UNION BARGAINING POWER IN AN EFFICIENCY WAGE ENVIRONMENT

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INTRODUCTION

The operation of labor markets differs fundamentally from that of other markets because the commodity traded, hours of labor time, cannot be separated from human beings. Unlike markets for goods or finances, the value of the commodity traded depends, in part, upon the opinions of the vessel which contains that commodity: the morale of the laborer affects the level of effort exerted within the space of an hour of labor. This in turn affects labor productivity, production costs and so on. Thus, in addition to their obvious economic properties, labor markets possess important social and political attributes: group interactions or opinions (norms) may influence individual motivation, and coalitions of participants, whose interests may differ, can affect important labor market outcomes.

Efficiency wage models, and effort-regulation (or shirking) models in particular [Bowles, 1985; Shapiro and Stiglitz, 1984], address the issue of individual motivation by explicitly considering the influence of the wage, or more generally the cost of job loss, on the worker's decision concerning the level of effort exerted within an hour of labor. Fair wage models developed by Akerlof [1982] and Akerlof and Yellen [1990] approach the social nature of labor markets by considering influence of reference groups and group norms on individual motivation.

The concept of contested exchange, developed by Bowles and Gintis [1990], directly addresses the political side of labor markets; it extends the effort-regulation argument to consider the exercise of power by employers. In nonunion settings, employers occupy the short-side of a non-clearing, effort-regulation, labor market: there is a shortage of the commodity which employers offer on the market—jobs. This in turn allows employers to exercise unilateral power over workers, by implicitly (or perhaps directly) threatening job loss.

In unionized labor markets, on the other hand, power is bilateral: both unions and employers possess bargaining power which, in turn, affects wage determination. Chamberlain and Kuhn [1986] argue persuasively that the bargaining power of each party is a function of its costs of meeting the other's terms — costs of agreement — relative to its costs of opposing the other party — costs of disagreement.

This paper offers a theoretical argument that a cost-based conception of union bargaining power, similar to Chamberlain and Kuhn's, is compatible with and operates within an effort-regulation/contested exchange framework. More precisely, I locate such bargaining power in an effort-regulation wage setting environment which is influenced by fair wage considerations and where union bargaining operates

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as a specific institutional manifestation of the principle of contested exchange. In this context, union bargaining attempts to alter the wage/effort relationship depicted in the effort model, primarily by affecting a firm's monitoring of effort and by influencing the "fair" wage norms established among groups of workers. The effort-regulation process, in turn, impacts collective bargaining because the cost of job loss, derived from the effort model, affects the costs of agreement and disagreement facing unions and companies. Moreover, the Bowles/Gintis definition of power fits into the Chamberlain/Kuhn concept of costs of disagreement.

Discussion begins by developing an effort-regulation model for nonunion workers. Next it turns to the influence of union bargaining power on the operation of the effort model, including fair-wage considerations. In so doing, this argument links the individual-based effort model with group-based concepts of wage norms and bargaining, without sacrificing the notion of individual rationality. The argument proceeds to develop a simple model of bargaining power based upon the relative costs of agreement and disagreement facing unions and management. The paper closes with a brief, illustrative application of the model to wage developments of the 1980s.

THE NONUNION EFFORT FUNCTION

Nonunion workers are assumed to have no bargaining power; an effort-regulation model describes their wage/employment relationship. This model employs standard competitive assumptions with three important qualifying assumptions, reflecting stylized facts of the labor process: (1) the amount of work actually performed cannot be fully specified *a priori* by contract; (2) workers prefer to work at a level of effort which, in the absence of monitoring, falls somewhat below that which would maximize a firm's profits, and (3) it is costly for firms to monitor workers' performance. Firms therefore face an effort enforcement problem which is endogenous to the operation of the labor market.[1]

Under these conditions, workers choose a level of work effort that maximizes their expected utility of income and work effort:[2]

$$u = u(y,e), \tag{1}$$

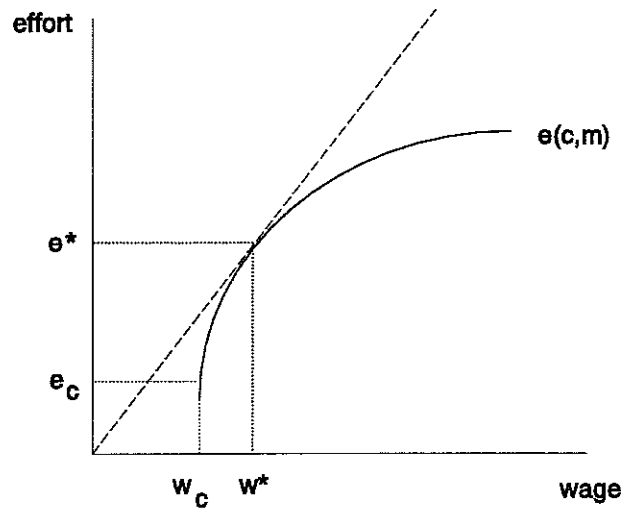
where u represents individual utility, y is income, e is work effort, $u_y>0$ and u_e is assumed to be negative over the relevant region.

