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Source: *ILR Review,* Vol. 34, No. 4 (Jul., 1981), pp. 489-509
Published by: Sage Publications, Inc.
Stable URL: http://www.jstor.org/stable/2522473
Accessed: 29-03-2018 11:30 UTC

JSTOR

THE EFFECT OF UNIONISM
ON FRINGE BENEFITS

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This study analyzes the impact of unionism on fringes paid to production workers, using data on individual establishments. It compares fringe expenditures in establishments having the same level of compensation per hour and finds that unionism raises the share of compensation allotted to fringes, particularly to pensions, vacation pay, and life. accident, and health insurance. In addition, since unionism also raises the straight-time wage rate, itself a prime determinant of expenditures on fringes, unionism has a very sizeable impact on total fringe expenditures, as well as on the fringe share of compensation. The union fringe effect exceeds, in percentage terms, the union wage effect and is sufficiently large to suggest that standard union wage studies understate the union effect on total compensation. The study also compares the fringe expenditures of production and non-production workers within the same establishment, controlling for within-establishment pay policies. The findings suggest that the presence of a union among production workers in an establishment may have a sizeable spillover effect on the fringes paid nonproduction workers in that establishment.

DOES collective bargaining alter the composition of the compensation package received by workers? Is the fraction of the labor cost spent on "fringe benefits" higher in union than in nonunion firms, and if so, why? How does the impact of unionism on fringes compare to its impact on wages, which is the focus of most studies of the union effect on pecuniary rewards?

Despite considerable public attention

given to the fringe benefits negotiated by major unions and numerous studies of the effect of unions on wages, the impact of collective negotiations on the composition of the wage bill has received relatively little professional attention. While most labor economists believe that unions increase fringe benefits, the only substantive empirical analysis of the determination of fringes found little evidence of a sizeable union impact.[1] With firm size and wages, among other factors, held fixed, Rice's regressions across industries yielded generally insig-

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[1]Robert Rice, "Skill, Earnings and the Growth of Wage-Supplements," *American Economic Review,* Vol. 54, No. 2 (May 1966), pp. 583 – 93.

nificant coefficients on the percentage organized. Reviewing the evidence, Reynolds concluded that much of the increase in fringes in recent years was probably attributable to "voluntary employer action" and that "the specific influence of unionism is hard to determine."[2]

This study uses more detailed and disaggregated data from individual establishments to show that, contrary to Rice's results using gross cross-industry data, unionism does significantly raise the fringe share of compensation and, in fact, unionism raises fringes by a greater percentage amount than it raises wages. As a result, it is argued, the union impact on total compensation is noticeably understated by standard union wage equations.

The main source of data is the Expenditures for Employee Compensation (EEC) survey of the Bureau of Labor Statistics, which contains statistics on the compensation of office and nonoffice (production) workers in private nonfarm establishments.[3] By providing information on two types of workers within an establishment, one of whom (the office worker) is rarely organized, the EEC data permit some methodological advances in the estimation of union effects. *Within*-establishment differences in compensation can be used as units of observation, eliminating the potential effects of unobserved firm factors in much the same way as a comparison of brothers or twins eliminates family background effects in the analysis of earnings among individuals.[4] In addition, it is possible to exploit the establishment data to estimate models in which unionism of production workers induces firms to raise the fringes paid nonproduction workers within

the establishment. These methodological innovations have a substantive effect on the magnitude of the estimated impact of unionism.

Unionism and Fringe Benefits

The potential impact of unionism on the amount of establishment expenditures on fringe benefits can be decomposed into two separate effects: the effect of unionism on fringes that results from unions possibly altering the fringe share of a given compensation package; and the effect of unionism on fringes that results from unions raising the total level of compensation, which itself invariably alters spending on fringes. Formally let:

F = expenditures on fringes, defined broadly as compensation other than direct wages and salaries, per hour;

W = wages and salaries, per hour;

C = total compensation $(F + W)$, per hour;

X = diverse factors that affect fringe spending; and

U = 0 − 1 variable for whether the unit is organized.

Then, from the standard regression formulae, our decomposition is:

$$(1) \qquad b_{FU \cdot X} = b_{FU \cdot CX} + b_{FC \cdot UX} \, b_{CU \cdot X}$$

where

$b_{FU \cdot X}$ is the total effect of unionism on fringes (conditional on controls X),

$b_{FU \cdot CX}$ is the union effect on fringes, holding compensation fixed (therefore, the effect on the fringe share of compensation),

$b_{FC \cdot UX}$ is the effect of compensation on fringes, holding unionism fixed, and

$b_{CU \cdot X}$ is the effect of unions on compensation.

