Bargaining with a Shared Interest:
The Impact of Employee Stock Ownership Plans on Labor Disputes*

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Abstract

Bargaining often occurs between parties with some shared interest. Partnerships, joint ventures and cross-ownership are examples. We extend standard bargaining models to allow for joint ownership. Joint ownership reduces costly bargaining disputes, as bargainers' interests are more aligned. We then test the theory with collective bargaining data, where employee stock ownership plans (ESOPs) are the source of joint ownership. The theory predicts that ESOPs will lead to a reduction in strike incidence and the fraction of labor disputes that involve a strike. Consistent with improved bargaining efficiency, we find that the announcement of a union ESOP is from 33 to 86 percent larger than the announcement of a nonunion ESOP.

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Bargaining often occurs between parties with at least some shared interest. Examples include partnerships, joint ventures, cross-ownership, profit sharing and household bargaining. Yet standard bargaining models ignore the variety of ownership structures seen in practice. This paper extends the standard bargaining models to allow for joint ownership. In the standard theory, costly bargaining disputes arise from incomplete information (Ausubel, Cramton, Deneckere, 2002). We show that bargaining efficiency improves with joint ownership. Even modest joint ownership can have a large impact on expected dispute costs.

We then test the theory with collective bargaining data. Employee Stock Ownership Plans (ESOPs) are the source of joint ownership in our data. By 1992, many companies adopted ESOPs in response to changes in the tax law and other factors. Consistent with the theory, we find the benefit of ESOP adoption by unionized firms is capitalized in the stock price. The unconditional differential is from 33 to 86 percent depending on the event window. When we control for other firm factors such as asset size and market-to-book, the union announcement differential is larger for each event window.

The growth in ESOPs in the 1980s fostered a considerable literature into the reasons for their adoption and their impacts on the adopting firm. ESOPs are "qualified pension" plans that were given explicit recognition and tax incentives by the Employee Retirement Incomes Security Act of 1974 (ERISA). In 1980, 4,925 ESOP plans existed covering approximately 5.3 million workers. By 1995, the number of plans had increased to 9,232 with coverage expanding to 7.2 million workers.[1] Beginning in 1988, it is possible to identify ESOPs that are established as a part of a collective bargaining agreement. As of 1991, union ESOPs covered 1.1 million workers, 6.6 percent of all private sector workers covered by collective bargaining agreements. In the

[1] See DOL (1999).

same year, nonunion ESOPs covered 5.5 million workers, 6.4 percent of all private sector nonunion workers.[2] That is, by the early 1990s ESOPs had become as prevalent in unionized as in nonunionized firms.

Despite the relative prevalence of ESOPs in unionized firms, there has been little research on the likely impact of ESOPs on collective bargaining. Ben-Ner and Jun (1996) develop a screening model of bargaining that allows the union to use an ESOP to buy a majority equity stake in the firm. In their model, during a contract negotiation the union's initial offer to the firm consists of a wage demand and a buyout price. High valuation firms accept the wage demand with no labor dispute, low valuation firms accept the buyout price again with no labor dispute and labor disputes screen the remaining intermediate firm types. The buyout option lowers the overall dispute rate and dispute duration by providing the union with an additional screening device.

While including ESOPs as a buyout option in a screening model is an interesting theoretical extension, this option is rarely exercised in practice. Figure 1 shows the distribution of ESOP ownership shares in our data of ESOPs at unionized firms. Less than three percent of these ESOPs involve a controlling interest in the firm.[3] The ownership share for the typical union ESOP is substantially below 50 percent.

In this paper, we examine the impact of ESOPs on the collective bargaining process when the union has a non-controlling ownership interest in the firm. This conforms to nearly all union ESOPs observed in the data. Rather than focusing on the adoption of an ESOP as a bargaining outcome, we focus instead on the effect that an existing ESOP has on current contract

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[2] We thank Doug Kruse for tabulating the number of participants in collectively bargained ESOPs from the IRS Form 5500 data.

[3] The best known example unions using an ESOP to gain a controlling interest in a company was the union buyout of United Airlines in 1993. Cott and Stuart (1995) provide a useful summary of this buyout.

negotiations. We do this by extending the signaling model of Cramton and Tracy (1992) to allow the union members to hold an equity stake in the firm. In the signaling model, labor disputes arise from asymmetric information about attributes of the bargaining setting. The ESOP causes the union to internalize to a degree the costs to the firm associated with labor disputes. As the union's equity stake grows, we show that the union is less likely to select the strike threat and that the firm is more likely to accept the union's initial wage offer. ESOPs, then, are predicted to shift the composition of disputes from strikes towards holdouts.[4]

The signaling model predicts that ESOPs should improve the efficiency of collective bargaining by reducing the incidence of costly strikes. This improved bargaining efficiency creates value for the firm's shareholders over and above any of the traditional arguments for why ESOPs should lead to higher profitability. This suggests that the announcement of a union ESOP should generate a larger stock market reaction than for the announcement of a non-union ESOP. We test this prediction by conducting an event study of ESOP adoptions. Using a sample of 209 firms (45 unionized and 164 non-unionized), we find that the announcement of a union ESOP leads to a differentially larger stock market reaction as compared to the announcement of a non-union ESOP.

As mentioned, an ESOP is just one example of cross-ownership or other shared interest. Cross-ownership ties the success of each company to its partners. As a result, the companies have better incentives in negotiating and investing in long-term supply relationships. Bargaining costs are reduced and the companies enjoy a more productive collaboration.[5] Our analysis is relevant to the study of bargaining with shared interests more generally.

[4] Holdouts are labor disputes in which the union agrees to work under the terms of the expired labor agreement while negotiations continue. In a holdout, the union puts pressure on the firm using a variety of tactics such as "work-to-rule."

[5] In the context of firms competing in an industry, the improved cooperation of common ownership may have anti-competitive effects (Azar, Schmalz, and Tecu 2015).

The paper is organized as follows. In the next section we describe important features of ESOP pension plans. In section 3, we show how standard bargaining models can be extended to allow joint ownership. We discuss the data and present our findings in section 4. We conduct in section 5 an event study of the announcement of a new ESOP to explore the implications of ESOPs for the firm's shareholders. The final section contains thoughts for future work.

2. A primer on ESOPs

ESOPs were formally sanctioned in 1974 as a type of retirement plan under *ERISA*. A firm that wants to set up an ESOP establishes a trust fund in which to make contributions. These contributions are allocated to individual worker accounts held by the trust. Allocation formulas vary in practice but are based on factors such as the worker's level of compensation and years of service. Vesting of assets allocated to worker accounts takes one of two forms: no vesting for the first five years, followed by 100 percent vesting; or 20 percent vesting after three years and 20 percent per year for the next four years. The nondiscrimination requirement stipulates that "highly compensated" employees cannot account for more than 30 percent of participants in the ESOP.[6]

An important feature of ESOPs for understanding their incentive effects for collective bargaining is that at least fifty percent of the ESOP's assets must be invested in the employer's securities. While other deferred compensation plans may in fact hold significant amounts of employer securities, they are not compelled to do so. Workers with 10 years of plan participation can begin to diversify their ESOP account when they reach age 55.[7] This diversification option continues until the worker reaches age 60, when he/she is given a one-time option to diversify up

[6] Qualified plans must meet nondiscrimination tests regarding (a) coverage and (b) nondiscrimination in plans features. Each of these tests can be met through a variety of tests. Plans covering collectively bargained employees are effectively exempted from these rules.

[7] See Oringer (2001).

to 50 percent of his/her account.[8] The employee receives the vested assets in his/her account at the end of the employment relationship with the firm.[9]

Shares in an ESOP are legally owned by the ESOP trust. The control rights to these shares reside in the trustee of the plan, who is typically appointed by management. The trustee of the ESOP votes all nonallocated shares. In public companies, the plan participants must be allowed to vote their shares on "voting issues."[10] Fiduciary decisions, for example the consideration of a tender offer, need not be passed through to the participants. However, the ESOP can be set up so that this authority is given to the plan participants for decisions on allocated shares. Most public companies do structure their ESOPs in this manner (Rosen, Snyder and Young 1993).

Motives for adopting an ESOP have been explored in the literature. First, Delaware law makes ESOPs a potential takeover defense.[11] A firm incorporated in Delaware must wait three years after it acquires 15 percent of the target firm's equity before it can merge with the target, unless it can obtain a waiver by 85 percent of the shareholders. In 1989, Polaroid won a decision in Delaware Court that upheld the company decision to issue 14 percent of its stock to an ESOP prior to the initiation of a hostile tender offer by Shamrock Holdings. Management may feel that giving voting rights to the union through an ESOP is a way of placing the votes in "friendly" hands (e.g., Chang and Myers 1992 and Chaplinsky and Niehaus 1994). Second, ESOPs were given special tax incentives in order to encourage their adoption. The specifics of these tax benefits, though, are not directly relevant for our purpose. Interested readers can find a detailed discussion in Beatty (1995) and Scholes and Wolfson (1990). Finally, ESOPs may improve

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[8] This requirement applies to ESOP shares allocated to worker accounts after December 31, 1986.