Workers caught working at less than management's desired levels can be fired; they face a potential cost of job loss defined as

$$c = w - [jw_a + (1-j)b], \tag{2}$$

where c is the cost of job loss; w is the wage on the job; w_a is the wage on an alternate job; j is the probability of finding a new job during the relevant period (a function of the level of unemployment), and b is the unemployment benefit, assumed to be less than w. For simplicity it is assumed that $w=w_a$; in this case c is positive whenever j is less than one.

FIGURE 1
Effort Function for Nonunion Workers



c is the the cost of job loss; m is the level of monitoring, assumed constant; w_c is the market clearing wage (where c=0); e_c is the level of effort provided when cost of job loss is zero; w^* is the cost minimizing wage; e^* is the utility maximizing level of effort consistent with w^*.

It can be shown that the utility maximizing level of effort chosen by workers, e, is a function of the cost of job loss and the level of monitoring chosen by the firm [Bowles, 1985]:

$$e = e(m,c), \tag{3}$$

where m is the *level* of monitoring and both partial first derivatives are positive.

The cost of job loss offers workers an incentive to increase their effort above a purely voluntary level; monitoring adds an implicit threat of firing for sub-standard performance. Equation (3) will be referred to hereafter as the "effort function".

Figure 1 represents the effort function for nonunion workers. The initial (bottom) point on the curve shows the worker's voluntary level of effort (e_c); this level would ensue if the firm were to set its wage to yield no cost of job loss, at wage w_c. The positive slope of the effort function arises from the obvious positive relationship between the wage and the cost of job loss, *ceteris paribus*. Its concave shape reflects assumed diminishing marginal returns of effort to an increased cost of job loss.

Firms maximize profits subject to the constraints that workers impose on them via the effort function. To do this firms minimize costs of labor per unit of effort: they minimize $(w+p_m m)/e$, where p_m is the hourly cost of monitoring and m is the level of monitoring. Assuming, for simplicity, that the total costs of monitoring ($p_m m$) are constant, firms minimize w/e which is equivalent to maximizing e/w. This proposition is shown graphically in Figure 1: the cost minimizing wage (w^*) occurs at the tangency

of a ray from the origin (with a slope of e/w) with the effort function, $e(c,m)$.[3] Since effort (e) is a function of the wage (via c), this tangency simultaneously determines the equilibrium level of effort, e^*.

This graph illustrates several relevant points. First note that w_c represents the wage level which would clear the labor market and provide full employment.[4] Because firms face a work enforcement problem, resolved by paying a wage high enough to ensure a positive cost of job loss, a firm can increase its workers' effort by paying an above market-clearing wage; it will choose the wage that maximizes effort per wage dollar (w^*). The effort-regulation model, then, provides a microeconomic foundation, based upon rational behavior, for the existence of involuntary unemployment in a competitive economy.[5]

Note further that exogenous components of the cost of job loss determine the location of the effort function. External labor market conditions, such as rates of unemployment and levels of unemployment benefits, shift the effort function.[6] Changes in exogenous factors related to firms' ability to monitor, on the other hand, cause the effort function to rotate around its point of origin. Increases in costs of monitoring, for example, reduce the cost of job loss associated with each wage above w_c, without changing either w_c or e_c, rotating the curve outward.

The effort-regulation concept can be expanded to include effort and wage norms formed by groups of workers as described by Akerlof [1982]. Effort norms can influence the voluntary level of effort (e_c) as well as the relationship between the cost of job loss and effort [Bowles and Gintis, 1990; Weiss, 1990], causing the effort function in Figure 1 to shift.[7] Similarly, the presence of wage norms may cause the wage level associated with e_c to deviate from w_c, shifting the effort function, and possibly rotating it as well.[8]

According to Bowles and Gintis [1990], effort-regulation models operate within a context of contested exchange. Contested exchange occurs whenever the resolution of disputes which arise in the process of market exchange requires an enforcement mechanism which is, at least in part, endogenous to the operation of the market. Such mechanisms are necessary when contracts cannot completely stipulate the terms of an exchange. The effort-regulation model offers a case in point: because labor contracts cannot fully specify the level of effort, labor markets create an effort enforcement problem which must be resolved internally.[9]