Differentiating between the union impact on the share of compensation going to fringes $(b_{FU \cdot CX})$ and the impact operating via the level of compensation is important because the forces likely to determine the fringe share will differ from those that determine the level of compensation and its associated fringe spending. Whereas the impact of unionism on total compensation (fringes included) is readily analyzable in the context of the standard "monopoly"

[2]Lloyd G. Reynolds, *Labor Economics and Labor Relations* (Englewood Cliffs, N.J.: Prentice-Hall, 1974), pp. 216−17.

[3]For a detailed discussion of the survey, see U.S. Bureau of Labor Statistics, *Handbook of Methods*, Bulletin 1910 (Washington, D.C.: G.P.O., 1976), pp. 175−83.

[4]Gary Chamberlain, "An Instrumental Variable Interpretation of Identification in Variance-Components and Mimic Models," in Paul Taubman, ed., *Kinometrics: The Determinants of Socio-Economic Success Within and Between Families* (Amsterdam: North Holland Publishing Co., 1971), p. 197.

model of unionism in which union market power is used to raise pecuniary rewards to workers, the impact of unionism on the fringe share is not so readily explicable. An increase in the fringe share of compensation necessarily means a reduction in the wage share, which directs attention to the forces that might lead unionized workers to be more (or less) willing than nonunion workers to forgo dollars of wages for fringes. This in turn requires an understanding of how unions amalgamate individual workers' preferences into the group preferences that are brought to the bargaining table.

Union Impact on the Fringe Share

The division of a dollar of compensation per hour between fringe benefits and straight-time pay can be fruitfully analyzed in terms of the *supply price* of fringes, defined as the wage workers would forgo to obtain the benefit. The higher the supply price facing an employer, the greater is the probability that the employer will provide the fringes, the greater is the amount likely to be spent on the fringes that are provided, and, as a consequence, the greater is the fringe benefit share of compensation.

There are several reasons for expecting trade unionism to raise the effective supply price of fringes. The most important one is that unions are political as well as economic institutions; therefore their behavior must be consonant with the desires of a majority of the workers. In a world in which some workers can be viewed as permanently attached to firms (for reasons of transaction costs of mobility), while others are more mobile or marginal, the union will give greater weight to the preferences of the older, relatively permanent employee than to the younger, more mobile one. This differs from a competitive market in which the desires of the marginal employee set the supply price. In the context of the median voter model, the union would represent the tastes of the median worker as opposed to the marginal worker. If, then, as seem reasonable, older presumably less mobile workers have greater desires for fringes,[5] the

supply price of fringes will be greater under collective than individual bargaining. Hence, firms that engage in collective bargaining are likely to allot a greater share of compensation to fringe benefits.

Formally, I represent the postulated differential attachment of workers to firms by an upward-sloping supply schedule dependent on wages and fringes:

(2) $L(W,F)$ where $L_W > 0$, $L_F > 0$,

where L = the number of workers supplied to the firm. $L_W (L_F)$ is the partial derivative of L with respect to $W (F)$. Throughout this paper the subscript form represents the partial derivative of the relevant variable with respect to the subscript variable.

The inverse function of Equation 2, relating wages to fringes and employment, defines the *supply price of fringes:*

(3) $W(F,L)$, $W_F < 0$, $W_L > 0$.

Cost minimization by the firm faced with this supply price requires, for any given L, an interior solution F^* such that a dollar of fringes reduces the marginal wage cost of labor by one dollar:[6]

(4) $W_F(F^*,L) = -1$.

The firm will provide a given fringe F_i (where i denotes the ith fringe) when at the optimal value F_i^* the reduction in wages exceeds expenditures on the fringe and the average fixed cost (C/L) of instituting the program:

(5) $W(0,L) - W(F_i^*,L) \geq F_i^* + C/L$,

where $W(0,L)$ is the wage paid in the absence of the fringe and $W(0,L) - W(F_i^*, L)$ is the savings of wages from introducing the fringe. According to Equation 4, expenditures on fringes in a nonunion setting depend on the marginal evaluation of fringes by the marginal (L^{th}) worker, $W_F(F,L)$. According to Equation 5 initiation of a particular benefit depends on the change in wages $W(0,L) - W(F_i^*,L)$ exclusive of any

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[5]For evidence see Stanley M. Nealey, "Pay and Benefit Preference," *Industrial Relations,* Vol. 3, No. 1 (October 1963), pp. 17–28.

