = 1$ units of its product for a price, $p^* = R$. Therefore, total surplus is maximized when the size of the workforce is unity.

Workers must exert effort if any production will take place. This effort cost is $\underline{e}$. 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 $(p^* - \underline{e})L^*$ $= R - \underline{e}$.

Assumption

- *Economic rents are of size R – e > 0.*

- *Regardless of the split of economic rents, the workforce will be of size 1.*

2.2   Monitoring costs

Monitoring union members' effort is costly. Unions may either be resistant or open to monitoring. 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. Indeed, union members may actively attempt to hide their co-worker's indiscretions. On the other end of the spectrum, union members may reduce the cost of monitoring by actively reporting the slack efforts of co-workers to managers. Further, someone who does not "pull his weight" may face formal or, more likely, informal 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.

Let the total cost of monitoring be $(\mu + \eta)q$. Let q be the probability that shirking is detected. Further, $0 \leq q \leq 1$. μ and η are parameters where μ and $\eta > 0$. [7]

Suppose that union members bear some of these costs of monitoring. μq denotes the costs of evading or aiding monitoring, which are increasing in q. There may be some psychic cost of either aiding or hindering managers in policing

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[7] Earlier drafts considered the effect of a variety of cost functions on the non-shirking constraint and union rents. We found that only the marginal costs of monitoring were relevant to the CEO's choice of

productivity. Union members find it costly to aid (or hinder) monitoring efforts. ηq denotes the cost of monitoring directly borne by the firm. This may 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.

2.3   The non-shirking condition

We will present the efficiency wage model of Acemoglu and Newman (2002). We alter their static model by having workers bear some of the costs of monitoring, μq. Let us assume that all workers are risk-neutral with separable utility function below:

$$U = w - e - \mu\, q \tag{2}$$

U is utility; w is the wage; e is the effort expended; and μq are the costs of monitoring borne by each union member. Employees have outside opportunities or unemployment benefits that pay a wage of $\underline{w}$, which 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 $\underline{e}$

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detection probabilities, q. For ease of exposition, we have restricted our discussion to one where the

has no probability of dismissal. Moreover, let us assume that no one will quit. In equilibrium, no one will exert more effort than $\underline{e}$. Everyone not fired for shirking is paid at the end of the fourth period. The maximum expected benefits from working productively and never being fired for shirking is $w - \underline{e} - \mu q$. This must exceed the expected benefits of shirking, $(1 - q)(w - \mu q)$. (Recall that if someone is fired their wage is 0.) This leads us to the following non-shirking condition (NSC):

$$\text{NSC} \qquad w \geq \frac{\underline{e}}{q} + \mu q \qquad\qquad (3)$$

Therefore, the worker must be fully compensated for his "contribution" to the costs of monitoring, μq, when the firm pays the minimum NSC. Further, all $L^* = 1$ workers will work productively when the NSC is paid.

3. Splitting rents with a "hard" manager

In the previous section, we considered what efficiency wages needed to be paid in the last stage of the game for production to take place. Efficiency wages are the lower bound of any wage settlement. The union can always expect to get paid efficiency wages. In this section, we will consider the optimum choice of debt and equity for a "hard" CEO who always acts to maximize the firm's value. We will find that such a CEO will behave opportunistically and minimize efficiency wages. For this reason, union members will maximize the marginal costs of monitoring when the surplus is sufficiently large. This activity will lead to substantial deadweight losses and will cause the firm's value to fall to zero.

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union only affects the marginal costs of monitoring.

3.1 "Hard" CEO compensation

In this dynamic game, the union moves before the CEO sets capital structure. Therefore, the union will solve for the "hard" CEO's optimal detection probability for a given level of monitoring costs. In this section, we discuss the second stage of the game where the "hard" CEO sets a financial structure. We will assume that managers' sole objective is to maximize shareholder value. We find that managers will set (risk-less) debt constraints to the maximum level given the non-shirking condition is satisfied. In section 4, we will discuss the optimal capital structure for the "soft" CEO.

Definition ("hard" CEO)

A top manager is "hard" if her incentives motivate her to maximize the value of the firm. Further, in every stage of the game her actions are unconstrained. The "hard" CEO cannot commit to act in a way that does not satisfy her objective of increasing her compensation. Further, the "hard" CEO's wage is observed by all players.

Let π be the profit obtained from production in the final period. The total value, V, of the firm is the profits collected in this fourth period.[8] Suppose that the firm is made up of two securities, non-postponable debt, D, and equity, E. $V = D + E$.