In such situations, the party which occupies the short-side of a non-clearing market, in this case the employer, possesses "short-side" economic power. Bowles and Gintis define power (of party A) as follows:

> ... for A to have power over B, it is sufficient that, by imposing or threatening to impose sanctions on B, A is capable of affecting B's actions in ways that further A's interests while B lacks this capacity with respect to A. [1990, 173]

In an effort model, the implicit threat of job loss serves as a sanction which induces favorable behavior — more effort — from the worker. The worker, who occupies the long-side of the labor market, has no ability to retaliate since she or he is replaceable by an identical unemployed worker.[10]

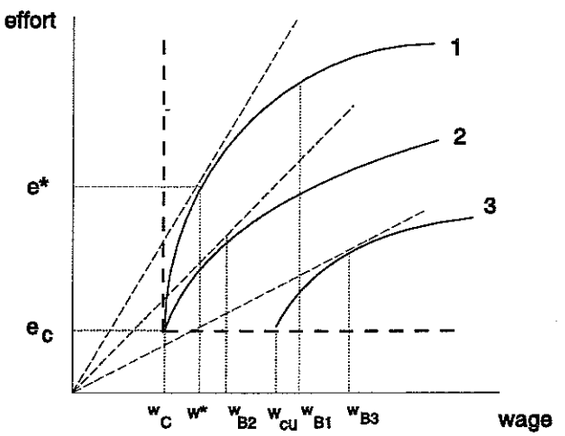
The groundwork is now prepared for bargaining to enter the picture. Collective bargaining offers workers a degree of countervailing power; it influences the model (and hence the wage) by rotating and/or shifting the effort function to labor's advantage.

BARGAINING AND THE EFFORT FUNCTION

Unionized firms maximize the effort/wage ratio subject to the additional constraint of union bargaining power. Collective bargaining allows workers to influence the entire effort/wage relationship by imposing costs on their employer (for reasons explained in the next section). Such influence may manifest itself in four fashions:[11]

1. If unions were to bargain solely over wages, without concern for monitoring or effort, bargaining would force the wage up along a given effort function (to w_{B1} on Curve 1 of Figure 2). Such a wage increase would, however, increase the cost of job loss and thus induce more effort, potentially decreasing worker utility and possibly offsetting the utility gain from a higher wage.[12] It is not clear that unions would use bargaining power to achieve such an outcome. Union political concerns similar to those discussed by Ross [1948] might, however, lead unions to pursue such goals under some circumstances.
2. Union grievance and arbitration procedures may impede management's detection of and/or punishment for sub-standard effort. This increases the costs of monitoring and/or reduces its effectiveness, lowering the cost of job loss for a given wage above w_c. Thus, in order to achieve any given level of effort (greater than e_c), unionized firms must pay wages above those of nonunion firms. This effect rotates the effort function to the right from its point of origin, pushing the cost-minimizing wage to w_{B2} as shown by Curve 2 in Figure 2.
3. Perhaps more importantly, unions may demand higher (than nonunion) wages for all possible levels of effort. In so doing, unions influence "fair" wage norms established among groups of workers, increasing the wage associated with each level of effort (including e_c) above that shown on the nonunion curve. This effect shifts the effort function to the right. This shift, however, need not be parallel. For example, a union wage norm differential may increase the more effort exceeds e_c, rotating the curve outward as well (see Curve 3 in Figure 2).
4. Finally, unions may modify effort norms established among groups of workers, altering the voluntary level of effort, e_c, and shifting the

FIGURE 2
Effort Function for Union Workers



c, w_c, e_c, w^* e^* are defined in Figure 1. w_{cu} is the reservation wage when union raises norm of "fair" wage; w_{bi} is the union-bargained wage for curve i. Curve 1: Effort function for wage bargaining only. Curve 2: Effort function where union raises costs of monitoring or reduces effectiveness of monitoring. Curve 3: Effort function where union raises concept of "fair wage." Note that union voice effects could shift and/or rotate any of the curves upward as well. Heavy dashed lines show region for possible shifts in effort function.

> entire curve upward or downward. For example, union voice effects [Freeman and Medoff, 1984] may increase e_c, elevating the curve to indicate more effort for any given wage. Again, the shift need not be parallel.[13]

Unions will use their bargaining power to achieve results (3), (2), and possibly (1). Voice effects may emerge as a by-product, reducing the negative impact on the firm somewhat.[14] The composite impact of bargaining on the effort function combines all rightward rotations and shifts with any voice-induced upward shifts and/or rotations; the curve lands somewhere in the region bounded by the two heavy dotted lines in Figure 2. The final location of the curve cannot be precisely determined without specifying the strength of the monitoring, wage norm and effort norm effects. In any case, successful bargaining will drive w_B above the nonunion wage, w^*.