[6]If C is the fixed cost of instituting the program, the total cost function $TC = C + WL + FL$. Differentiation with respect to F yields $W_FL + L = 0$. This model assumes that the firm is indifferent between paying fringes or paying hourly rates. See pages 492–93, however, for a discussion of why firms might prefer one form of compensation over the other.

potential inframarginal "worker surplus."

By contrast, the supply price set by the union will depend on the operation of the union as a political entity and the resultant union maximand. In this paper I consider two schematic models of union behavior: a median voter model and an optimizing cartel model. Under both models, and reasonable mixtures or variants thereof, it can be demonstrated that the supply price of fringes will be higher under unionism.

Consider first the case in which the union seeks to maximize the preference function of the median worker. If all workers are ordered from 0 to L in terms of greatest to least attachment to the firm, the supply price function will be $W(F,L/2)$.[7] Cost minimization by the union firm leads to the interior solution, F^m, that satisfies:

$$(6) \qquad W_F(F^m, L/2) = -1$$

and to the condition for introducing the fringe, F_i, of

$$(7) \quad W(0,L/2) - W(F_i^m, L/2) > F_i^m + C/L.$$

If, as assumed, marginal workers have less desire for fringes than inframarginal workers, $W_F(F,L/2) < W_F(F,L)$. As a consequence $F^m > F^*$ and the union firm will spend more on fringes and be more likely to introduce particular fringe programs than the nonunion firm.

As an alternative, consider the behavior of a union that, for reasons of logrolling and internal redistribution of benefits among members, operates like an optimizing cartel. Such a union will be assumed to maximize total worker surplus, defined as the area above the supply curve:[8]

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[7]The assumption that ordering workers by attachment to the firm also orders them by preferences for fringes is the key assumption in the analysis. In the model all workers of the same tenure with a firm are treated as if they had the same preference for fringes, making the difference in tenure the sole cause of different desires. When worker preferences for fringes differ for reasons unrelated to attachment to the firm, the competitive market will produce different sets of compensation packages, with more fringes in some establishments than in others to attract those preferring fringes. Variation of this type is ignored to concentrate on the situation in which preferences differ by potential mobility or tenure in the firm.

[8]For a detailed discussion of this maximal in the context of work quality, see W. Kip Viscusi, "Unions,

$$(8) \qquad L_W(F,L) - \int_0^L W(F,X)dX.$$

Maximization requires an interior solution, F^C, that satisfies:

$$(9)\ W_F(F^C,L) - 1/L\ \int_0^L\ W_F(F^C,X)\ dX = 0,$$

where $1/L\ \int_0^L\ W_F(F^C,X)$ is the average supply price of the fringe, and the condition for providing the fringe, F_i, is:

$$(10)\ \ 1/L \int_0^L\ W(F_i,X)\ dX\ > F_i^C + C/L.$$

When the average supply price is greater (in absolute value) than the marginal supply price, F^C will exceed F^*. When the "average surplus," $1/L\ \int_0^L\ W(F_i, X)\,dX$, exceeds the saving in wages $W(0,L) - W(F_i, L)$, the union firm will be more likely than the nonunion firm to initiate particular programs. Both of these conditions hold when $W_{FL} < 0$, i.e. when, as postulated, marginal workers have less desire for fringes than inframarginal workers.

Although both the median voter and optimal cartel models represent polar cases, which ignore the numerous complexities of union behavior, they do shed light on the difference between the supply prices of fringes under collective and individual bargaining. The prediction of greater allocation of funds to fringes under unionism does not depend on the precise model of union behavior but rather on the broad principle that, as political institutions, unions are likely to weigh more heavily than will nonunion firms the preferences of inframarginal workers who tend to be especially desirous of fringes.

Additional Routes of the Union Effect

Trade unionism is likely to raise the supply price of fringes in several other ways as well. First, by increasing the length of the attachment between workers and firms (raising job tenure and lowering quit rates)[9] unionism will increase the likelihood that workers will receive deferred fringes such as

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Labor Market Structure, and the Welfare Implications of the Quality of Work," *Journal of Labor Research*, Vol. 1, No. 1 (Spring 1980), pp. 175–92.

[9]See Richard B. Freeman, "The Exit-Voice Tradeoff in the Labor Market: Unionism, Job Tenure, Quits, and Separations," *Quarterly Journal of Economics*, Vol. 94, No. 4 (June 1980), pp. 643–73. Note that the estimates given are corrected for the likely impact of fringes on attachment, so that the reduction in exit can be taken as exogenous to the current problem.

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nonvested pensions or life insurance bene-
fits. As a result, the value of these fringes to
workers will be greater under unionism,
raising the willingness of workers to forgo
wages to obtain these fringes.