[9] See http://www.esopassociation.org/whatis/howdo.html

[10] I.R.C. § 4975(e)(7) (1989).

[11] General Corporation Law SS 203, effective 2 February 1988.

worker productivity by giving workers an equity stake in the firm. Considerable effort has been devoted to pinning down the productivity effects of profit-sharing in general, and ESOPs in particular (Kruse 1993, Bell and Kruse 1995 and Kruse and Blasi 1995). Kim and Ouimet (2014) examine the effect of adoption of ESOPs on workers' wages and document an increase in wages for large ESOPs in concentrated industries.

The net impact of ESOPs on a firm's profitability can be assessed by conducting an event study of the announcement effect of a new ESOP. The announcement of a new ESOP on average is viewed in a positive light by investors. Studies have found that the average two day cumulative excess stock return on the day prior to and the day of an ESOP announcement ranges from one to three percent (Gordon and Pound 1990 and Beatty 1995).[12]

3. Incorporating ESOPs into a bargaining model

It is often argued that ESOPs serve to improve worker incentives by giving individual workers ownership in the firm. The difficulty with this argument is that any given worker's performance has only a negligible impact on the firm's profitability. A rational worker, outside of top management, should not alter his/her behavior as a result of an ESOP. However, the impact of even a small ESOP on collective bargaining can be dramatic. This is because collective bargaining avoids the dissipation of incentives that is seen at the individual worker level. As a result, the presence of an ESOP will affect the union's wage demand and its decision to strike.

To assess the impact of an ESOP on collective bargaining we extend the wage bargaining model of Cramton and Tracy (1992). The model assumes one-sided private information in which the union is uncertain about the firm's profitability. The firm credibly signals its profitability

[12] This announcement effect captures more than just the tax benefits of an ESOP since it has been documented that stock prices react positively to ESOP adoption even when there is no tax benefit (and adopting companies are takeover targets). See Sellers, Hagan, and Siegel (1994) for further discussion.

through its willingness to postpone agreement. The union decides how best to pressure the firm by selecting the threat, either strike or holdout. Under holdout, the union continues to work under the terms of the expired labor agreement, but at a reduced level of efficiency. In contrast, striking typically involves a substantial disruption of production. We will see that an ESOP impacts not only wages, dispute incidence and dispute duration, but also the form the dispute takes.

Consider the following stylized labor contract negotiation. A union and a firm are bargaining over the wage to be paid during a contract of duration T. Let v be the firm's value of the current union labor force working under a contract of duration T. It is common knowledge that v is drawn from the distribution F with positive density f on an interval of support $[l, h]$. However, at the outset of the negotiations only the firm knows the realized value of v.

Negotiations begin with the union selecting a threat $\theta \in \{H,S\}$, where H indicates the holdout threat and S indicates the strike threat. The union's threat choice remains in effect until a settlement is reached. Absent an ESOP, in the threat θ, the payoff to the union is x_θ and the payoff to the firm is $a_\theta v - b_\theta$, where $a_\theta \in [0,1)$ and $b_\theta \geq 0$. The term $1 - a_\theta$ captures the dispute cost in that threat. Define $c_\theta = (b_\theta - x_\theta) / (1 - a_\theta)$ to be the relative payment difference during the threat θ. Since the total payoff in agreement is v and the total payoff during the threat θ is $a_\theta v - b_\theta + x_\theta$, the "pie" that the union and firm are bargaining over (the difference between the agreement and the threat payoffs) is $(1 - a_\theta)v + b_\theta - x_\theta = (1 - a_\theta)(v + c_\theta)$. We assume that the pie is positive for all $v \in [l, h]$, which implies that $c_\theta > -l$.

Let w^0 denote the wage under the expired labor agreement. Since the terms and conditions of the previous labor agreement remain in force during a holdout, the workers continue to be paid w^0 during the holdout, so $x_H = b_H = w^0$ and $c_H = 0$. We assume there is some inefficiency during a holdout, $a_H < 1$.

With an ESOP, the union gets a share α < ½ of the profits of the firm. This changes the payoff flows both during the threat and after settlement as shown in Figure 2. The outcome of this bargaining process between the union and the firm denoted by $\langle t, w, \theta\rangle$ consists of the time of the settlement t where $t \in [0,T]$, the wage settlement w and the threat selected by the union θ. The union and firm payoffs are calculated as the sum of the threat payoffs and the agreement payoffs, weighted by the fraction of time spent in each state.

Define

$$D(t) = \frac{1-e^{-rt}}{1-e^{-rT}}$$

to be the discounted fraction of time spent in dispute if an agreement occurs at time t. Then, given the bargaining outcome $\langle t, w, \theta\rangle$, the union's payoff is

$$U(t,w,\theta) = [x_\theta + \alpha(a_\theta v - b_\theta)]D(t) + [w + \alpha(v-w)][1-D(t)]$$

and the firm's payoff is

$$V(t,w,\theta) = (1-\alpha)(a_\theta v - b_\theta)D(t) + (1-\alpha)(v-w)[1-D(t)].$$

Notice that the ESOP does not change the firm's incentives. The firm still seeks to maximize its overall profits, despite the fact that a share α of these profits is going to the union. In contrast, the ESOP does fundamentally change the incentives of the union. With an ESOP, the union cares not only about its wage, but also about the firm's profitability, which falls with higher wages and longer and more costly labor disagreements. As a result, the ESOP makes the union a less demanding negotiator. As we will see, the ESOP gives the union an incentive to select a less destructive threat and to demand a lower initial wage demand.

The bargaining sequence is as follows. Following the union's threat choice the union and the firm alternate making wage offers, with the union assumed to make the initial offer. After a wage offer is made by one side, the other side has two options: (1) make a counteroffer, in which case the bargaining continues, or (2) accept the current offer, in which case the bargaining ends and labor is supplied at the offered wage for the reminder of the contract period. As in Admati and Perry (1987), a bargainer can delay responding to an offer. This assumption leads to the signaling equilibrium in which the firm signals its value through its willingness to delay the agreement. For simplicity, we assume that the minimum time between offers is arbitrarily small.

The equilibrium of this bargaining game takes a simple form. If the wage under the expired labor agreement, w^0, is sufficiently low (that is, below some indifference level $\tilde{w}$) the union decides to select the strike threat; otherwise ($w^0 \geq \tilde{w}$) the union selects the holdout threat. The indifference level wage, $\tilde{w}$, depends on *r, T, F*, the strike and holdout threat payoffs and the ESOP size α. A second indifference level, $m \in (l, h)$, determines the firm's response to the union's initial wage offer. If the firm's valuation is higher than this indifference level, $v > m$, the firm accepts the union's initial wage offer and an immediate settlement takes place. Otherwise, the firm rejects the union's initial wage offer and a labor dispute begins. Whether the dispute is a strike or a holdout depends on the union's prior threat choice.

The signaling equilibrium is characterized by three propositions, which are proven in Appendix A.

Proposition 1. *Let θ be the threat chosen by the union. In the limit as the time between offers goes to zero, there is a perfect Bayesian equilibrium with the following form:*

- *The union makes an immediate offer of* $w_\theta(m) = x_\theta + \frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(m+c_\theta)$, *where*

  $m(c_\theta) \in (l\ , h)$ *maximizes*

(M) $$(1-2\alpha)(m+c_\theta)(1-F(m))+\int_l^m\left(\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{1-2\alpha}}-2\alpha(v+c_\theta)\right)dF(v).$$

- *The firm accepts the offer if v ≥ m. Otherwise, if v < m the firm waits until* $\left(\frac{v+c_\theta}{m+c_\theta}\right)^{1-2\alpha}$ *of the contract period remains before offering* $w_\theta(v)=x_\theta+\frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(v+c_\theta)$*, which is accepted by the union.*

Several observations follow from Proposition 1. First, all wage offers are Rubinstein (1982) full information wage offers. The wage offer consists of the union's payoff in the threat θ, x_θ, plus the fraction $\frac{1-2\alpha}{2-2\alpha}$ of the bargaining rents (the avoided loss) based on the firm's profitability, *v* (or *m* in the case of the union's initial offer). For bargaining units without an ESOP (α = 0), the rents are split equally between the union and the firm with the union receiving its share of the rents entirely through the settlement wage. At the other extreme, as the bargaining unit's interest in the firm approaches one-half (α = ½), bargaining conflict between the firm and the union vanishes. The union receives a "competitive" wage equal to its threat payoff, x_θ. However, the union still collects half of the rents, v - x_θ, though it now receives the payment entirely through its equity stake. For intermediate values of α, the union receives some of its rents through the wage and some through its equity stake. Second, during a labor dispute the union has every incentive to impose as much inefficiency on the firm as possible. The wage under both threats increases linearly with the degree of inefficiency, but the strength of this incentive diminishes with α.