Bargaining in this model, therefore, concerns union and company attempts to rotate and/or shift the effort function to their respective advantage and possibly to influence the placement of w_B along a given effort function. A more precise discussion of the determinants of bargaining power is now in order.

UNION BARGAINING POWER

Chamberlain and Kuhn's cost-based conception of bargaining power offers a foundation upon which a simple model of bargaining power can be constructed. They define bargaining power as: "The ability to secure another's agreement on one's own terms" [1986, 176]. For example, in a dispute between party A and party B, party A's bargaining power is defined as its ability to get party B to agree with specific terms that it wants — as opposed to having to submit to party B's terms. Notice that this definition defines bargaining power with respect to specific terms of agreement.[15]

There are two possible outcomes to any dispute: agreement and disagreement. The bargaining power of each party depends upon costs of agreeing with (or meeting) its opponent's terms relative to the costs of disagreement. More precisely, the bargaining power of party A over the terms of agreement increases as it becomes more costly for party B to oppose (disagree with) A's terms and decreases as it becomes more costly for B to meet (agree with) A's terms.[16]

Applying these concepts to unions and companies, the following bargaining power functions emerge:

$$BP_U = BP_U(CD_C/CA_C); \tag{4}$$

$$BP_C = BP_C(CD_U/CA_U); \tag{5}$$

where BP is bargaining power; CA_U is the expected cost to the union of agreeing with company terms, while CA_C is the expected cost to the company of agreeing with union terms. Similarly, CD_U and CD_C are the respective expected costs of disagreement.

An increase in CA_C makes it more difficult for the company to meet a given set of union demands, reducing union bargaining power over the specific terms of agreement. Conversely, as it becomes more costly for the company to oppose union demands, the union's power increases. Symmetrical arguments apply to the firm's bargaining power. All of these costs are envisioned *a priori*; they are expected rather than actual costs.

Each of the four arguments on the right-hand side of equations (4) and (5) are functions of specific economic variables. Starting with costs of agreement:

1. The costs to the union of agreeing with a given (low) company wage offer (CA_U) is a function of the elasticity of demand for union labor [Levinson, 1966]. Inelastic demand yields minimal expansion of employment for a given wage reduction, indicating high costs of agreement for the union.[17]
2. The cost to the company of agreeing with a (high) union wage (CA_C) is a function of market permissiveness [Levinson, 1966], which in turn depends upon company degree of monopoly power in the relevant market area (DMP) and upon company profits (π). Barriers to entry in

the relevant market area allow firms to accommodate union wage demands by raising prices without cutting deeply into sales, and they allow for above normal profits.[18] The ensuing rents may be shared with labor.

The following functions emerge:

$$CA_U = CA_U(ED_L), \tag{6}$$

$$CA_C = CA_C(DMP,\pi), \tag{7}$$

where ED_L is the elasticity of demand for union labor; *DMP* indicates the company's degree of monopoly power *within* the relevant market area, and π is company profits.

The costs of disagreement are more complicated and more interesting.[19] At least some of these costs are estimated with considerable uncertainty since neither side can fully anticipate the consequences of failing to resolve a dispute. This allows room in the bargaining process for "subjective elements" [Chamberlain and Kuhn, 1986] such as threats and misperception. Moreover, costs of disagreement fit directly into the Bowles and Gintis [1990] concept of short-side power: costs of disagreement are the mechanism through which the party on the short side of a non-clearing market imposes sanctions on the other party. Bargaining power thus alters the terrain of contested exchange by offering both workers and employers the ability to impose sanctions.

Costs of disagreement for the company constitute its estimated losses should the union decide to strike. These are a function of expected strike duration (*ESD*) and the company's dependence on its union workers.[20] Dependence varies inversely with the company's ease of replacing union workers. This in turn depends on the elasticity of demand for *union* labor in the relevant market (*EDL*), unemployment rates facing union workers in the relevant market area (U_U), and the institutional legal setting (*ILS*), e.g., the laws governing labor relations.[21]

Union workers face two potential costs of disagreement: costs of facing a strike from the union point of view and costs of layoffs or dismissal which may follow a labor dispute. In either case the institutional legal setting governing labor relations (*ILS*) influences the costs faced by workers. Whenever union workers expect to retain their jobs after a strike, union costs are a function of the expected strike duration (*ESD*), the size of the union strike fund (*USF*), and the expected wage loss during the strike, which is closely related to the cost of job loss.[22] Alternately, in a case where strikers may lose their jobs, the union's anticipated costs are a function of the above strike costs as well as the cost of job loss (c) and the union's estimated probability of dismissal (*PRD*), both of which are influenced by U_U.[23] Note that the uncertainty facing the union's estimation of *PRD*, combined with workers' dependence upon jobs for income makes this variable particularly susceptible to employer threats.