Suppose that the "hard" CEO was paid the following wage, ω^H:

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[8] There is no conflict between maximizing the value of the firm and maximizing shareholder value as modeled.

$$\omega^H = \underline{\omega} + \gamma\, V, \qquad \text{where } \gamma > 0$$

γ could be arbitrarily small. Further, her outside option wage is $\underline{\omega} = 0$. These assumptions are not necessary but they simplify the equations somewhat when we talk about the division of the surplus. The present paper is not concerned about how much the CEO is paid. Instead, we discuss top management incentives in the context of the division of rents between the union and the firm's original owners. In essence, the "hard" CEO has incentives to maximize shareholder value, but the cost of retaining her is so trivial that we need not factor her wage into our division of rents. Jensen and Murphy (1990) point out that very low levels of performance compensation are necessary if it takes little effort to take the appropriate course of action. Indeed, here we have assumed that the CEO can do her job without effort.

3.2   Splitting the pie

The NSC in (3) can be considered the minimum wage at which labor is supplied (at least, in this case, the minimum wage necessary for productive labor). Nevertheless, because labor is organized, there can be a range of possible settlements. The price multiplied by the marginal product of labor is the maximum wage that the firm will pay for labor. This is simply R. Nevertheless, some revenues must pay for the direct costs of monitoring, ηq, incurred by the firm. Therefore, the set of possible wage bargaining outcomes is the following:

$$w \in \left[\frac{\underline{e}}{q} + \mu\, q,\ R - \eta\, q \right] \qquad (4)$$

In the first-best for the firm, when the NSC binds, the union is hurt by the precision of the monitoring technology employed. This is because q lowers the union members' utility. Monitoring costs are increasing in q. Combining (2) and (4) it is clear that the minimum payoff to the union is declining in the shirking detection rate, q. The maximum payoff is a function of the size of the surplus, which is declining in the total monitoring costs.

$$U \in \left[\frac{\underline{e}\,(1-q)}{q},\ R - \underline{e} - (\mu + \eta)q \right] \tag{5}$$

When the minimum non-shirking wage is paid, the firm will choose the detection probability, q, to minimize total costs.

$$\underset{q}{\arg\min}\, c(q) = \frac{\underline{e}}{q} + (\mu + \eta)\, q \tag{6}$$

Recall that μ is the marginal cost of "evasion," which goes directly into the union members' objective functions. Likewise, η is the marginal cost that the firm pays to monitor evasion.

It is easy to verify that the second order condition is positive. Therefore, this function can be minimized, and thus profits can be maximized for some level of monitoring which we will denote q^H—the "hard" CEO's optimum.

$$q^H = \min\left[\sqrt{\frac{\underline{e}}{\mu + \eta}},\ 1 \right] \tag{7}$$

Note that the detection probability, q, cannot exceed 1. Therefore, for very low levels of marginal monitoring costs, $\mu + \eta < \underline{e}$, all shirkers will be detected with certainty.

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(This corner solution will be more important as we discuss the union's choice of monitoring costs, μ and η.)

With bond finance, the firm can ensure that it pays the minimum NSC wage, maximizes profit, and returns the maximum value to shareholders.

Assumption

Let us 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 $\underline{w} = 0$.[9]

Let us recall the timing of the game. In period 0, a "hard" or "soft" CEO is selected. Then, the union selects the monitoring cost function. In period 2, the CEO selects financial structure. In period 3, the union has the opportunity to divide the remaining net profits (after interest payments) with shareholders. The "hard" CEO will always want to avoid dividing the remaining profits in the third period. She can avoid that outcome by issuing a pre-bargaining, debt-financed dividend in period 2.

The optimal debt policy involves setting the coupon of the bond equal to the present value of profits in the final period. Suppose that the periodic interest rate is $r = 0$. Therefore, the maximum present value bond in all periods is $D = \pi(q^H)$. That is, the debt can be worth no more than the maximum possible profits. Then the value of

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[9]   We have assumed that bankruptcy means complete 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 if there are no special costs associated with bankruptcy reorganization.

Further, default on debt obligations rarely leads to complete, immediate shutdown. It is very common for firms to continue operating under bankruptcy relief. Moreover, a filing of bankruptcy, especially under United States Chapter 11, does not even mean the firm inevitably will shut down.

Bronars and Deere (1991) point out that for 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. Weiss (1990),

the bond is dispersed to shareholders in period 2 by way of a pre-bargaining, debt-financed dividend, share buy-back, or debt-for-equity swap.[10] In this way, no surplus would remain over which the union can bargain with shareholders.

Proposition (dividend timing)

It is essential that the proceeds of the bond are distributed to shareholders prior to negotiations. Otherwise, the bond is irrelevant.

This is easy to verify by contradiction. Consider the situation where the firm just invested D and earned a gross return of $(1 + r) D = D$. Therefore, bondholders would be paid regardless of whether a settlement is reached with the union. Therefore, any wage settlement in equation (4) would guarantee the firm's solvency. The bond neither adds to nor detracts from the negotiating position of the firm. If the money is accessible, then it can be used to pay back bondholders and does not reduce the potential pie over which to be bargained.