Second, in sectors of the economy in
which workers are attached to occupations
rather than employers (construction, for
example), or in which enterprises are short-
lived (the garment trade), or in which firms
are relatively small (trucking), unions pro-
vide the type of large permanent market
institution needed to operate most fringe
programs. Without unions (or some com-
parable structure) the probability that
workers would receive deferred benefits
would be too small and the employer's start-
up costs too high for most benefits to be
economically sensible. What is needed are
multi-employer programs, of the type in-
itiated by unions in the aforementioned
industries, which vest benefits across em-
ployers and provide the size to reduce aver-
age set-up costs.[10] In just such a manner
did unions operate as fraternal benefit
societies years ago.

Third, as argued by Freeman, Hirschman,
and Nelson, unions may elicit more accurate
information about workers' preferences for
fringes than can be gained from individual
bargaining.[11] Conceptually, the adversary
relation between employers and employees
—the fact that the level as well as allocation
of the compensation package is at stake—
argues for circumspection by workers in
providing their employer with information
about their preferences. If employers had
complete knowledge of employee preference
functions, they would seek to extract all of
the worker surplus, striking a bargain that
would leave workers at their minimum

acceptance point.[12] This provides a motiva-
tion for nonunion employees to withold
information about preferences. As the agent
of workers, on the other hand, unions
should obtain a more accurate revelation of
preferences through their internal process of
bargaining over the pay package that will
be acceptable to the majority of members; in
this way, unions may play an especially
important role in eliciting employees' de-
sire for fringes.

Empirically, there is some evidence that
information factors are important in differ-
entiating union and nonunion firms in the
fringe area. Lester's 1967 review of surveys
of managerial perceptions of worker pref-
erences found "limited data. . .that workers
value benefits more highly compared to
wages than employers believe their workers
do."[13] Lawler and Levin's study of union
leaders concluded that they are generally
good predictors of the members' preferences
for various compensation packages, al-
though they also seem to have understated
the desire for fringes.[14] It is therefore reason-
able to expect more accurate information on
these employee preferences to emerge from
collective negotiation, despite bargaining
tactics, than from exit interviews, question-
ing of individual workers, and similar
methods that provide workers little incen-
tive to respond accurately.[15]

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[10]In the academic setting the TIAA-CREF system
provides an alternative institution for instituting a
multi-enterprise pension program.

[11]Richard B. Freeman, "Individual Mobility and
Union Voice in the Labor Market," *American Eco-
nomic Review*, Vol. 66, No. 2 (May 1976), pp. 361–68;
Albert Hirschman, "Some Uses of the Exit-Voice
Approach—Discussion," *American Economic Re-
view*, Vol. 66, No. 2 (May 1976), pp. 386–89; and
Richard L. Nelson, "Some Uses of the Exit-Voice—
Discussion," *American Economic Review*, Vol. 66, No.
2 (May 1976), pp. 389–91.

[12]Wassily W. Leontief, "The Pure Theory of the
Guaranteed Annual Wage Contract," *Journal of
Political Economy*, Vol. 54, No. 1 (February 1946),
pp. 76–79. This article on the guaranteed annual
wage makes the argument using the standard Edge-
worth box.

[13]Richard Lester, "Benefits on a Preferred Form of
Compensation," *Southern Economics Journal*, Vol.
33, No. 4 (April 1967), p. 494.

[14]Edward E. Lawler III and Edward Levin, "Union
Officers' Perception of Members' Pay Preferences,"
Industrial and Labor Relations Review, Vol. 21, No. 4
(July 1968), p. 517.

[15]The information argument can be investigated
further by analyzing the extent to which, other factors
fixed, union negotiated fringes spillover to nonunion
firms. Since the nonunion firm will imitate the union
employer only if workers prefer the allocation of the
wage bill in the union sector, the existence of a positive
spillover could be taken as evidence of a better in-
formation flow. If there were no additional informa-
tion about preferences in the union package, non-
union firms would not be influenced by the *compo-
sition* of the union settlement.

Fourth, the complexities involved in evaluating the costs and prospective benefits of modern fringe benefits may make workers more willing to accept fringes when they have a specialized agent, like a union, evaluating and monitoring employer claims and programs.[16] Significant investments in knowledge that lie beyond the purview of individual workers are needed to judge the true cost and future benefits of alternative compensation packages. Union lawyers, actuaries, and related experts are one institutional mechanism by which workers can obtain the expertise to bargain over these diverse benefits.