For a given threat θ, we can determine how the dispute incidence and duration respond to changes in the distribution of *v*, changes in the threat payoffs, or to changes in the size of the

ESOP. The following proposition says that dispute activity increases with uncertainty. In addition, dispute activity increases when the threat θ becomes more attractive to the union (i.e., c_θ falls). However, dispute activity decreases with larger ESOPs (as α rises).

Proposition 2. *Suppose that m uniquely maximizes* ***(M)****. Dispute incidence F*(*m*) *and dispute duration* $D(v) \equiv 1 - (\frac{v + c_\theta}{m + c_\theta})^{1-2\alpha}$ *increase with a linear, mean-preserving spread of the distribution of F. Moreover, dispute incidence and duration decrease as* c_θ *increases and as* α *increases.*

Dispute activity depends on the amount of uncertainty about the firm's private information. Dispute incidence always exceeds one-half, and converges to one-half in the limit as uncertainty disappears.[13] Recall that c_θ measures what the firm pays less what the union receives in the threat θ scaled by the dispute cost. Proposition 2 yields several testable predictions. For example, if a local union receives strike benefits throughout a strike from its national union (and the costs of the benefits are spread across the national membership), then this lowers c_S which should increase strike incidence and lengthen strike durations. Similarly, if workers on strike qualify for general welfare payments, this also lowers c_S and should increase the incidence and duration of strikes.

The intuition for why ESOPs reduce dispute incidence and dispute duration stems from the fact that as α increases the union's preferences become more in line with the firm. A bargaining unit without an ESOP receives rents only through the negotiated wage. Labor disputes are a costly activity that allows the union to raise its wage. A bargaining unit with an ESOP no longer collects its rents entirely through the negotiated wage. Depending on the size of

[13] By dispute incidence we mean the likelihood that either a strike or a holdout takes place. Dispute incidence less than one-half results when there is a fixed cost to initiating a dispute.

the ESOP, a portion of the union's rents is now collected through its ownership stake in the firm. As the ESOP share α increases, the union collects a higher share of its rents through its equity stake, which dampens the union's incentive to invest in costly labor disputes in order to raise its wage. At α = ½, all of the union's rents are collected through its equity stake and there is nothing left to disagree about. Consequently, dispute incidence and duration vanishes to zero.

Our third proposition demonstrates that the union's threat decision depends critically on the current wage under the expired labor agreement, w^0.

Proposition 3. *If* $w^0 < \tilde{w}$ *, the union selects the strike threat; if* $w^0 \geq \tilde{w}$ *the union selects the holdout threat, where*

$$\tilde{w} = x_S + (1-a_S)(m_S + c_S)(1-F(m_S)) - (1-a_H)m_H(1-F(m_H))$$
$$-\frac{\alpha}{1-\alpha}(c_S(1-a_S)F(m_S) + (1-a_S)\int_l^{m_S} vdF(v) - (1-a_H)\int_l^{m_H} vdF(v))$$

and $m_S = m(c_S)$ *and* $m_H = m(c_H)$ *maximize* **(M)**.

The intuition is that the union will select the strike threat if and only if the higher bargaining costs that are associated with a strike are more than made up for by a higher wage. If the current wage under the expired labor agreement is sufficiently high, this is not the case and the union prefers the holdout threat.

Proposition 3 provides a key insight into strike activity. The overall incidence of strikes depends not just on the overall incidence of disputes, but also on the fraction of disputes that involve a strike. As shown earlier, the level of dispute activity depends on the degree of uncertainty and the size of the ESOP. The composition of disputes between strikes and holdouts depends on w^0, the size of the ESOP, the threat payoffs and the location of the distribution of *v*.

We would like to determine how the size of the ESOP impacts the composition of disputes. An examination of the Rubinstein wage provides some insight:

$$w_\theta(v) = x_\theta + \frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(v+c_\theta)\,.$$

We see that as α increases, the wage under both threats falls. However, assuming that the strike threat is much more destructive than the holdout threat ($a_S << a_H$), then it is the case that as the ESOP share increases the wage under the strike threat is falling much faster than the wage under the holdout threat. A higher ESOP share reduces the relative wage gap between the strike and the holdout threats. Hence, we should expect that an ESOP should increase the relative attractiveness of the holdout threat. The incentive to strike is further reduced when the union factors in the dispute costs. The less destructive threat, holdout, results in lower dispute costs. Thus, our intuition is that we should expect ESOPs to shift the composition of disputes away from strikes.

This intuition is difficult to establish without making further assumptions on the threat payoffs. One useful simplification is

Assumption S. $b_S = x_S$.

This states that what the firm pays out during a strike is equal to what the union receives implying that $c_S = 0$.[14] In the case of holdout, recall that the firm pays the union the wage from the expired contract, which means $b_H = x_H = w^0$, and $c_H = 0$. Thus, with Assumption S, $c_H = c_S = 0$, which implies that the union selects the same cutoff level m under either threat ($m = m_S = m_H$). As a result, the incidence and duration of the dispute is the same under either threat. Since $a_S < a_H$, it immediately follows that the expected loss from a strike is higher than the expected loss from a holdout. In addition, we can show

Proposition 4. *Suppose Assumption S holds and m is the unique maximizer of (M). Then as α increases from* 0*, $\tilde{w}$ falls and the union is more apt to choose the holdout threat. Moreover, if v*

[14] Assumption S can hold in a variety of situations. If the firm closes down during a strike and the union workers do not find alternative employment, then the assumption holds. Similarly, if the firm hires replacements at a competitive wage and the striking workers find alternative employment at the competitive wage then the assumption also holds.

is uniformly distributed, then for all α, the union's threat choice shifts toward holdout as the size of the ESOP grows.

Propositions 1–4 yield a number of predictions about how collective bargaining changes with the introduction of an ESOP. As a union's equity position in the firm grows, we should expect fewer and shorter disputes. Moreover, the union should be less apt to select the more destructive strike threat, and thus strike incidence should be less. To get a sense of the magnitude of these effects, we set the model parameter values to the benchmark levels of Cramton and Tracy (1994). These parameter values were calibrated such that the equilibrium outcome with $\alpha = 0$ (no ESOP) fits the descriptive statistics of private-sector collective bargaining in large (more than 1,000 workers) private-sector bargaining units in the U.S. from 1970 to 1989.[15]

Figure 3 shows how dispute incidence changes in the benchmark model with the introduction of an ESOP. Overall dispute incidence declines slowly as the ESOP ownership share increases from 0 to 25 percent. However, there is a substantial change in the form that disputes take, resulting in a large decline in strike incidence. Strike incidence, initially at 11 percent with $\alpha = 0$ falls roughly linearly to 0 at $\alpha = 0.17$. This decline in strike incidence is the result of the union avoiding the more costly strike threat when the union has an equity interest in the firm. Table 3 summarizes the implications of the calibrated model for the sample of ESOPs in our data. We use the distribution of ESOPs sizes in our data to calculate a weighted average impact of the ESOP on bargaining outcomes. Strike incidence for the sample is predicted to decline by 5.6 percentage points, while the fraction of disputes that involve a strike is predicted to decline by 10.7 percentage points.

Figure 4 shows how the expected loss from disputes declines as the union's ESOP

[15] Specifically, we assume v is uniform on 1 ± 0.07, w^0 is uniform on 0.48 ± 0.05, $a_S = 0.75$, $a_H = 0.96$, $x_S = b_S = 0.35$, $r = 10\%$, and $T = 2.7$ years.

ownership share increases. The expected loss conditional on the strike threat is cut in one-half as α increases from 0 to 0.25—this is the consequence of the mean strike duration dropping from 36 days at $\alpha = 0$ to 18 days at $\alpha = 0.25$. However, the expected loss from disputes drops by a factor of more than four as α increases from 0 to 0.25. The faster decline in the dispute loss is the result of two sources of reduction as the union's equity interest increases: 1) shorter disputes and 2) the shift away from the more costly strike threat.

The decline in dispute costs with the introduction of an ESOP raises the possibility that both the union and the firm may benefit from the ESOP, all else equal. In our benchmark model, this is not the case. With $\alpha = 0$, the union and firm split the pie roughly equally, but as the union's ownership share increases to 20 percent, the split shifts to 60/40 in favor of the union. This suggests that firms would offer ESOPs only in conjunction with some combination of tax breaks and concessions by the union (to make the ESOP profitable for the firm). However, we do not analyze the negotiation of the ESOP here—only the implications of the ESOP to subsequent bargaining.