The following cost of disagreement functions emerge:

$$CD_C = CD_C(ESD,ED_L,U_u,ILS); \tag{8}$$

$$CD_U = CD_U(ILS,ESD,USF,PRD,c); \tag{9}$$

where *ESD* is expected strike duration; U_U is unemployment facing union workers in the relevant market area; *PRD* is the union's estimated probability of dismissal following a labor dispute; *ILS* is the institutional legal setting, and other terms remain as previously defined.

Given these cost relationships, the bargaining power of each side can be summarized with the following equations:

$$BP_U = BP_U[CD_C(ESD,ED_L,U_U,ILS)/CA_C(DMP,\pi)]; \tag{10}$$

$$BP_C = BP_C[CD_U(ILS,ESD,USF,PRD,c)/CA_U(ED_L)]. \tag{11}$$

The entire bargaining relationship can be summarized in one function which shows relative union bargaining power:

$$RBP_U = BP_U/BP_C = RBP_U(ED_L,U_u,PRD,c,DMP,\pi,USF,ESD,ILS); \tag{12}$$

where RBP_U represents relative union bargaining power and the other terms remain as previously defined.

Partial derivatives are negative with respect to the first four arguments, positive with respect to *DMP*, π and *USF*, ambiguous with respect to *ESD*, and undefined with respect to *ILS* since only discrete changes in *ILS* are possible. Obviously changes in *ILS* which favor labor raise RBP_U and vice versa.

Returning to the efficiency wage/contested exchange framework, union bargaining power offers labor a countervailing power to company short-side economic power by enabling workers to impose sanctions on their employers. Union bargaining power rotates and/or shifts the union effort function to the right of the nonunion function and may also move the bargained wage above the point of tangency on a given function. These effects push the union wage above the profit maximizing nonunion wage (w^* on Figures 1 and 2). Naturally, any factors which increase (decrease) RBP_U drive w_B further above (closer to) w^*.

APPLICATION TO WAGE DEVELOPMENTS OF THE 1980s

Each of the elements in the RBP_U function may, in turn, respond to current economic conditions. The following discussion briefly suggests how the model can be applied to wage developments of the 1980s. This is intended as an illustration of the potential applicability of the model, not as a serious empirical study.

During the 1980s the following relevant developments occurred: (1) a shift in the institutional setting exemplified by the Reagan National Labor Relations Board, the

breaking of the air traffic controllers' strike, and by increased employer willingness to confront unions [Edwards and Podgursky, 1986]; (2) declining union coverage nationally and particularly in mining and manufacturing; (3) a dramatic increase in import penetration, predominantly in the manufacturing sector, and (4) a decline in both relative and absolute employment for the goods-producing sector of the economy and for manufacturing in particular.[24]

All four developments reduce RBP_U via the arguments of equation (12).

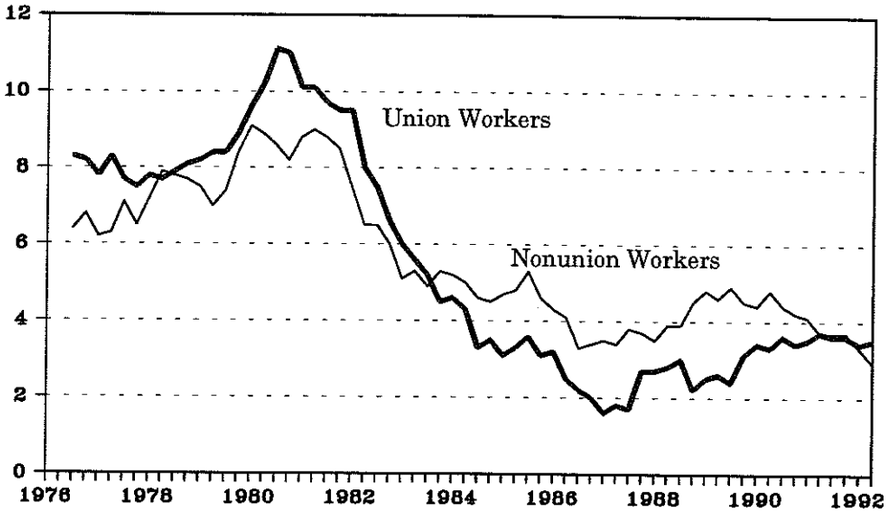
1. The shift in *ILS* is clearly adverse from labor's point of view; RBP_U falls.
2. Decreasing union coverage increases the elasticity of demand for union labor (ED_L), and probably lowers union strike funds (*USF*). Both effects lower RBP_U.
3. The rise in import penetration has two direct effects: it reduces the level of domestic union coverage in the relevant market area, causing ED_L to rise, and it signifies a reduction of entry barriers, diminishing company monopoly power (*DMP*) and possibly lowering profits (π). In addition, rising import penetration lends credibility to employer threats of dismissal during strikes (or disputes) causing *PRD* to rise. All of these effects reduce RBP_U.
4. Declining employment in relatively highly unionized industries increases union unemployment (U_U), reducing employer dependence upon employed workers. Employer threats of dismissal gain credibility, increasing *PRD*. The cost of job loss for remaining employees (c) rises. All of these effects further erode RBP_U.