Suppose that, instead, the firm gave an arbitrarily small dividend, δ. Then the firm would be short δ when it came time to pay bondholders. Then, the firm would default. In that case, delay would cause the entire pie to vanish under our assumptions. Therefore, the union would at least want to accept a contract with wage equal to $R - \delta - \eta\, q^*$, where q^* is the minimum level of q such that the NSC is satisfied. Otherwise, the firm would be in default. Since q^H, by definition maximizes the size of the debt D, it is the only q that could be chosen that satisfies both the NSC

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for example, estimates that the costs of bankruptcy are approximately 3 percent of book assets and 20 percent of market value of equity a year prior to a bankruptcy filing.

[10] Amaro de Matos (2001, p. 97) points out that share buybacks became the dominant form of payout to shareholders in the United States during the late 1990's. This trend may have been driven by the tax treatment of dividend earnings versus capital gains earnings. A pre-bargaining share buyback would

and will prevent bankruptcy when D is distributed to the founding shareholders. It is

not hard to see that the firm would be able to credibly commit to its first best

detection probability, q^H, if it gave all of D to shareholders prior to negotiations.

Q.E.D.

Note that with debt, the "hard" CEO chooses q^H. Final period profit and,

thus, the value of the debt is reduced by $c(q^H)$. Because the proceeds from the sale of

bonds are distributed to the founding shareholders, if there is a monitoring cost, it is

entirely borne by the firm's original owners.

The minimum efficiency wage is paid when the bond is maximized. Union

members' utility is unaffected by monitoring costs because they are fully

compensated for these costs in the NSC. In this case, from (3), utility is merely the

following:

$$U = \frac{\underline{e}\,(1 - q^H)}{q^H} \geq 0, \tag{8}$$

where $0 \leq q \leq 1$.

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

constraint.

3.3   The union's choice of monitoring costs

We depart from much of the literature concerning the strategic use of debt in

this section. In many models of strategic debt, unions have been modeled as either

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have essentially the same effect in our context, if all founding shareholders sold their shares, giving the
surplus to shareholders and "hiding" it from the union.

passive players in the game of pre-commitment, or eager to constrain themselves from earning excessive rents. In Bronars and Deere (1991), for example, the union decides to form after debt commitments have been made. Alternatively, it is argued that unions are sometimes better off taking less *ex post* surplus, Grout (1984), Ulph (1989), and Skåtun (1997). The union's bargaining power could lead to inefficiently low investment in these latter studies. On the other hand, here the pre-bargaining commitments are attempts to capture free cash flow and not pay for new investment. Therefore, when the purchase of strategic debt only reduces union members' rents, as in the case of free cash flow, without increasing the size of the pie, as in the case where there are new investment opportunities, we should expect the union to be more likely to actively oppose the sale of new debt. Here we show that, given the surplus is sufficiently large, the union, regardless of its bargaining power, can increase its members' rents by raising the costs of monitoring.

In the last section, we computed the "hard" CEO's problem in the second period of the game. Now, we will consider the first period of the game where the union chooses the marginal costs of monitoring, given that a "hard" CEO has been selected. We find that the union will prefer a high marginal cost technology, even when costless technologies are available.

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 in period 4.

Recall that when monitoring costs are sufficiently high, $q^H < 1$, q^H is strictly falling in the marginal costs of monitoring, $\mu + \eta$. Let $m = \mu + \eta$.

$$\left.\frac{\partial q}{\partial m}\right|_{q^H < 1} = -\frac{\sqrt{e}}{2m^{3/2}} < 0$$

Below, we substitute in $m = \mu + \eta$ and $q^H < 1$ into the union members' objective function.

$$U = \sqrt{\underline{e}m} - \underline{e} \geq 0, \tag{9}$$

when $q^H < 1$.

$$\left.\frac{\partial U}{\partial m}\right|_{q^H < 1} = \frac{1}{2}\sqrt{\frac{e}{m}} > 0 \tag{10}$$

Likewise, where $m = \mu + \eta > \underline{e}$, we can see from (10) 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^U denote the union's optimal choice of total 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—$\pi(q^H[m^U]) = 0$.

Proposition (maximum costs)

Given $q^H(m^U) < 1$, the union will choose the highest cost monitoring technology such that the firm will earn at least zero profits.

This follows from (10).

Further, note that the union will never choose monitoring costs in which the "hard" CEO cannot at least have the firm earn zero profits. That would lead the "hard" CEO to take up reservation employment since her wage, ω, would be worth less than her outside option, $\underline{\omega} = 0$. (Further, it is not clear how the firm could find working capital to operate under those circumstances.)

Lemma ($q^H = 1$)

Suppose that the probability of detection is unity, $q^H = 1$, for all levels of marginal monitoring costs, $m \geq 0$, in which profits are non-negative. In this case, the union will be indifferent between selecting $m^U = 0$ or any other values of $m > 0$ for which the non-negative profit constraint, $\pi(q^H(m) = 1) \geq 0$, is satisfied.