To summarize, the benchmark model—calibrated to fit the main features of U.S. collective bargaining—suggests several hypotheses: 1) ESOPs should result in lower strike incidence, strike duration and fraction of disputes involving a strike, 2) ESOPs should result in lower expected dispute costs, and 3) ESOPs should be associated with union concessions. The size of the ESOP impact depends on the union's ownership share of the firm. According to the benchmark model, the average impact of ESOPs based on the observed distribution of ESOP shares (see Figure 1) is as follows: dispute incidence falls from 51.8 to 51.6 percent, strike incidence falls from 11.1 to 5.5 percent and the union's selection of the strike threat falls from 21.4 to 10.7 percent.

4. Shareholder Wealth Effects

In this section, we analyze the shareholder wealth associated with the announcement of an ESOP adoption. While the market reaction to an announcement of a new ESOP has been documented in the literature, we provide new evidence on the announcement gains/losses disaggregated by the collective bargaining status of the firm. If ESOPs improve the efficiency of contract negotiations and if these efficiency gains are shared between the union and the firm, then we would expect to see these gains to the shareholders capitalized into the announcement effect of a union ESOP. We measure these announcement effects using an event-time methodology as described in MacKinaly (1997). We calculate cumulative abnormal returns (CAR) over three intervals around the announcement date of ESOP.

Our primary data source for ESOP information was the *National Center for Employee Ownership* (NCEO). We collected the percent shares allocated to ESOPs and the adoption year for each listed firm in the NCEO data base. Next, we sent surveys to 387 corporations where there was any indication of possible error in the NCEO data. A total of 268 companies responded to the survey, although about a third of responses were not informative since the plan administrators claimed that they did not have information about the specific circumstances surrounding the adoption of their ESOPs. We made corrections to the data based on the usable survey responses. In addition, we checked the accuracy of our ESOP data against those reported in Chang and Mayers (1992), Gordon and Pound (1990) and Chaplinsky and Niehaus (1994). Finally, we cross-checked our data with the information provided to the Internal Revenue Service in the Form 5500.[16] We were unable to check the accuracy of ESOPs that were put into place before 1988 due to the fact that many of these companies were subsequently delisted.

[16] Every ESOP involving more than 100 participants must file a Form 5500 report with the Internal Revenue Service. Beginning in 1988, the Form 5500 data indicate if the ESOP is part of a collective bargaining unit.

This produced a total sample of 602 firms with ESOPs. We were able to identify the exact announcement date for only 225 firms, nearly 37 percent of the sample. Additionally, 16 firms were eliminated due to missing observations in one or more key financial variables (employees, assets, common shares outstanding, and common equity). The final sample consists of 209 firms. Tables 2 to 4 provide descriptive statistics on our ESOP sample. Table 2 shows the ESOP adoption dates across years and Table 3 across industries. The distribution of our ESOPs across time and type of industry align with earlier work by Chang (1990) and Chang and Mayers (1995).

Table 4 provides descriptive statistics on the firms in our ESOP sample disaggregated by whether they are unionized or not. We report information on firm size (measured by the book value of assets), growth opportunities (measured by market to book ratio), whether the firm was a takeover target over the three months prior to the ESOP and the size of the ESOP as a percentage of shares outstanding.[17] On average firms adopting an ESOP have about $4 billion in assets. Unionized firms, though, tend to be larger with $8.3 billion in assets. Firms that adopt an ESOP have a mean (median) market to book of 1.3 (1.2), indicating growth prospects. Unionized firms have a slightly higher market to book than non-unionized firms. Twenty percent of our firms were takeover targets, with non-union firms relatively more likely to be a target (23 percent) as compared to union firms (13 percent). ESOPs on average have 11.4 percent of the firm's shares outstanding, with a median equity stake of 7.8 percent. Unionized ESOPs tend to have a larger fraction of outstanding shares, with a mean (median) difference of 1.5 percent (0.03 percent). Appendix B provides information on the name of the company, the year of ESOP adoption and percentage shares outstanding in the plan for our sample of union ESOPs.

[17] We thank Saeyoung Chang for providing us with his takeover data. We extended his coding to 16 ESOP adoptions that are in our sample but were not in Chang's data.

Table 5 reports the event study results. We report average CARs for three event windows (-2,1), (-5,1) and (-5,5), where t = -1 is the ESOP announcement date, and t = 0 is the date the announcement is reported in the press. For two of the event windows, we include the five days prior to the press release to capture any leakage of the news to the markets, although little is reported in the literature as to when the firm, if at all, shares the ESOP information with its employees. CARs for the overall sample of firms are positive and statistically significant over each of the three intervals. The estimated average CARs are roughly between 80 and 100 basis points depending on the event window.

Since our sample is different than those in other studies, we compare the announcement returns with findings in three other papers. Our calculated four-day return of 78 basis points is a lower than 370 basis points from Chang (1990), and higher than the 53 and 73 basis points from Beatty (1995) and Chang and Mayers (1992) respectively.[18] These studies differ because of the type of ESOPs included in the sample. Beatty points out that Chang's reported excess return of 370 basis points would be reduced to 160 basis points if the 35 leveraged buyout ESOPs were excluded from his sample. Thus, our overall announcement returns are roughly comparable to earlier studies.

Study, Event Window	Sample Size	Sample Period	CARs
Beatty (1995), (-2,1)	122	1976-1989	0.0053
Chang (1990), (-2, 1)	165	1976-1987	0.0370
Chang and Mayers (1992), (-1, 0)	276	1976-1989	0.0073

Table 5 also reports CARs disaggregated by the union status of the firm. For the 164 non-

[18] The event window for Chang and Mayers is only 2 days as compared to 4 days for the rest of the estimates. When we restrict our event window to (-1,0), our average CAR is 0.0092.

unionized firms, the average CARs across the three event windows are slightly smaller than for the overall sample of firms. The CARs for the 45 unionized firms range from 33 to 86 percent larger than for the nonunion sample. For the unionized firms, the CARs are 97 basis points for the interval (-2,1), 122 basis points for the interval (-5,1) and 148 basis points for the interval (5,5). Whatever the benefits are to firms in general from establishing an ESOP, the benefits appear to be considerably larger for unionized firms. To our knowledge, this feature of the data has not been previously noted in the literature.

A possible concern with interpreting the results from Table 5 as indicating that the shareholders benefit relatively more ESOP adoptions in unionized firms is that union and non-union firms that adopt ESOPs differ in other dimensions which are not controlled for in Table 5. For example, from Table 4 we see that the unionized firms are on average larger than the non-unionized firms. If ESOPs are relatively more beneficial for larger firms, then the union effect may simply be reflecting this left-out firm size effect.

We explore this possibility in Table 6 with a regression of the estimated firm CARs on an indicator for whether the firm is unionized, a measure of firm size (Log Assets), a measure of growth opportunity for the firm (Market-to-book) and whether the firm was a takeover target. We find that the ESOP announcement effects are insensitive to firm size for all three event windows. In contrast, the data indicates that firm growth opportunities as reflected in the market-to-book ratio have a significant negative impact on the size of the announcement effect. The announcement effects for firms that were takeover targets are significantly lower than otherwise, with estimated differentials ranging from 388 to 462 basis points depending on the event window. This compares to Chang's (1990) unconditional takeover announcement effect of −234 basis points.

Both the firm size and market-to-book variables are expressed as deviations from their sample means. This allows us to interpret the constant term in the regression as the average announcement effect for a non-union firm with the average size and growth opportunities that was not a takeover target. The coefficient on the union indicator measures the conditional announcement effect differential for unionized firms. Controlling for firm size, growth opportunities and takeover status has the effect of increasing the absolute and relative union announcement effect differentials relative to the unconditional results reported in Table 5. The conditional union announcement effect differential ranges from 68 to 95 basis points – or from 43 to 69 percent. The conditional union differential is statistically significant at the 10 percent level for the two wider event windows.

The calibration results displayed in Figure 4 offer some insights into this finding. The costs to current shareholders of the firm giving employees an equity stake are the same regardless of the union status of the firm. Union and nonunion firms likely benefit equally from the tax advantages afforded by establishing an ESOP. If there are important productivity effects associated with ESOPs, it is less clear that they would be equally shared by non-union and union firms. However, the calibration exercise clearly illustrates that the expected bargaining losses associated with labor disputes declines with the size of the union's equity stake. This creates a differential value of an ESOP to union firms which if understood by investors should be capitalized in the announcement effect.

6. Conclusion

Parties that repeatedly negotiate contracts with each other have an incentive to adopt an ownership structure that reduces bargaining costs. Cross-ownership between a firm and its supplier is an example. The cross-ownership better aligns the parties' interests, thus reducing bargaining costs. Similarly, ESOPs alter the incentives of a firm and union in ways that help reduce the frequency and costs of labor disputes.