Finally, the fact that most fringe benefits have been ruled by the courts to be mandatory bargaining topics, whose lack of resolution can lead to impasses and strikes, is also likely to spur programs and expenditures in the union sector. Prior to the 1949 court rulings on pensions and group health insurance,[17] companies often argued that such benefits were "management gifts" and not subject to negotiation. Since then fringes have become a major issue in almost all collective negotiations. While agreement need not be reached on these (or other) mandatory topics, the rulings have presumably impelled more serious negotiations and provisions than would have occurred if fringes had been ruled permissive topics.

In sum, unionism is likely to increase the number of fringes available to workers and the employer's expenditures on these programs. It is also likely to have sizeable effects on deferred benefits favored by older workers and benefits with high fixed costs, and to have especially sizeable effects on small

firms in industries with unstable employer-worker relations.

Other Determinants of Fringes

The fringe share of the wage bill is likely to depend on several economic factors in addition to unionism, the influence of which must be held fixed in empirical work. Among the most important are:

Overall level of compensation. Fringes are likely to have a positive income elasticity and thus be correlated with total compensation per hour. If the elasticity exceeds one, the fringe share of the wage bill will also be related positively to total compensation.

Specific human capital. By creating an incentive for permanent employment relations, specific human capital will increase the fringe share of compensation. Workers will have a higher supply price for fringes because of the likelihood of remaining with the firm. Firms will use deferred fringes, notably pensions, to discourage quitting by the specifically trained.

Firm size. Two factors are likely to lead to greater fringe expenditures in larger than in smaller firms. First, given any fixed costs of instituting or operating a given program or any costs per worker that decline with number of workers covered, such as fees for managing a pension fund, larger firms will face lower costs per worker for purchasing fringes. Second, the greater tenure of workers with large firms, due to possibilities of within-firm mobility, will result in a larger proportion qualifying for benefits such as vested pensions and for higher benefits under plans linking size of benefits to length of service.

Demographic characteristics of workers. The supply price for fringes should vary among the population, depending on personal characteristics. Older workers, for example, tend to favor deferred fringes like retirement pay and medical and health insurance,[18] and women generally have less desire for fringes than men, in part because they are often covered by their husbands' pension and health plans.[19]

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[16]Armen Alchian and Harold Demsetz, "Production, Information Costs, and Economic Organization," *American Economic Review*, Vol. 42, No. 5 (December 1972), pp. 777–95.

[17]In the Inland Steel Company case (1948), a National Labor Relations Board ruling that pensions were a mandatory subject was upheld by the Seventh Circuit. [Inland Steel Co. v. NLRB, 170F 2d 247, 22 LRRM 2505 (CA 7, 1948), *cert. denied*, 336 US 960, 24 LRRM 2019 (1949).]

In the W.W. Cross & Co. case (1949), group health insurance was ruled mandatory by the NLRB and upheld by the First Circuit. [W.W. Cross & Co. v. NLRB, 174 F 2d 875, 24 LRRM 2068 (CA I, 1949).]

[18]Nealey, "Pay and Benefit Preference."

[19]Nancy Herman, "Labor Union Participation and Compensation Preferences of Workers, undergraduate thesis (Harvard University, 1978). Herman shows that

Tax benefits of deferred compensation are also important in determining expenditures for fringes. Because money placed into pension and related plans is not taxed when payment is first made, earns interest that is not taxed until paid out, is taxed at potentially favorable capital gains rates or as salary at lower income tax rates on retirement, the tax system raises the value of receiving income in the form of fringes as opposed to receiving income in the form of wages and thus encourages substitution of fringes for wages. Although we lack information of the precise effect of these tax benefits, they are related to the income of workers and therefore the control for the overall level of compensation also provides a rough control for tax benefits. As a result of the tax advantages, the income elasticity of fringes with respect to before-tax income will be biased upward since the true effect of income will be confounded with the price effect due to increasing tax rates and tax "savings" from fringes.

Data and Econometric Issues

The principal source of data for the empirical analysis is the Expenditures for Employee Compensation (EEC) Survey of the Bureau of Labor Statistics. The EEC is an establishment survey covering all large establishments in the private nonfarm sector and a probability sample of smaller establishments. The survey has several advantages: it relates to establishments rather than more aggregate units, it contains detailed information on the compensation package, it differentiates between nonoffice (blue-collar or production) workers and office (white-collar) employees, and it has an appropriate measure of unionism— whether or not workers are covered by a collective bargaining contract.[20] It has some

disadvantages too, however. To preserve confidentiality, the public data tapes exclude certain large firms;[21] because the tape surveys enterprises rather than workers, information on the personal characteristics of workers is lacking; and because the figures relate to costs rather than to benefits, they provide imperfect measures of the value of fringes to workers. Even so, the detailed establishment compensation figures make the EEC the best available data set for analysis of the effects of unionism on the compensation package. The abandonment of the survey in 1975 represents a serious loss of information on compensation.