The model predicts that the drop in RBP_U will rotate and/or shift the effort function inward and possibly push w_B closer to the tangency point along a given effort function. These effects move the bargained wage, w_B, closer to the nonunion wage, w^*. This model predicts that these four developments of the 1980s should have reduced the wage differential between union and nonunion workers.

Figures 3 and 4 offer data which is at least consistent with this prediction. These figures compare rates of growth for total compensation (Figure 3) and wages and salaries (Figure 4) for union workers with those for nonunion workers, indicating a narrowing of the union/nonunion wage differential beginning in the early 1980s. For both sets of data, the union growth rate exceeded nonunion growth prior to 1983, fell behind during 1983, and remained below the nonunion growth rate for the remainder of the decade.

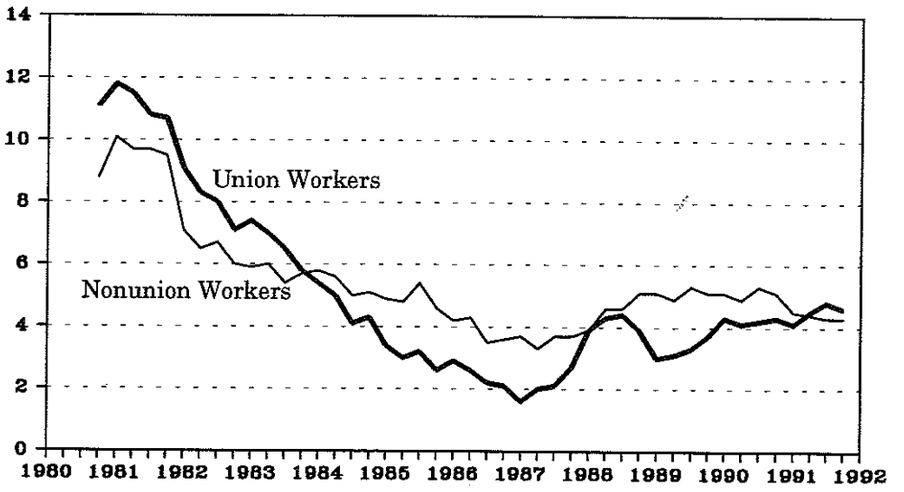
While this evidence is by no means conclusive, it at least suggests that this model of union bargaining power which operates in an efficiency wage environment is capable of generating interesting hypotheses. The proposition that key economic developments of the 1980s — institutional changes, declining unionization, rising import penetration and declining employment in highly unionized sectors — worked to reduce union bargaining power and thereby slowed the rate of growth of union wages relative to nonunion wages merits further investigation.

FIGURE 3
Annual Growth of Wages and Salaries for Private Industry Union and Nonunion Workers, 1976-91



U.S. Department of Labor [1992].

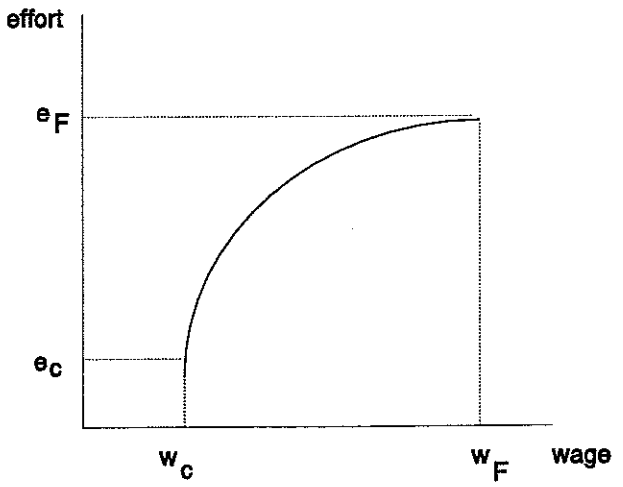
FIGURE 4
Annual Growth of Total Compensation for Private Industry, Union and Nonunion workers, 1980-91



U.S. Department of Labor [1992].