The union earns rents by making the "hard" CEO willing to accept a $q^H < 1$ in exchange for lower total monitoring costs, $q^H m^U$. If $q^H = 1$, or $\underline{e} > \mu + \eta = m$, for all levels of monitoring costs in which profits are non-negative, then the union gains nothing by resisting detection. Allowing some notation abuse, union members' wages will be simply $w(q^H = 1) = \underline{e}$, and their payoff will be $U = 0$, regardless of the monitoring costs they choose.[11] *Q.E.D.*

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[11] Earlier versions of this paper used the 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) and the continuous time version of Acemoglu and Newman (2002) interpret the

Assumption

The union will minimize costs when it is weakly in its interests to do so.

This saves us the notational burdens of always giving the union strict preferences to act in a way that minimizes costs. Closely related to this assumption and the previous lemma is the following: [12]

Lemma (SPE of "hard" CEO)

It is a subgame perfect Nash equilibrium (SPE) to appoint a "hard" CEO when rents are sufficiently small such that $q^H(m^U) = 1$. In this case, the firm's value is $R - \underline{e}$, and union members receive a utility payoff of zero.

Recall that when there existed no $m > \underline{e}$ such that profits were non-negative, $q^H(m^U) = 1$. This follows from equation (7). Since the union earns no rents when $q = 1$, equation (8), it will weakly prefer to minimize monitoring costs. By our assumption above, it will always do so. Only $\underline{e}$ needs to be left to pay union members to prevent shirking. In that case $w = \underline{e}$, and $U = 0$. Therefore, what little rents there are to be fought over can be captured by the "hard" CEO who pushes debt to the maximum, $D = R - \underline{e}$, in period two. Therefore, founding shareholders will always weakly want to give her "hard" incentives in period 0. *Q.E.D.*

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parameter of detection technology, q, as a rate. Therefore, q can take on any non-negative value. One of the nice features of the q being unconstrained over the interval $[0, \P)$ was that we would not have this corner solution. The union would always select positive levels of monitoring costs and drive profits to zero. With such a game, it would never be a subgame perfect Nash equilibrium to appoint the hard CEO.

[12] In dynamic games where each players' moves and payoffs are known with certainty by all the other players, Gibbons (1992, p. 56) asserts that the appropriate solution concept is the subgame perfect Nash equilibrium (SPE). Once we move past the moral hazard (hidden action) problems in period 4, the union and the firm are playing a game where actions and payoffs are publicly known.

Note that the cost that union members incur to evade or aid monitoring, μ, is a perfect substitute for the marginal cost incurred directly by the firm, η. That leads us to the following lemma:

Lemma (μ vs. η)

For the purposes of rent-seeking, the union will be indifferent to whether the marginal monitoring costs are initially incurred by its members, μ, or by the firm, η. In the end, all monitoring costs are borne by the firm, and union members are totally compensated for any costs incurred.

μ and η are perfect substitutes from the union's point of view. This follows from differentiating (9) with respect to μ or η and noting that utility is increasing at the same rate for a given total level of marginal monitoring costs m. *Q.E.D.*

Consider where $q^H(m^U) < 1$.

$$\pi\left[q^H\left(m^U\right)\right] = R - 2\sqrt{\underline{e}\, m^U} = 0, \quad \text{when } q^H\left(m^U\right) < 1 \tag{11}$$

Suppose that $m^U > \underline{e}$. It is easy to show by substituting in m^U in (10) for $(\mu + \eta)$ in (8) that utility, $U[q^H(m^U)]$, is maximized at $R/2 - \underline{e} \geq 0$. (Note that when $m^U < \underline{e}$, $R/2 < \underline{e}$, and union members cannot earn rents from this strategy. For this reason, appointment of the "hard" CEO is a SPE of the game when $m^U < \underline{e}$.) Recall that the union and the "hard" CEO were vying for a pie of size $R - \underline{e}$. Since the union leaves no surplus for shareholders after it chooses monitoring costs, over one-half of the surplus has been wasted through the costly monitoring technology! Namely, the

deadweight loss is $R/2$. This "wasteful" behavior is a response to the firm's ability to appropriate any cost savings that the union adopts through debt-financed dividends.

Lemma (union rents)

When $q^H(m^U) < 1$ and a "hard" CEO is appointed, the union would receive rents of $R/2 - \underline{e}$. This means that over half the surplus would be dissipated in monitoring costs. Namely, deadweight losses would be $R/2$. Nevertheless, this outcome is not a subgame perfect Nash equilibrium (SPE) of the game.

This is not an equilibrium because, as we will see in the next section, founding shareholders could win some rents by appointing a "soft" CEO committed to give union members at least $R/2 - \underline{e}$. Namely, founding shareholders could receive rents as large as the deadweight losses if they could endow the CEO with the correct incentives.

The problem here is that, if the union would choose a costless monitoring technology, then the "hard" CEO would respond by setting debt levels so high that production would be only feasible if $q = 1$. This follows from equation (10). For their cost cutting, union members would receive the meager payment of $\underline{e}$ and utility of zero, ceding all rents to shareholders.