The analysis focuses on the EEC surveys for 1967 – 68, 1969 – 70, and 1971 – 72, the years for which data were available when the project began. The data from the surveys were amalgamated into a single pooled sample, with monetary figures transformed into comparable 1967 dollar units by dividing the figures for other years by the ratio of average hourly earnings in the private sector in those years to average hourly earnings in the private sector in 1967. The pooled sample contains 10,088 establishment observations.

Table 1 summarizes the sample's data on the composition of compensation per hour paid for union and nonunion production workers in the entire private nonfarm sector and in the manufacturing subsector. The figures reveal significantly higher employer expenditures in 1967 – 72 on nearly all types of compensation in the union sector, due in part to the concentration of unionism in high-wage industries and in part to the impact of unionism on compensation within industries. The data on shares of compensation show that the proportion of compensation, as well as the absolute level of fringe spending, was markedly higher in the union than in the nonunion sector.

Since some fringes are required by law and thus not subject to collective negotiations, lines 4 and 5 divide the fringes into two basic

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at the same level of wages women desire fringes less than men.

[20]The union variable is coded 1 for an establishment in which 50+ percent of nonoffice workers (or office workers) are covered by a union agreement. While this coding means that some workers who are not covered by contracts may be counted as covered and vice versa, B.L.S. experts informed me in a private discussion that it is reasonable to assume that all workers in one of these groups are covered when 50+ percent

of them are covered and that none are covered when fewer than 50 percent are covered.

[21]Since the regressions deal with establishments and include size variables, however, this limitation of the data should not create any major problems.

Table 1. Dollars Spent per Hour on Total Compensation and on the
Components of Compensation, and the Share of Dollars Spent,
Production Workers in Union and Nonunion Establishments, 1967 – 72.[a]

Compensation per Hour Paid For	Manufacturing (n=4074)				All Private Nonfarm (n=10,088)			
	Union (n=2580)		Nonunion (n=1494)		Union (n=4973)		Nonunion (n=5115)	
	Dollars	Share	Dollars	Share	Dollars	Share	Dollars	Share
1. Total	$3.66	1.000	$2.81	1.000	$4.33	1.000	$2.73	1.000
2. Straight-time pay	2.75	.750	2.26	.804	3.35	.773	2.25	.826
3. All fringes	.91	.250	.55	.196	.99	.227	.47	.174
4. Legally required fringes	.22	.059	.18	.063	.28	.065	.18	.067
5. Voluntary fringes	.70	.191	.37	.133	.70	.162	.29	.106
a. life, accident, health insurance	.15	.041	.07	.023	.16	.036	.05	.017
b. vacation	.15	.041	.07	.026	.11	.025	.06	.021
c. overtime premiums	.12	.033	.09	.032	.13	.031	.07	.026
d. pensions	.12	.033	.05	.017	.15	.035	.04	.013
e. holiday	.09	.024	.05	.018	.07	.015	.04	.014
f. shift premiums	.03	.007	.01	.004	.02	.004	.01	.002
g. sick leave	.01	.003	.01	.003	.01	.003	.01	.004
h. bonuses [b]	.01	.003	.02	.008	.01	.003	.02	.007
i. other [c]	.03	.007	.01	.002	.04	.010	.01	.002

[a] All figures are in 1967 labor cost units, obtained by deflating 1968 – 72 figures by division by the ratio of average hourly earnings in the private sector in each year to average hourly earnings in the private sector in 1967.

[b] Lump-sum payments under profit-sharing plans or seasonal bonuses.

[c] Leave benefits, severance, vacation and holiday funds, supplemental unemployment benefits, savings plans, and other private welfare benefits.

Source: Calculated from the Bureau of Labor Statistics, *Expenditures for Employee Compensation Survey*, tapes 1967 – 68, 1969 – 70, and 1971 – 72. Shares are based on dollars carried to additional decimal places. Column sums do not always add to the correct total due to rounding.

types: those *legally required,* such as Social Security, unemployment insurance, and workers' compensation, and voluntary fringes, which include vacation pay, holiday pay, pensions, life, accident, and health insurance, sick leave, overtime pay, and several smaller benefits. While, as seems reasonable, the table shows little difference in the proportion of compensation spent on legally required fringes between union and nonunion establishments, it reveals a sizeable difference in the proportion going to voluntary fringes. In manufacturing, for example, 19.1 percent of the wage bill in unionized establishments was spent on voluntary fringes, compared to 13.3 percent of the wage bill in nonunion establishments. In all private industry, the propor-

tions were 16.2 percent (union) and 10.6 percent (nonunion). Because voluntary fringes are the subject of labor-management negotiations, they will be the main dependent variable in the ensuing empirical analysis.