APPENDIX

FIGURE 5
Effort Model with Fair Wages



c, w_c, e_c, w^* e^* are defined in Figure 1. w_F is the "fair" wage; e_f is the level of effort associated with w_F.

NOTES

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1. I also assume that workers are risk neutral. Note that assumptions (1) and (3) are specific exceptions to the standard competitive assumption of perfect information. Joseph Stiglitz refers to shirking models as a form of "information economics" [Stiglitz, 1993]. Assumption (2) extends the domain over which utility maximization operates to include effort (in addition to income and leisure). Note further that assumption (2) does not require that workers dislike work; it requires only that, in the absence of monitoring, workers' utility maximizing level of effort is less than that which would maximize the firm's profits.

   Alchain and Demsetz [1972] identify the same enforcement problem and argue that it arises from the nature of team production. They proceed to argue that the structure of property rights (profit vs. non-profit status) affects the incentives of managers to monitor and thereby minimize shirking. While much of their argument could be applied to the effort model, they do not specifically develop such a model, nor do they focus on the relationship between wages, the cost of job loss and incentives to provide effort. Their concept of teamwork, and their notion that loyalty might mitigate the shirking problem may also be compatible with the gift giving model of Akerlof [1982].
2. This model is derived from Bowles [1985]; it also appears in Bowles and Gintis [1990]. Similar models appear in Shapiro and Stiglitz [1984] and Bulow and Summers [1986], though these two models posit shirking as a yes/no decision, not allowing for a continuous wage/effort relationship. See also Weiss [1990] and Akerlof and Yellen [1986].
3. The ray from the origin is an isoprofit curve. Bowles and Gintis [1990] note that the firm here is using price leadership in the Stackelberg sense. The workers' effort function is equivalent to the price follower's response function.

4. Note that w_c is not a Walrasian market clearing wage, since assumptions 1-3 indicate that this model does not operate in a Walrasian world. It is impossible, therefore, to tell whether w^* is above or below a hypothetical Walrasian market clearing wage. Note, however, that w_c is a reservation wage in the sense that the worker will refuse employment at any wage below w_c.
5. Lawrence Summers [1988] argues that efficiency wage models provide a microeconomic foundation for Keynesian unemployment.
6. An increase in unemployment benefits (b), for example, would increase w_c and lower the cost of job loss for every wage above w_c (without changing e_c), shifting the function out to the right. Similarly, an increase in aggregate unemployment would shift the curve inward.
7. Such a shift need not be parallel; the effort function may rotate as well.
8. Akerlof and Yellen [1990] develop a fair wage model which formalizes the concept of wage norms. While they do not intend their model to serve as an adjunct to an effort regulation model, their model would develop an effort function similar to that shown in Figure 1 if one were to assume diminishing returns of effort to increases in the actual wage (w) as w approaches the fair wage (w_F). This is a possibility that they allow for, but do not develop [ibid., 269]. In this case the effort function would originate at a maximum attainable effort level (at point w_F,e_F; where e_F is effort provided at the fair wage). It would extend downward in a concave shape similar to that shown in Figure 1 (see Figure 5 in Appendix). Changes in exogenous factors which affect w_F would shift the function and perhaps also alter its slope.