This incentive to commit to a high marginal cost monitoring technology may explain some common features of unionized workplaces. For example, grievance procedures and subsidized or free legal counsel for disciplined workers may raise the cost of firing slacking employees. Union members are often distrustful of managers and very hesitant to aid in detection efforts. Indeed, a worker who reports slack effort to non-union supervisors may pay some heavy psychic penalties. (Those penalties are

likely to be levied by fellow union members!) Therefore, the adversarial culture of unionized workplaces can be seen as a pre-commitment to raise the monitoring costs of shirking.

The union will adopt inefficient technology not only because the gains from efficient technology can be appropriated by the firm, but also because those efficiency gains lower the surplus accruing to union members.
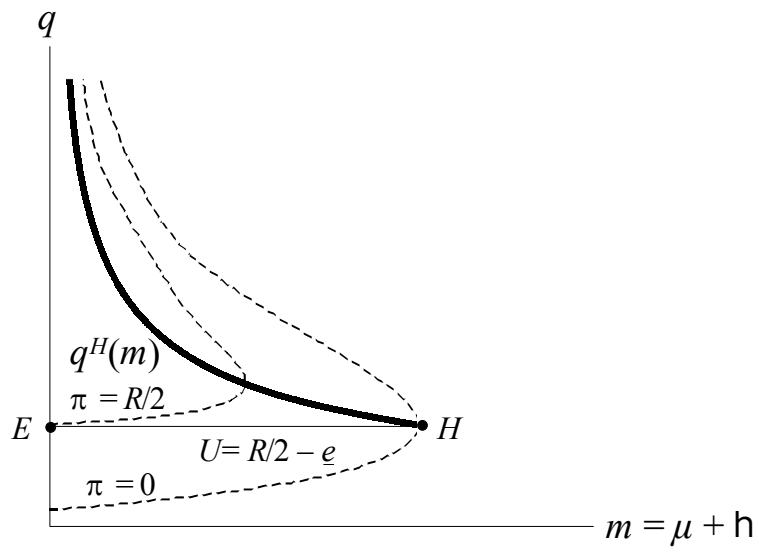
Figure 2 represents this game graphically. This diagram shows the isoprofit curves for the firm—the thin dashed lines. The thin horizontal line, the union's indifference curve, represents all combinations of m and q where utility is $R/2 - \underline{e}$. Moreover, the thick black curve is the firm's reaction function, $q^H(m)$. It is the firm'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.

The union always prefers lower detection probabilities because its members' rents are derived through the non-shirking condition, which 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 utility indifference curve, $U = R/2 - \underline{e}$, intersects the firm's reaction function at the 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.

Note that point E with zero monitoring costs would lead to an efficient split of the surplus and no deadweight losses. Nevertheless, this point is not strategically stable since it does not lie on the firm's reaction function. Therefore, the union could only win the payoff of one-half if it chose a marginal monitoring cost, m^U, not labeled, lying on the firm's reaction function at the strategically stable point labeled H. In the next section, we will see that the "soft" CEO can achieve the efficient split at

point E. Because founding shareholders can appoint a "soft" CEO, we will see that E will be the subgame perfect Nash equilibrium when $m^U > \underline{e}$.

Figure 2

q

$q^H(m)$

$\pi = R/2$

E

$U = R/2 - \underline{e}$

H

$\pi = 0$

$m = \mu + h$

4. The efficient solution: a "soft" CEO

4.1 "Soft" CEO compensation

We have assumed that managers attempt to maximize the firm's value though capital structure. Yet, their efforts will destroy value when the union is able to manipulate monitoring costs. Therefore, shareholders may be better off delegating to a manager who union members could trust not to hide surpluses with financial manipulations.

Dessí (2001) finds that when job-specific investments are made by workers, managers should sometimes only have "low-powered incentives" so that they will want to honor those implicit contracts *ex post*. Low-powered incentives mean that managers are only penalized for poor performance. Yet, that paper finds that if cash flows are large and unlikely to fall below the threshold necessary to compensate workers for their efforts, then manager's incentives should be "high-powered" or closely aligned with shareholder value.

Nevertheless, we have found that even when default risk is nil and cash flows are high, top managers may need some sort of low-powered or "soft" incentives. This need for "low-powered" incentives stems from the union's ability to manipulate what constitutes compensation for their efforts. Otherwise, the union rightly will fear that surpluses will be transferred to shareholders *ex post,* if workers commit to low or zero marginal monitoring costs *ex ante*. We argue below that total surplus can be maximized and the firm's value to its owners can be increased when $q^H(m^U) < 1$, if

control of the firm can be delegated to a manager with the correct incentive scheme—a "soft" one.

Definition ("soft" CEO)

A "soft" CEO is a top manager who has control of the firm. The "soft" CEO has incentives that diverge from maximization of shareholder value in some stages of the game. Her payoff is her wage, which is public knowledge. Further, the "soft" CEO is entrenched, and this manager's control cannot be removed until the end of the game.