Independent Variables

To estimate the impact of unionism on the compensation package, it is important to control for the several diverse other factors, described above and correlated with unionism, that can also be expected to affect fringes. The EEC tapes contain data on several establishment variables that will be used as controls:

• *Total compensation per hour paid for,* which will control for income

effects and, to some extent, the effect of tax benefits in the "purchase" of fringes and will isolate the effect of unionism on the composition as opposed to the level of the wage bill;

• *Size of establishment,* measured by nonoffice employment;

• *Region and SMSA dummy variables,* which distinguish among four regions and size of communities in which establishments are located;

• *Industry dummy variables,* entered to control for various differences, including technologically determined differences in specific human capital and differences in characteristics of workers. A large number of industry dummies will be used to permit focusing on groups of establishments that are closely similar.

As noted previously, a major problem with the establishment data set is its lack of information on the personal characteristics of workers that can be expected to affect fringe payments.[22] This problem is dealt with in three ways. First, I supplement the EEC data with information from the Current Population Survey (CPS) on the characteristics of workers in detailed industries. Specifically, tabulations from the May 1973, 1974, and 1975 CPS files of the mean years of schooling, percent male, percent white, percent above 50 years of age, and percent below 30 years of age for union and nonunion production and nonproduction workers in three-digit industries are added to the EEC tapes.[23] Establishments in which

production workers were organized are given the means for union workers in the three-digit industry while establishments that were unorganized are given the means for nonunion workers. With different figures for organized and unorganized establishments in the same sector, the procedure controls for differences in the personal characteristics of union and nonunion workers *within* an industry but not for differences across individual establishments.

Second, in several calculations I enter the ratio of office workers to production workers in an establishment as a possible crude indicator of the occupational categories covered by the production work force. The hypothesis underlying the use of this ratio, which was suggested by Professor Melvin Reder, is that establishments with a high office-to-production worker ratio are more likely to have, all else the same, a more skilled blue-collar work force. To the extent that this is true and that more skilled blue-collar workers are older or more educated and have greater desires for fringes, this ratio provides another potential control. (Its omission, however, does not affect results.)

Third, as noted, extensive use is made of industry dummy variables, in part to control for characteristics of workers that vary significantly among industries. While none of these procedures eliminates the problem of inadequate personal data, that is the price that must be paid for the advantages of the establishment data files presently available.

Econometric Issues

The effect of unionism and the other independent variables on fringes will be estimated with linear and log-linear equations:

(11) $F_i = a + bC_i + cU_i + dX_i + e_i$ and

(12) $\ln F_i = a + b(\ln C_i) + cU_i + dX_i + v_i,$

where the variables are as defined earlier and where

e_i = random disturbance and
v_i = random disturbance.

The linear form is applied to the entire sample, including the small minority of firms (about 2 percent of the sample) that pay no voluntary fringes, and is also used to analyze specific fringes where there are numer-

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[22]The most important personal characteristics are likely to be the age and sex of workers. Unionized workers tend to be older and are more likely to be male than are nonunion workers. Since older workers and men are more likely to desire fringes, there is a danger of confounding the effect of demographic factors with the effect of unionism, assuming for the market that the age-sex differences between organized and unorganized work forces are exogenous to provision of fringes. Part of the demographic effect may be picked up with the total level of compensation, but part is likely to remain, motivating the addition of the data described in the text.

[23]The May CPS files were used because union membership is included in the May survey. The estimates were obtained from the basic data using unweighted counts of union and nonunion members.

ous zero values. The log form is used in analyses that correct for omitted establishment factors and that treat interactions between unionism and other variables. It is applied to the establishments that have nonzero voluntary fringes.

There are two econometric problems with Equations 11 and 12. The first problem is that since total compensation includes fringes $(C_i \equiv F_i + W_i)$ we have a standard simultaneous bias due to the presence of the same variable on both sides of the equation.[24] To correct for simultaneity in the linear form, $F_i + W_i$ is substituted for C_i in Equation 11 and the resultant equation solved for F_i to obtain:

$$(13)\ F_i = a/1-b + (b/1-b)W_i + (c/1-b)U_i$$
$$+ (d/1-b)X + e_i/1-b.$$

The structural parameters of concern can be obtained from Equation 13 by solving the estimated coefficient on W_i for $\hat{b}$ and multiplying the other parameters by $1 - \hat{b}$. To correct for simultaneity in the log form, $\ln C_i$ will be regressed on $\ln W_i$ (and the other variables in Equation 12) and the predicted value used in place of $\ln C_i$ in the equation.