   Note that w_c in the model described here is a reservation wage in the sense that the worker will refuse employment at any wage below w_c. This argument suggests that norms concerning a "fair" wage may move the reservation wage for a group of workers above w_c; in such a case the effort function in Figure 1 shifts to the right. This interpretation is consistent with the notion of wait unemployment.
9. A traditional (i.e., pre-efficiency-wage) neo-classical labor market assumes that enforcement is *exogenous* to the operation of the market [Bowles and Gintis, 1990].
10. Bowles and Gintis [1990] argue that the employment rent is the price the employer pays to maintain power; the rent is necessary because workers are autonomous (they can decide how hard to work); it is not a reflection of worker economic power. For a thorough discussion of the relationship between efficiency wage theory, radical political economy, and neoclassical labor economics, see Rebitzer [1993].
11. I assume here that unions strive to maximize the utility of the union membership. Because I assume homogenous workers, the concept of median voter analysis [Kaufman and Martinez-Vasquez, 1987] is not applicable here. Nonetheless the median voter concept that unions are constrained by both potential employment loss and potential costs of strikes is consistent with the analysis presented in the section on union bargaining power below.
12. If all workers, economy-wide, are assumed to be homogenous, and if the labor market were to clear, the effort function would be an indifference curve. Because the cost of job loss imposes a cost to exit on the worker (a barrier analogous to entry barriers in the Stackelberg model), it is not clear that the utility loss from increased effort is exactly equal to the utility gain from the wage increase. Moreover, even if the utility tradeoffs are equal along a given effort function, if the model were to assume further that only workers in an individual firm are homogenous, but that they differ from workers at other firms, it is possible that the utility losses and gains created by movement along a given effort function do not completely offset each other. In this case, the effort function would represent an envelope of effort/wage possibilities, summing a series of effort functions for categories of workers (different firms). The firm effort functions could have a tighter curvature (i.e., the second derivative d^2e/d^2w would have a larger absolute value) than the envelope, indicating that upward movement along the envelope would increase utility for a given category of workers. In either case, there may be some, second-order, utility gain to workers for moving upwards along an effort function.
13. Voice effects will rotate the curve when they manifest themselves through the monitoring relationship and will shift it when they alter the voluntary level of effort, e_c. Stafford and Duncan [1980] and Duncan and Stafford [1982] link union productivity effects to the presence of public goods in the working environment at the individual firm. Hirsch [1991] finds a positive relationship between unionization and firm productivity possible, but not conclusively. Union voice effects may reduce the degree of class conflict. An increase in e_c suggests that workers have altered their utility functions in a manner which shifts the effort function in a direction preferred by the firm. This notion

is fully compatible with Akerlof's notion of gift exchange [1982]. Moreover, it fits into conceptions of labor peace discussed by Edwards and Podgursky [1986], among others.

14. The final union level of effort may land either above or below the nonunion e^*, but it is highly unlikely that the union ratio e/w will lie above that for nonunion firms. If it were, we would not expect to observe management opposition to unions.
15. This definition takes the terms of the conflict, the concrete proposals over which there is disagreement, as given. An alternative, and more complicated, conception might envision bargaining power as influencing the parameters of conflict as well as what happens within those parameters. This issue, however, will not be addressed here.
16. For example, if it costs a company $2.00 per hour to meet union demands, a rational company will settle for the union's terms whenever the costs of disagreement, such as bearing a strike (for the relevant time period, discounted) exceeds $2.00 per hour. More generally, the more disagreeing with union demands costs relative to the costs of meeting such demands, the more likely it is that the company will settle for something approximating the union's terms.
17. Levinson [1966] notes further that CA_U may also be a function of political relationships between unions. The costs to a union of failing to achieve a "pattern" bargain may be very high. In such a case company bargaining power is reduced. This case, though quite plausible, will not be considered in the present discussion.
18. Levinson [1967] stresses the importance of competitiveness in the relevant market area as opposed to aggregate market competitiveness. Unions can secure high wage gains in industries which are considered to be competitive on a national level, such as construction and trucking, if competition within specific unionized areas is limited by geographical barriers to entry.
19. Indeed some bargaining models focus on the dependency of each side on the other [Bacharach and Lawler, 1981; Osborne, 1984].
20. The economics literature traditionally treats costs of disagreement between unions and employers as the costs to either side of bearing of a strike [Hicks, 1968; Chamberlain and Kuhn, 1986; Levinson, 1966]. It is possible to expand this notion to include the costs of slowdowns and various morale problems which companies may face in labor disputes. Note that any resulting morale problems may shift an effort function downward by lowering the voluntary level of effort e_c.
21. Regional and occupational unemployment rates may influence U_U. A number of other possible variables could affect company costs of disagreement, such as the degree of solidarity among the union members and unique skills or knowledge of employees. Lindbeck and Snower [1990] argue that unique skills and knowledge contribute to employee "insider power." Treatment of these considerations awaits a future paper.
22. Workers' income loss for the duration of the strike can be expressed by an equation which resembles equation (2): $cs = w - (j'w + (1-j')b')$, where cs is the income loss of striking, j' is the probability of finding alternate employment during the strike, and b' is the strike benefit. If the ratios j'/j and b'/b are constant, income loss for the duration of the strike is directly proportional to the cost of job loss. Schor and Bowles [1987] provide evidence that an increased cost of job loss reduces the occurrence of strikes.
23. Note the cost of job loss is itself an indicator of workers' dependency on the company. The cost of job loss, then, plays a dual role: it affects the level of effort on a given effort function and it affects union bargaining power.
24. Between 1979 and 1989 merchandise imports increased from $212 billion to $477 billion. Over this period, goods-sector employment dropped from 26.5 million to 25.3 million and manufacturing employment fell from 21.0 million to 19.4 million. For the service sector, on the other hand, employment rose from 63.4 million to 83.0 million over the same period [Council of Economic Advisers, 1992].

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