In this paper, we extend standard bargaining models to allow joint ownership. In the case of collective bargaining, the theory predicts ESOPs lead to fewer strikes as a fraction of total disputes. The presence of an ESOP changes the incentives of the union since it no longer collects its rents exclusively through the negotiated wage. We examine the impact of ESOPs on collective bargaining outcomes by extending the signaling model of Cramton and Tracy (1992) to allow the union to hold an equity stake in the firm. The model predicts that increasing the size of the union's equity stake acts to more closely align the union's interests with the interests of the firm. A consequence is a reduction in labor disputes and a shift by the union away from the more costly strike threat and towards the holdout threat.

The theory suggests that shareholders of unionized firms should experience a differential gain from the adoption of an ESOP. We verify this by conducting an event study of the stock market reaction to 209 ESOP adoptions, including 45 unionized and 164 non-unionized firms. We find that the unconditional stock market reaction to a unionized ESOP adoption is from 33 to 86 percent larger than for a non-union ESOP adoption. Conditional on firm size and market opportunities, the union announcement differential is even larger for each event window. These findings indicate that ESOPs may provide firms and unions with a tool to improve the efficiency with which they renegotiate labor agreements. A more complete picture requires more data on post-ESOP contract negotiations and detailed information on pre- and post-ESOP wage settlements.

Our analysis applies generally to bargaining settings with shared ownership. Like ESOPs, cross-ownership should reduce bargaining costs and make collaborations more productive.

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Table 1: Calibrated Impact of ESOPs on Collective Bargaining

	Dispute Incidence	Strike Incidence	Dispute Composition
Pre-ESOP (theory)	51.8	11.1	21.4
Post-ESOP (theory)	51.6	5.5	10.7
ESOP Impact (theory)	–0.2	–5.6	–10.7

Notes: The theoretical impact of an ESOP is calculated from the benchmark model of section 3, using the empirical distribution of ESOP ownership shares.

Table 2: Adoption of ESOPs - by Year

Year	Number of ESOP Adoptions	Percent of Total
1976	1	0.5
1978	1	0.5
1979	2	1.0
1980	3	1.4
1981	3	1.4
1982	4	1.9
1983	6	2.9
1984	9	4.3
1985	15	7.2
1986	8	3.8
1987	15	7.2
1988	35	16.7
1989	103	49.3
1990	3	1.4
1991	1	0.5
	209	100

Table 3: Adoption of ESOPs - by Industry

Industry	Number of Bargaining Units Adopting	Percent of Total ESOPs
Consumer Non-Durables	20	9.6
Consumer Durables	6	2.9
Manufacturing	47	22.5
Oil, Gas, and Coal Extraction and Products	11	5.3
Chemicals and Allied Product	15	7.2
Business Equipment	19	9.1
Telephone and Television Transmission	5	2.4
Utilities	7	3.3
Wholesale and Retail Services	27	12.9
Healthcare, Medical Equipment, and Drugs	4	1.9
Finance	22	10.5
Other	26	12.4
	209	100

Table 4: Descriptive Statistics of the Sample Characteristics

Variable	*Sample Size* [c]	*Mean*	*Median*	*Min*	*Max*
Book Value of Assets ($ millions)					
All	209	4,031.2	697.2	5.4	77,951.6
Non-union	164	2,858.4[†]	315.2	5.4	77,951.6
Union	45	8,305.3	3,123.6	56.3	41,941.0
Market Value / Book Value [b]					
All	209	1.2	1.1	0.7	4.8
Non-union	164	1.2	1.1	0.7	4.8
Union	45	1.3	1.2	0.7	2.4
Takeover Target dummy					
All	209	0.206	0	0	1
Non-union	164	0.226	0	0	1
Union	45	0.133	0	0	1
ESOP (%)					
All	209	11.4	7.8	0.1	75.5
Non-union	164	11.0	7.7	0.1	75.5
Union	45	12.5	8.0	2.4	60.0

Notes:

[a] Sample size indicates non-missing variables in COMPUSTAT.

[b] Defined as price-close calendar year times shares outstanding plus total assets minus common equity all divided by book value of assets.

[†] Non-union and Union mean figures are statistically different at 5 percent, using a two-sample t-test for comparison.

Table 5. Cumulative average abnormal returns (CAR)

	Sample	*(-2,1)*	*(-5,1)*	*(-5,5)*
Overall	209	0.0078**	0.0077**	0.0097**
		(0.0025)	(0.0023)	(0.0021)
Nonunion	164	0.0073**	0.0065**	0.0083**
		(0.0030)	(0.0027)	(0.0025)
Union	45	0.0097**	0.0122**	0.0148**
		(0.0039)	(0.0036)	(0.0032)

Notes: ESOP announcement day (t = -1). Standard errors are in parentheses and are calculated taking into account the heteroscedasticity of the individual CAR estimates. CARs estimated using the market model discussed in MacKinlay (1997). Parameters of the model are calculated using returns over the period -260 to -61 and 61 to 260.
** significant at the 5% level, * significant at the 10% level

Table 6. Union ESOP Premium on our Takeover Indicator

	(-2,1)	*(-5,1)*	*(-5,5)*
Constant	0.0158**	0.0137**	0.0171**
	(0.0032)	(0.0029)	(0.0027)
Union Indicator	0.0068	0.0095*	0.0078*
	(0.0056)	(0.0052)	(0.0047)
Log Assets	−0.0034**	−0.0024*	−0.0015
	(0.0015)	(0.0014)	(0.0012)
Market-to-book	−0.0220**	−0.0295**	−0.0290**
	(0.0060)	(0.0052)	(0.0049)
Takeover Target	−0.0462**	−0.0388**	−0.0441**
	(0.0068)	(0.0064)	(0.0057)

Notes: Number of observations 209. ESOP announcement day (t = -1). Standard errors are in parentheses and are calculated taking into account the heteroscedasticity of the individual CAR estimates. CARs estimated using the market model discussed in MacKinlay (1997). Parameters of the model are calculated using returns over the period -260 to -61 and 61 to 260. Market-to-book is in deviation from its sample mean.
** significant at the 5% level, * significant at the 10% level

Figure 1. ESOP Ownership Shares for Unionized Firms

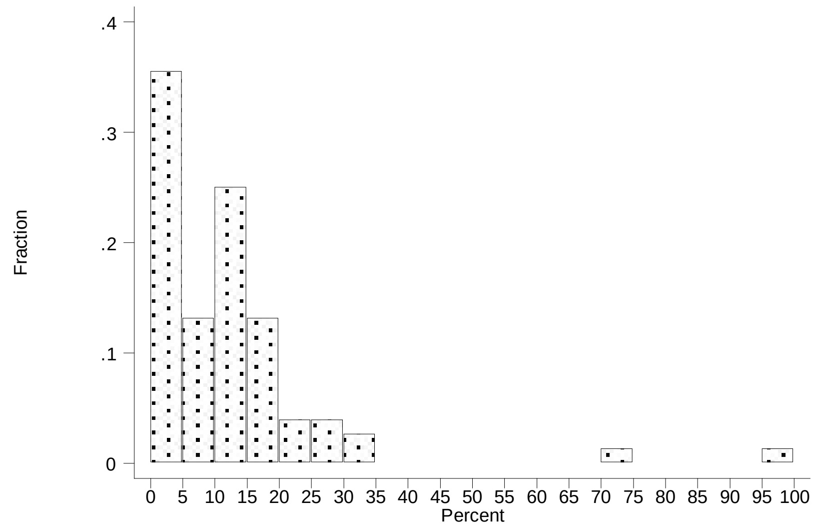


Figure 2. Payoffs from Bargaining Outcome $\langle t, w, \theta\rangle$ with an ESOP of size α

Payoffs During Threat θ	Payoffs After Settlement
Loss: $(1 - a_\theta)(v + c_\theta)$	Firm: $(1 - \alpha)(v - w)$
Firm: $(1 - \alpha)(a_\theta v - b_\theta)$	
Union: $x_\theta + \alpha(a_\theta v - b_\theta)$	Union: $w + \alpha(v - w)$