Finally, recall that we assumed that, if the union is indifferent between raising monitoring costs to the maximum or setting monitoring costs to zero, then the union will set $m = 0$.

Proposition ("soft" CEO compensation)

Consider a firm where $q^H(m^U) < 1$. Suppose that there exists a costless monitoring technology, which the union can adopt. Further, suppose that founding shareholders can delegate control to a "soft" CEO who is entrenched. There exists a compensation scheme for the "soft" CEO such that the union will be indifferent between either minimizing monitoring costs and accepting her wage offer or maximizing monitoring costs in period 1.

Let ω^S be the "soft" manager's wage. Further let us suppose that the union's objectives and bargaining power are publicly known. Let $\underline{\omega}$ be the manager's payoff

if she does not accept the employment contract with the firm. (Let $\underline{\omega} = 0$ so that we can devise a virtually costless compensation scheme.)

All we need to do to prove the proposition on "soft" CEO compensation is to give an example of a compensation scheme in which the manager will prefer to give union members rents of $R/2 - \underline{e}$. Below is such an example:

$$\omega^S = \underline{\omega} + \alpha \; [min(V, R/2) - max(V - R/2, 0)] \tag{12}$$

Suppose that $\alpha > 0$, but α can be arbitrarily small. With this scheme, the manager never has an incentive to capture the union's share of the surplus *ex post*. She would always strictly prefer to give the union a wage $w^S = R/2$ and not a penny more. Since costs are zero, the union's payoff, or utility, is $U^S = R/2 - \underline{e}$.

This is exactly the payoff that the union could gain by raising monitoring costs to the maximum. In that case, a CEO with "soft" incentives in (12) would behave exactly like a CEO with hard incentives. There is no remaining surplus to hide so $D = 0$. In the third period they would offer a wage $w^H = w^S = R/2$ to prevent shirking in the final period when $m = m^U$.

We must assume that soft managers are entrenched.   That is, there is no risk that managers can be replaced by firing or hostile takeover. There would be an opportunity to co-opt bargaining if shareholders could have a new manager sell off the entire surplus, $R - \underline{e}$, *ex post* to bondholders when $m = 0$. That would lead us to the initial problem where the firm was unable to save any rents for shareholders because of its inability to commit.

For the above reasons and the indifference assumption, the union will choose zero monitoring costs when there is a "soft" CEO. The non-shirking condition can be

trivially satisfied since it is costless to make detection perfect. $q = 1$, when $m = 0$.

Q.E.D.

Lemma (SPE of "soft" CEO)

Because the "soft" CEO can induce union members to minimize monitoring costs (m = 0), it is a subgame perfect Nash equilibrium that founding shareholders will appoint a "soft" CEO when $q^H(m^U) < 1$.

This follows from the proposition and our discussion above. Suppose that rents are large enough such that $q^H(m^U) < 1$. If founding shareholders appointed a "soft" CEO, their payoff would be $\pi^S = R - w^S = R/2$. If they appointed a "hard" CEO their payoff would be zero. The "soft" CEO is the obvious choice. *Q.E.D.*

Recall that profit in the fourth period is the firm's value $\pi^S = V^S = R/2$.

Lemma ($V^S = R/2$)

When the appointment of the "soft" CEO is the subgame perfect Nash equilibrium of the game, the firm's value will be $V^S = R/2$.

Recent empirical work by DiNardo, Hallock, and Pischke (2000), concerning the relationship between managerial pay, efficiency wages, and unions, seems broadly consistent with our results here. They find that CEO pay is significantly lower in unionized firms. We have said nothing about the levels of CEO compensation needed to create the correct incentives for top managers. Yet, if "soft" incentives are associated with lower absolute levels of pay for CEO's, then we would expect CEO compensation would be lower in unionized firms.

Further, DiNardo, Hallock, and Pischke (2000) find that there are fewer managers per employee in heavily unionized industries. Our discussion is consistent with this observation. In the subgame perfect Nash equilibrium of the game that we have explored here, the union will minimize monitoring costs. Since we argued that the union receives rents of $R/2 - \underline{e} > 0$ when the surplus is sufficiently large, then union members wages are higher than the wages of a non-unionized workforce. No resistance to monitoring and higher unionized wages are consistent with the need for fewer supervisory managers to satisfy the non-shirking constraint.

4.2   Optimal capital structure with a "soft" CEO

We assumed that union members in the third 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 the third period 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 $D = R/2$ in the second period and distributed the proceeds to shareholders, then the "soft" CEO would want to offer the union a wage of $w^S = R/2$ in the third period. The union would accept this offer because it would give union members all the remaining surplus, $R/2 - \underline{e}$. Recall that default, by assumption, means that the entire surplus vanishes.