0 — Old Agreement Expiration

t — Time of Settlement

T — New Agreement Expiration

Figure 3. Dispute Incidence as a Function of ESOP Ownership Share

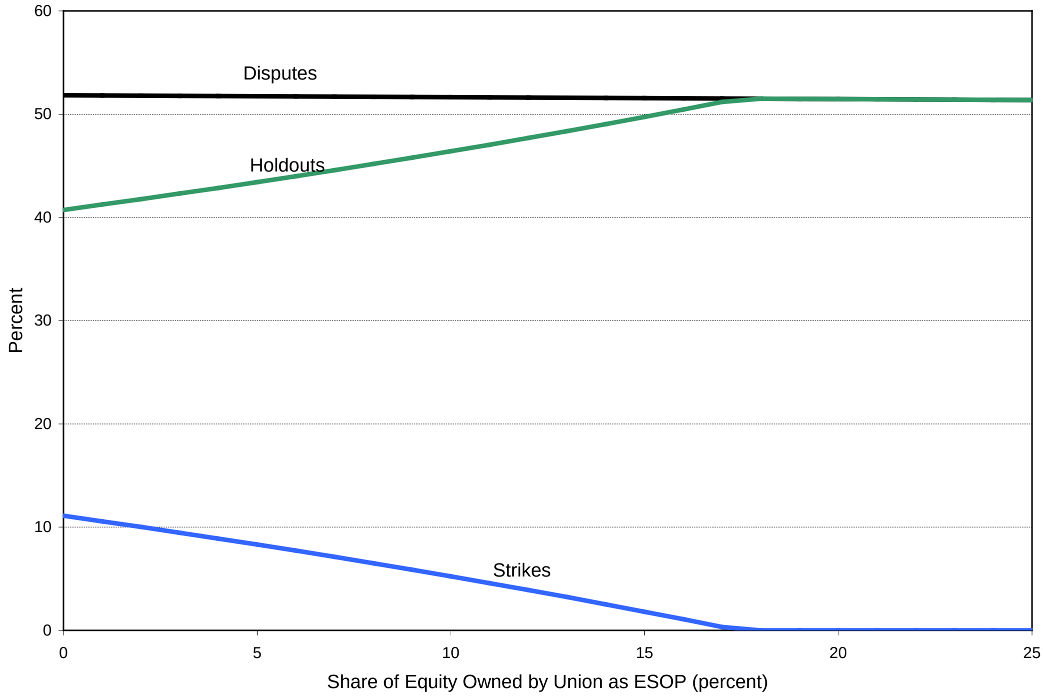
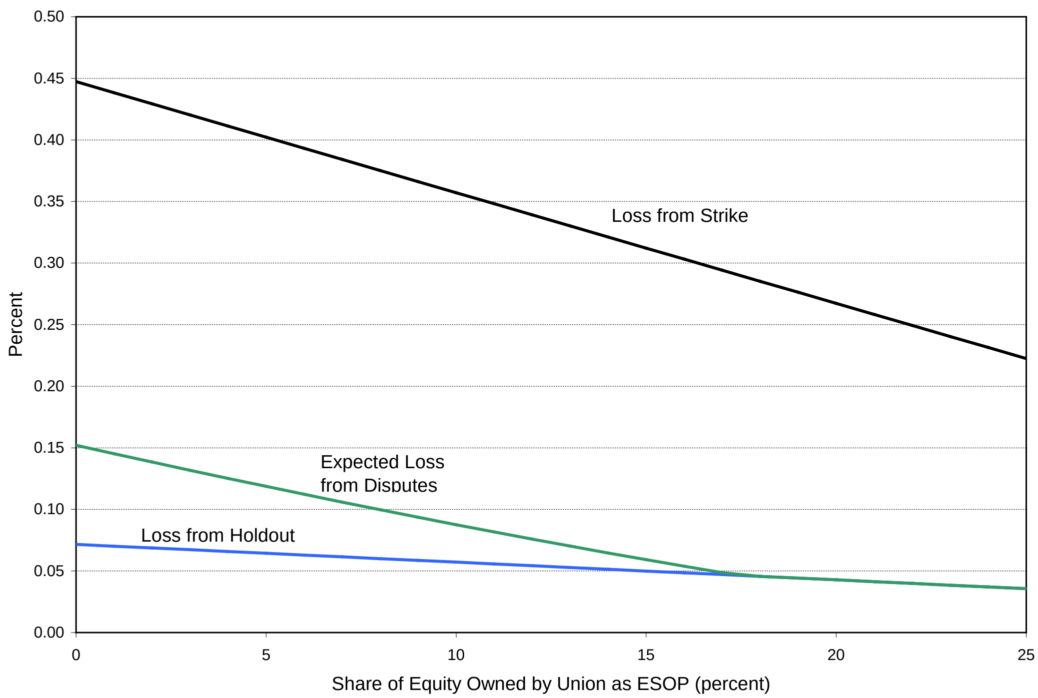


Figure 4. Expected Loss from Dispute as a Function of ESOP Ownership Share



Appendix A

The proofs of Propositions 1-3 are extensions of similar propositions in Cramton and Tracy (1992). As a result only a sketch of the proofs are given.

Proof of Proposition 1. We begin by establishing the Rubinstein wage when the union has an ESOP of size α. Then the payoffs during the threat θ and after settlement are as shown in Figure 1. The Rubinstein wage is determined from a pair of indifference relations, which require the firm offers a wage w_f and union offers wage w_u, such that each is indifferent between immediate acceptance of the other's offer or waiting and having the other accept their offer after a period of delay. Let δ be the discount factor between offers. Then the indifference relations for the union and firm are

$$w_f + \alpha(v - w_f) - x_\theta - \alpha(a_\theta v - b_\theta) = \delta(w_u + \alpha(v - w_u) - x_\theta - \alpha(a_\theta v - b_\theta))$$
$$(1-\alpha)(v - w_u - a_\theta v + b_\theta) = \delta(1-\alpha)(v - w_f - a_\theta v + b_\theta) .$$

Solving for the wage offers yields

$$\begin{aligned} w_f &= \frac{\delta((1-a_\theta)v + b_\theta) + x_\theta}{(1+\delta)(1-\alpha)} - \frac{\alpha}{1-\alpha}((1-a_\theta)v + b_\theta) \\ w_u &= \frac{(1-a_\theta)v + b_\theta + \delta x_\theta}{(1+\delta)(1-\alpha)} - \frac{\alpha}{1-\alpha}((1-a_\theta)v + b_\theta) \end{aligned} .$$

Finally, letting the time between offers go to zero ($\delta \to 1$), gives us the Rubinstein wage for the threat θ:

$$\begin{aligned} w_f = w_u &= \frac{1}{1-\alpha}(\frac{x_\theta}{2} + (\frac{1}{2} - \alpha)((1-a_\theta)v + b_\theta)) \\ &= \frac{1}{1-\alpha}(\frac{x_\theta}{2} + (\frac{1}{2} - \alpha)((1-a_\theta)v + (1-a_\theta)c_\theta + x_\theta)) \\ &= \frac{1}{1-\alpha}((1-\alpha)x_\theta + (\frac{1}{2} - \alpha)(1-a_\theta)(v + c_\theta)) \\ &= x_\theta + \frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(v + c_\theta). \end{aligned}$$

Next we need to determine the firm's optimal choice of delay, which credibly reveals its type. When the firm rejects the union's offer *p*, it makes the offer $w_\theta(v)$ after delaying for $D(t)$ of the contract period. The new contract expires at time *T*. Define

$$D(\Delta) \equiv \frac{1-e^{-r\Delta}}{1-e^{-rT}}.$$

The firm selects the delay Δ to maximize its profits:

$$\max_{\Delta}[D(\Delta)(1-\alpha)(a_\theta v-b_\theta)+(1-D(\Delta))(1-\alpha)(v-w_\theta)]$$

$$=\max_{\Delta}\frac{1-\alpha}{1-e^{-rT}}[(1-e^{-r\Delta})(a_\theta v-b_\theta)+(e^{-r\Delta}-e^{-rT})(v-x_\theta-\frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(v(\Delta)+c_\theta))]$$

$$=\max_{\Delta}\frac{1-\alpha}{1-e^{-rT}}[(1-e^{-r\Delta})y_\theta+(e^{-r\Delta}-e^{-rT})(v-w_\theta[v(\Delta)])].$$

The first order condition is

$$e^{-r\Delta}(r(y_\theta-v+w_\theta[v(\Delta)])-(1-e^{-r(T-\Delta)})w'_\theta[v(\Delta)])=0$$
$$\Rightarrow r(v-w_\theta[v(\Delta)]-y_\theta)+(1-e^{-r(T-\Delta)})w'_\theta[v(\Delta)])=0,$$

where

$$y_\theta=a_\theta v-b_\theta$$
$$w_\theta(v)=x_\theta+\frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(v+c_\theta)$$
$$v-w_\theta[v(\Delta)]-y_\theta=\frac{1}{2-2\alpha}(1-a_\theta)(v+c_\theta)$$
$$w'_\theta[v(\Delta)]=\frac{1-2\alpha}{2-2\alpha}(1-a_\theta)\frac{dv}{d\Delta}.$$

Hence,

$$r(v-w_\theta[v(\Delta)]-y_\theta)+(1-e^{-r(T-\Delta)})(1-2\alpha)(1-a_\theta)\frac{dv}{d\Delta}=0$$
$$\Rightarrow(1-D(t))^{\frac{1}{1-2\alpha}}=\frac{v+c_\theta}{m+c_\theta}$$
$$\Rightarrow 1-D(t)=(\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}$$
$$\therefore D(v)=1-(\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}.$$