By assumption, the capital structure for the firm would be all equity in periods zero and one. Then the firm would convert to all debt in period two and stay that way in periods three and four. The total value in any given period would be $V^S = D + E =$

$R/2$. The subscripts denote the value of the security in a given set of time periods where $t = \{0, 1\}$ and $T = \{2, 3, 4\}$. The following vector represents the value of the securities over time: $\{D_t, D_T, E_t, E_T\}=\{0, R/2, R/2, 0\}$.

This "optimal" capital structure is not unique. In periods two, three, and four the firm could hold "hard," non-postponable debt based on the bargaining strength, β, of the union.

Surplus is divided 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. Let profits less interest payments be defined as net profits, N. In the third period, after debt has been issued, N is the payoff to remaining shareholders. Therefore, $N = R - w - D_T$. $U = w - \underline{e}$. The NBS would satisfy:

$$\underset{w}{argmax} \qquad U^{\beta} N^{1-\beta} = [w - \underline{e}]^{\beta} [R - w - D_T]^{1-\beta},$$

The constraints, $N \geq 0$, and $w(1) \geq \underline{e}$, are both slack.

The NBS wage would be $w = \beta (R - D_T) + (1 - \beta) \underline{e}$. Ideally the "soft" CEO would like to offer a wage of $w^S = R/2$. 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, $R/2 \geq \beta (R - D_T) + (1 - \beta) \underline{e}$. Let us assume that the firm cannot sell bonds with a negative face value. Rearranging, we see that the "soft" CEO will set debt levels to the following:

$$\frac{R}{2} \geq D_T \geq \max\left[0, R\left(1 - \frac{1}{2\beta}\right) + \underline{e}\left(\frac{1-\beta}{\beta}\right)\right] \qquad (13)$$

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 $D_T = R/2$. As before, $\{D_t, E_t\} = \{0, R/2\}$. Yet, in periods two, three, and four the value of equity, or debt, could be between zero and $R/2$, depending on the union's bargaining strength and given that the total value of the firm is always $R/2$.

Figure 3 represents the split of surplus and range of debt and equity choices. The vertical axis measures total surplus $R - \underline{e}$. The horizontal axis represents union bargaining strength, $1 \geq \beta \geq 0$. When rents are sufficiently large, the union always receives rents of $R/2 - \underline{e}$—the vertical distance of region X—regardless of its bargaining strength.

When there is a "hard" CEO and rents are sufficiently large such that $q^H(m^U) < 1$, the deadweight losses are represented by the vertical distance of the regions $Y + Z$. Nevertheless, this outcome is not an equilibrium of the game. A "hard" CEO is only appointed if $q^H(m^U) = 1$.
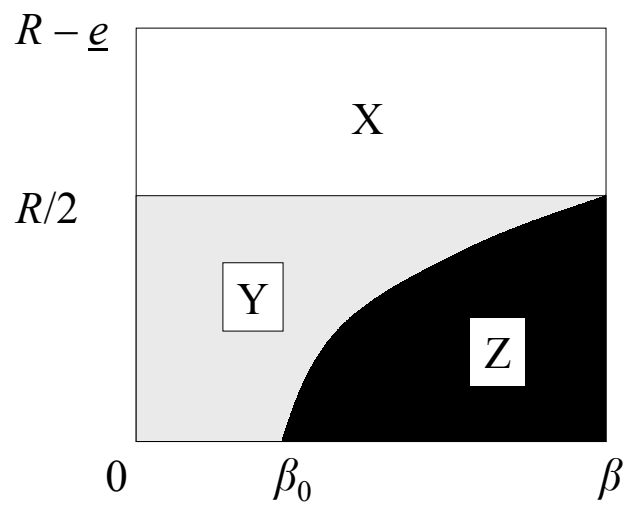
When $R/2 - \underline{e} > 0$, the subgame perfect Nash equilibrium of this game is that the "soft" CEO will be appointed in period zero. She can maximize the value of the firm and enact the efficient solution where no surplus is wasted. She can swap all the equity for "hard" debt in period two, and the firm's value will be $R/2$. The gray region Y is the maximum amount of equity she can retain in the later periods of the game $T = \{2, 3, 4\}$ for a given union bargaining strength. For "strong" unions where the index of bargaining strength is greater than $\beta_0 = (R/2 - \underline{e})/(R - \underline{e})$, it will be necessary to hold some senior debt to maximize the value of the firm at $R/2$. The minimum value of bonds, D_T, that the "soft" CEO will retain for a given level of union bargaining strength is given by the black region, which is labeled by Z.

Therefore, the union's bargaining strength only affects capital structure and not the value of the firm.

Lemma (debt with a "soft" CEO)

When union bargaining strength $\beta < 1$, there is no unique mix of debt and equity that maximizes the firm's value. Nevertheless, the soft CEO will never issue bonds worth more than R/2. In addition, in order to maximize the firm's value at R/2, the "soft" CEO will have to issue some debt in period two when the index of union bargaining strength is sufficiently high, or $\beta > (R/2 - e)/(R - \underline{e})$.

      This follows from our discussion above and equation (13).