The final step in the equilibrium construction is to determine the cutoff value *m*. When the union makes the initial offer $w_\theta(m)=x_\theta+\frac{1-2\alpha}{2-2\alpha}(1-a_\theta)(m+c_\theta)$, then the firm immediately accepts the union's offer if $v\geq m$. Otherwise, the firm with value *v* delays until *D*(*v*) of the contract has passed. The union's utility if there is a dispute is

$$= (1-D(v))(w_\theta(v)+\alpha(v-w_\theta(v))) + D(v)(x_\theta+\alpha(a_\theta v-b_\theta))$$
$$= (1-D(v))((1-\alpha)x_\theta+\alpha v+(\frac{1}{2}-\alpha)(1-a_\theta)(v+c_\theta)) + D(v)((1-\alpha)x_\theta+\alpha v-\alpha(1-a_\theta)(v+c_\theta))$$
$$= (1-\alpha)x_\theta+\alpha v-\alpha(1-a_\theta)(v+c_\theta)+\frac{1}{2}(1-a_\theta)\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{1-2\alpha}}.$$

The union's utility if there is no dispute is

$$= w_\theta(m)+\alpha(v-w_\theta(m))$$
$$= (1-\alpha)x_\theta+\alpha v+(\frac{1}{2}-\alpha)(1-a_\theta)(m+c_\theta)$$

Thus, the union's expected utility is

$$U(m) = (1-\alpha)x_\theta+\alpha E[v]+\frac{1}{2}(1-a_\theta)$$
,
$$\times\{(1-2\alpha)(m+c_\theta)[1-F(m)]+\int_l^m[\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{1-2\alpha}}-2\alpha(v+c_\theta)]dF(v)\}$$

and the union chooses *m* to maximize

$$(1-2\alpha)(m+c_\theta)[1-F(m)]+\int_l^m[\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{1-2\alpha}}-2\alpha(v+c_\theta)]dF(v)$$

The first order condition for maximizing *m* is

$$(1-2\alpha)(1-F(m))-(1-2\alpha)(m+c_\theta)f(m)+(1-2\alpha)(m+c_\theta)f(m)-(1-2\alpha)\int_l^m(\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha}dF(v)=0$$
$$\therefore 1-F(m)=\int_l^m(\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha}dF(v)$$
$$\Rightarrow 1-F(m)=F(m)(\frac{m+c_\theta}{m+c_\theta})^{2-2\alpha}-F(l)(\frac{l+c_\theta}{m+c_\theta})^{2-2\alpha}-2\frac{1-\alpha}{m+c_\theta}\int_l^m(\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}F(v)dv$$
$$\Rightarrow 1-F(m)=F(m)-2\frac{1-\alpha}{m+c_\theta}\int_l^m(\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}F(v)dv$$
$$\therefore F(m)\geq\frac{1}{2}$$

Now,

$$U'(\mu)=\frac{1}{2}(1-a_\theta)[(1-2\alpha)(1-F(\mu))-\int_l^\mu(\frac{v+c_\theta}{\mu+c_\theta})^{2-2\alpha}dF(v)]$$
$$a_\theta<1\,\&\,0\leq\alpha<\frac{1}{2}\Rightarrow U'(l)>0\,\&\,U'(h)<0.$$

Since, $U'(.)$ is a continuous function, the maximum occurs at an interior point *m* such that the first-order condition is satisfied. In addition, the second-order condition must also be satisfied, so

$$U''(m) < 0$$
$$\Rightarrow -f(m) - f(m) + (2-2\alpha)\int_l^m \frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{3-2\alpha}} dF(v) < 0$$
$$\therefore 1-(1-\alpha)\int_l^m \frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{3-2\alpha}} \frac{f(v)}{f(m)} dv > 0$$
$$\Rightarrow (m+c_\theta) f(m) - (1-\alpha)\int_l^m (\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha} dF(v) > 0$$
$$\therefore (m+c_\theta) f(m) - (1-\alpha)(1-F(m)) > 0.$$

Proof of Proposition 2. First we show that dispute incidence falls with α. From the first-order condition:

$$1-F(m(\alpha)) = \int_l^{m(\alpha)} (\frac{v+c_\theta}{m(\alpha)+c_\theta})^{2-2\alpha} dF(v)$$
$$\Rightarrow -f(m)\frac{dm}{d\alpha} = f(m)\frac{dm}{d\alpha} - 2\int_l^m (\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha} (\log(\frac{v+c_\theta}{m+c_\theta}) + \frac{1-\alpha}{m+c_\theta}\frac{dm}{d\alpha}) f(v) dv$$
$$\Rightarrow (-2f(m) + 2\int_l^m (1-\alpha)\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{3-2\alpha}} f(v) dv)\frac{dm}{d\alpha} = -2\int_l^m (\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha} \log(\frac{v+c_\theta}{m+c_\theta}) f(v) dv$$
$$\therefore \frac{dm}{d\alpha} = \frac{\int_l^m (\frac{v+c_\theta}{m+c_\theta})^{2-2\alpha} \log(\frac{v+c_\theta}{m+c_\theta}) \frac{f(v)}{f(m)} dv}{1-\int_l^m (1-\alpha)\frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{3-2\alpha}} \frac{f(v)}{f(m)} dv}$$
$$v \in [l,m] \Rightarrow \log(\frac{v+c_\theta}{m+c_\theta}) \le 0$$

$\therefore$ The numerator is negative and by the second order condition, the denominator is positive

$$\therefore \frac{dm}{d\alpha} < 0 \Rightarrow \frac{dF(m)}{d\alpha} < 0.$$

Therefore, dispute incidence falls as α increases.
Now consider how dispute duration depends on α:

$$D(\alpha) = 1-(\frac{v+c_\theta}{m(\alpha)+c_\theta})^{1-2\alpha}$$
$$\Rightarrow \frac{dD}{d\alpha} = -(\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}(-2\log(\frac{v+c_\theta}{m+c_\theta}) - \frac{1-2\alpha}{m+c_\theta}\frac{dm}{d\alpha})$$
$$\Rightarrow \frac{dD}{d\alpha} = (\frac{v+c_\theta}{m+c_\theta})^{1-2\alpha}(2\log(\frac{v+c_\theta}{m+c_\theta}) + \frac{1-2\alpha}{m+c_\theta}\frac{dm}{d\alpha})$$
$$\therefore \frac{dD}{d\alpha} < 0.$$

Therefore, dispute duration falls as α increases.

Now consider how dispute incidence depends on c_θ:

$$1-F(m(c_\theta)) = \int_l^{m(c_\theta)} \left(\frac{v+c_\theta}{m(c_\theta)+c_\theta}\right)^{2-2\alpha} dF(v)$$

$$\Rightarrow -f(m)\frac{dm}{dc_\theta} = f(m)\frac{dm}{dc_\theta} + 2(1-\alpha)\int_l^m \left(\frac{v+c_\theta}{m+c_\theta}\right)^{1-2\alpha} \frac{m+c_\theta-(v+c_\theta)(1+\frac{dm}{dc_\theta})}{(m+c_\theta)^2} f(v)dv$$

$$\Rightarrow (1-(1-\alpha)\int_l^m \frac{(v+c_\theta)^{2-2\alpha}}{(m+c_\theta)^{3-2\alpha}}\frac{f(v)}{f(m)}dv)\frac{dm}{dc_\theta} = (1-\alpha)\int_l^m \frac{(v+c_\theta)^{2-2\alpha}(v-m)}{(m+c_\theta)^{2-2\alpha}}\frac{f(v)}{f(m)}dv$$

$$\therefore \frac{dm}{dc_\theta} < 0.$$

Therefore, dispute incidence falls as c_θ increases.

Similarly, consider how dispute duration depends on c_θ:

$$D(c_\theta) = 1-\left(\frac{v+c_\theta}{m(c_\theta)+c_\theta}\right)^{1-2\alpha}$$

$$\Rightarrow \frac{dD}{dc_\theta} = -(1-2\alpha)\left(\frac{m+c_\theta-(v+c_\theta)(1+\frac{dm}{dc_\theta})}{(m+c_\theta)^2}\right)\left(\frac{v+c_\theta}{m+c_\theta}\right)^{-2\alpha}$$

$$\Rightarrow \frac{dD}{dc_\theta} = -(1-2\alpha)\left(\frac{m-v-(v+c_\theta)\frac{dm}{dc_\theta}}{(m+c_\theta)^2}\right)\left(\frac{v+c_\theta}{m+c_\theta}\right)^{-2\alpha}$$

$$v\in[l,m] \Rightarrow (m-v)\geq 0$$

$$\therefore \frac{dD}{dc_\theta} < 0$$

Therefore, dispute duration falls as c_θ increases.

Finally, we wish to show that a linear mean-preserving spread of the distribution F increases both dispute incidence and dispute duration. This follows, because a linear mean-preserving spread of the distribution is equivalent to a rescaling of the original problem with a smaller c_θ. Hence, both dispute incidence and duration increase from the calculations above.

Proof of Proposition 3. The union will select the threat that maximizes its expected payoff. Using the first order condition, yields the following equation for its expected payoff:

$$U(m) = (1-\alpha)x_\theta + \alpha E[v] + \frac{1}{2}(1-a_\theta)$$

$$\times\{(1-2\alpha)(m+c_\theta)(1-F(m)) + (m+c_\theta)(1-F(m)) - 2\alpha\int_l^m vdF(v) - 2\alpha c_\theta F(m)\}$$

$$= (1-\alpha)x_\theta + \alpha E[v] + (1-\alpha)(1-a_\theta)(m+c_\theta)(1-F(m)) - \alpha(1-a_\theta)(\int_l^m vdF(v) + c_\theta F(m))$$

$$= x_\theta + (1-a_\theta)(m+c_\theta)(1-F(m)) + \alpha(-x_\theta + E[v] + (1-a_\theta)(\int_l^m (m-v)dF(v) - m - c_\theta))$$

$$= x_\theta + (1-a_\theta)(m+c_\theta)(1-F(m)) + \alpha(a_\theta E[v] - x_\theta - (1-a_\theta)c_\theta + (1-a_\theta)(\int_l^h vdF(v) - m - \int_l^m (v-m)dF(v))).$$

$$\therefore U_\theta = x_\theta + (1-a_\theta)(m+c_\theta)(1-F(m)) + \alpha(a_\theta E[v] - b_\theta + (1-a_\theta)\int_m^h (v-m)dF(v))$$

The union will choose strike over holdout if and only if

$$U_H < U_S$$

$$\Rightarrow w^0 + (1-a_H)m_H(1-F(m_H)) + \alpha(a_H E[v] - w^0 + (1-a_H)\int_{m_H}^h (v-m_H)dF(v))$$

$$< x_S + (1-a_S)(m_S+c_S)(1-F(m_S)) + \alpha(a_S E[v] - x_S + (1-a_S)(\int_{m_S}^h (v-m_S)dF(v) - c_S))$$

$$\Rightarrow (1-\alpha)w^0 < (1-\alpha)x_S + (1-a_S)(1-\alpha)(m_S+c_S)(1-F(m_S)) - \alpha c_S(1-a_S)F(m_S)$$

$$+\alpha((a_S-a_H)E[v] + (1-a_S)\int_{m_S}^h vdF(v) - (1-a_H)\int_{m_H}^h vdF(v)) - (1-a_H)(1-\alpha)m_H(1-F(m_H))$$

$$\Rightarrow w^0 < x_S + (1-a_S)(m_S+c_S)(1-F(m_S)) - (1-a_H)m_H(1-F(m_H))$$

$$-\frac{\alpha}{1-\alpha}(c_S(1-a_S)F(m_S) + (1-a_S)\int_l^{m_S} vdF(v) - (1-a_H)\int_l^{m_H} vdF(v))$$

$$\therefore \tilde{w} = x_S + (1-a_S)(m_S+c_S)(1-F(m_S)) - (1-a_H)m_H(1-F(m_H))$$

$$-\frac{\alpha}{1-\alpha}(c_S(1-a_S)F(m_S) + (1-a_S)\int_l^{m_S} vdF(v) - (1-a_H)\int_l^{m_H} vdF(v)).$$

Proof of Proposition 4. Under Assumption S,

$$c_\theta = 0, \forall\theta \in \{S, H\}$$

$$\Rightarrow m_S = m_H = m(c=0,\alpha)$$

$$\therefore D(v) = 1 - (\frac{v}{m})^{1-2\alpha}$$

$$1 - F(m) = \int_l^m (\frac{v}{m})^{2-2\alpha} dF(v)$$

Therefore, dispute incidence and dispute duration for a given *v* is the same for either threat choice.

$$\tilde{w} = x_S + (a_H - a_S)(m(1-F(m)) - \frac{\alpha}{1-\alpha}\int_l^m vdF(v))$$

$$\Rightarrow \frac{d\tilde{w}}{d\alpha} = \frac{a_H - a_S}{(1-\alpha)^2}(-\int_l^m vdF(v) - (\alpha(1-\alpha)mf(m) - (1-\alpha)^2(1-F(m)-mf(m)))\frac{dm}{d\alpha})$$

$$= \frac{a_H - a_S}{(1-\alpha)^2}(-\int_l^m vdF(v) + (1-\alpha)(-mf(m) + (1-\alpha)(1-F(m)))\frac{dm}{d\alpha})$$

$$\frac{dm}{d\alpha} = \frac{\int_l^m (\frac{v}{m})^{2-2\alpha}\log(\frac{v}{m})\frac{f(v)}{f(m)}dv}{1-(1-\alpha)\int_l^m \frac{v^{2-2\alpha}}{m^{3-2\alpha}}\frac{f(v)}{f(m)}dv}$$

$$\Rightarrow (-mf(m) + (1-\alpha)(1-F(m)))\frac{dm}{d\alpha} = m\int_l^m (\frac{v}{m})^{2-2\alpha}\log(\frac{m}{v})dF(v)$$

$$\therefore \frac{d\tilde{w}}{d\alpha} = \frac{a_H - a_S}{(1-\alpha)^2}(-\int_l^m vdF(v) + (1-\alpha)m\int_l^m (\frac{v}{m})^{2-2\alpha}\log(\frac{m}{v})dF(v))$$

$$\gamma \equiv -\int_l^m vdF(v) + (1-\alpha)m\int_l^m (\frac{v}{m})^{2-2\alpha}\log(\frac{m}{v})dF(v)$$

$$\therefore \gamma < -\int_l^m vdF(v) + (1-\alpha)m\int_l^m (\frac{v}{m})^{1-2\alpha}dF(v)$$

$$v \in U[l,h] \Rightarrow$$

$$\gamma < \frac{1}{h-l}(-\int_l^m vdv + (1-\alpha)m^{2\alpha}\int_l^m v^{1-2\alpha}dv)$$

$$\Rightarrow \gamma < \frac{1}{h-l}(-\frac{1}{2}(m^2 - l^2) + \frac{1}{2}m^{2\alpha}(m^{2-2\alpha} - l^{2-2\alpha}))$$

$$\Rightarrow \gamma < \frac{-l^2}{2(h-l)}((\frac{m}{l})^{2\alpha} - 1)$$

$$\therefore \gamma < 0$$

When v is distributed uniformly then holdout is used more frequently as a threat choice as α increases.

$$\alpha = 0 \Rightarrow \gamma < -\int_l^m vdF(v) + m\int_l^m \frac{v}{m}dF(v)$$

$$\Rightarrow \gamma < 0$$

When the union is given a small positive share from zero share, then for any distribution of *v*, holdout is used more frequently as a threat choice as α increases.

Appendix B: Firms with Collective Bargaining Units and that adopted ESOPs.

Company Name	**Adoption Date**	**% ESOP**
3M Co	5/11/1989	3.4
Anheuser-Busch Cos Inc	4/27/1989	5.5
Armstrong Holdings Inc	6/21/1989	12.22
Ball Corp	5/26/1989	10.64
Bestfoods	5/17/1990	4.29
Brunswick Corp	4/4/1989	5.97
Chevron Corp	11/28/1989	4.2
Colgate-Palmolive Co	6/20/1989	9.14
Con-way Inc	5/22/1989	10.61
Conocophillips	6/16/1988	6.12
Cummins Inc	7/12/1989	11.08
Dennison Mfg Co	2/24/1976	5
Fairchild Industries Inc	1/31/1989	11.11
FMC Corp	4/14/1989	25.55
GTE Corp	7/17/1989	3.68
Hillshire Brands Co	4/28/1989	6
ITT Corp	5/10/1989	7
Kaisertech Ltd	3/27/1985	20
Knight-Ridder Inc	11/29/1988	14
Lukens Inc	6/29/1989	12.8
Mandalay Resort Group	1/25/1989	3
Maytag Corp	6/14/1989	3
Mobil Corp	12/18/1989	2.44
National Can Corp	2/20/1985	28.1
National-Standard Co	12/22/1987	29.87
Northeast Utilities	12/2/1991	8
Northrop Grumman Corp	11/16/1988	10
Officemax Inc	5/3/1989	12.89
Olin Corp	5/26/1989	6.31
PepsiAmericas Inc	1/23/1989	10
PPG Industries Inc	1/20/1989	14
Procter & Gamble Co	1/12/1989	5.38
Quaker Oats Co	1/18/1989	2.52
Rath Packing Co	9/24/1979	91.2
Republic Airlines Inc	7/3/1984	18
Ryerson Holding Corp	7/10/1989	9.58
SPX Corp-Old	5/17/1989	9.31
Stanley Black & Decker Inc	6/7/1989	7.01
Texaco Inc	12/12/1988	3.27
Textron Inc	6/8/1989	4.17
Tribune Media Co	4/5/1989	8.5
United Technologies Corp	7/3/1989	8
US Airways Group Inc-Old	8/14/1989	5
Verizon Communications Inc	5/26/1989	5.88
Xerox Corp	7/11/1989	11