Figure 3

5. Hostile takeovers

Up until now we have assumed that the "soft" CEO will get to remain until the end of the game with 100 percent certainty. If we perturb this assumption slightly, it becomes clear that hostile takeovers can cause share prices to rise *ex post* even though they do not create any *ex ante* value.

Suppose that a hostile bidder will be able to unseat the "soft" CEO between periods one and two. Let there be a $b *100$ percent probability that the hostile bidder will succeed and give control to a "hard," shareholder-value-maximizing, CEO, where $0 \leq b \leq 1$. Let us assume that this bid occurs in period 1½. Recall that in period one, union members commit to a level of monitoring costs. In period two, the CEO alters capital structure. In essence, the union is unsure about the payoffs of the CEO that it is playing against. To induce union members to minimize costs, given there is a $b *100$ percent chance of a hostile bid succeeding, a "soft" CEO must be committed to give union members utility of $(R/2 - \underline{e})/(1 - b)$. (Recall that a soft CEO is only appointed when rents are large enough that $R/2 - \underline{e} > 0$.) Let V^{Sb} be the value of the firm in periods $T = \{2, 3, 4\}$ when the "soft" CEO is retained, and there was an exogenous probability, b, of a hostile bidder taking control in period 1½.

$$V^{Sb} = (R - \underline{e}) - \frac{R/2 - \underline{e}}{1 - b} < \frac{R}{2}, \qquad \text{when } 1 \geq b > 0. \qquad (14)$$

If the hostile bidder succeeds, the value of the firm in $T = \{2, 3, 4\}$ is $V^{Hb} = R - \underline{e}$. In this case, the newly installed "hard" CEO will not share any of the rents with the workers. Therefore, $(1 - b) V^{Sb} + b V^{Hb} = R/2$:

$$\left((R - \underline{e}) - \frac{R/2 - \underline{e}}{1 - b} \right)(1 - b) + (R - \underline{e})\, b = \frac{R}{2}$$

Therefore, the *ex ante* value of the firm is unchanged by the presence of a hostile bidder.[13] Suppose there is only one share and that the current value of the all equity firm is its share price. When it becomes apparent that the hostile bid succeeds, in period 1½, the share price should rise from $R/2$ to $R - \underline{e}$. Likewise, when it becomes apparent that the "soft" CEO will be retained, the share price will fall from $R/2$ to the value given by the left hand side of equation (14). Therefore, a rising share price does not prove that a hostile bid creates value.   Alternatively, share price drops after the announcement of anti-takeover devices do not necessarily mean that those measures are destroying *ex ante* value.

Moreover, if one inspects (14) it becomes clear that the credibility of the "soft" CEO's promise to workers will come into question when b becomes large. The "soft" CEO will have to promise to drive the firm into negative profits in the last period if the b becomes too high. This occurs when

$$b > \frac{R/2}{R - \underline{e}}.$$

Since $R/2 > \underline{e}$ when a soft CEO is appointed, note that $½ < (R/2)/(R - \underline{e}) < 1$.

Therefore, unless the founding shareholders can devise some way that the "soft" CEO can pay out more surplus to workers than the firm generates, a high exogenous probability that the "soft" CEO will be replaced by a "hard" CEO may generate the bad equilibrium. Namely, union members will always raise monitoring

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[13] Suppose that hostile bids are costly, but profitable. Then *ex ante* shareholder surplus will be strictly destroyed by the potential of successful takeovers by hard CEO's. Further, if we assumed that employees were risk-averse, the possibility of a hostile bid would destroy shareholder value *ex ante* for

costs to the maximum. Workers 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 hostile bid succeeds. Therefore, in our model, a high probability of a hostile bid may completely wipe out shareholder value.

6.   Conclusion

In this paper, we explore a situation where shareholder value is preserved *ex ante* by a manager who takes actions that seem wasteful *ex post*. Hostile takeovers, top management reshufflings, and debt workouts may create value *ex post*. Yet, they may lead to poor labor relations and inefficiencies, which destroy shareholder value *ex ante*.

In our discussion here, high levels of debt can hide surpluses from a union after the union has acted to minimize monitoring costs. The *ex ante* potential for financial manipulations may sour labor relations, limiting the size of *ex post* surpluses. Along these lines we give some justification for top managers to have incentives to share surpluses with a rent-seeking union. Moreover, this gives a justification for top management contracts with limited upside potential and some degree of retrenchment protection.

This paper attempts to address a gap in the literature concerning the pre-commitment strategies of a rent-seeking union. The ability of a profit-maximizing firm to constrain its management with debt commitments when bargaining with unions has been well established. (See footnote 3 for some references.)

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any positive probability of a bid, *b*. Yet, in both cases, hostile bidders may increase share prices *ex post*.

Alternatively, we see here that the non-shirking constraint can be a means of commitment for a union prior to negotiations.

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 move first by committing to a costly monitoring technology, 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 may be in the best position to preserve shareholder wealth.

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