The second and potentially more serious econometric problem relates to the independence of U_i (or the X_i variables) and the residual e_i or v_i. If the residual includes an establishment component related to unionism, the coefficient on U_i will be biased. If high-fringe firms tend to be organized (say, because they are leading enterprises), ordinary least squares (OLS) estimates of Equation 11 or 12 will overstate the union effect because $E(v_i U_i) > 0$ or $E(e_i U_i) > 0$, where E refers to the expectation operator. Conversely, if high-fringe firms tend to be unorganized, OLS estimates of Equation 11 or 12 will understate the union effect.

The availability of data on office workers within an establishment can be used to treat this problem. If the omitted enterprise factor affects office as well as nonoffice workers, it will influence the fringes paid to both groups of workers, permitting white-collar

fringes to proxy the missing variable. Consider the log linear equation. Formally, when there is an enterprise-specific omitted factor, the error in Equation 12 can be divided into two parts, $v_i = \lambda h_i + \boldsymbol{\ell}_i$ where h_i is the firm effect with a scaling factor λ, and where $\boldsymbol{\ell}_i$ is the remainder of the residual.[25] This gives the following equation for nonoffice worker fringes:

$$(14)\ \ln F_i = a + b\,\ln C_i + cU_i + dX + \lambda h_i + \boldsymbol{\ell}_i.$$

Now, let the fringes of office workers (F_i^w) depend on their compensation (C_i^w), other controls (X^w), the omitted factor with a scaling factor of 1,[26] and a residual $\boldsymbol{\ell}_i^w$ uncorrelated with the independent variables.

$$(15)\ln(F_i^w) = a^w + b^w\ln(C_i^w) + d^w X^w + h_i + \boldsymbol{\ell}_i^w,$$

where the "w" superscripts relate to the office or white-collar workers and where the different scaling of the firm effect in Equations 14 and 15 permits the firm factor to affect white-collar workers differently from blue-collar workers.

The firm specific component h_i can be eliminated from Equation 14 by multiplying Equation 15 by λ and substituting for λh_i to obtain:

$$(16)\qquad \ln(F_i) = \lambda\ln(F_i^w) + cU_i$$
$$+ b(\ln C_i) - \lambda b^w \ln(C_i^w) + dX - \lambda d^w X^w$$
$$+ \boldsymbol{\ell}_i - \lambda \boldsymbol{\ell}_i^w.$$

Least squares estimates of Equation 16 will not yield unbiased or consistent parameter estimates since the residual, $-\lambda \boldsymbol{\ell}_i^w$, is negatively correlated with $\ln F_i^w$. The coefficient on $\ln F_i^w$ will be biased downward and, given a positive correlation between $\ln F_i^w$ and U_i, the union coefficient will be biased upward. While there is no easy way around this problem, the extent of the bias can be evaluated using standard bias formulae.[27] If $\ln F_i^w$ and

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[24]The problem is identical to that of estimating a consumption function in which C is regressed on Y, where $Y = C + I$.

[25]The scaling factor is arbitrary, of course, as the variable is unobserved.

[26]Since we have scaled h_i to have an effect of λ for blue-collar workers, an alternative scale must be used if we are to permit the omitted factor to affect the two groups differently. A scaling of 1 has the virtue of algebraic simplicity.

[27]An alternative way to handle the consistency problem is to specify a priori values of λ, move $\lambda \ln F_i^w$ to the left-hand side, and estimate the resultant equa-

U_i are only modestly correlated (as turns out to be the case), the bias will be quite small and the resultant estimate on U_i presumably close to the correct value.

Finally, to the extent that as industrial relations experts like Slichter, Healy, and Livernash claim "to some degree union plant workers have become pattern setters for office groups,"[28] the model embodied in Equation 16 provides an extremely stringent test of the impact of collective bargaining on blue-collar fringes. It uses expenditures on white-collar fringes (relative to expected expenditures) as a proxy for the omitted establishment component without allowing blue-collar unionism to affect the white-collar fringes. If unionized firms pay higher fringes to white-collar workers to forestall organization and minimize worker discontent, estimates of the impact of unionism that "correct" for omitted firm factors as in Equation 16 will understate the true union effect on production workers by misallocating the union effect to exogenous firm policy. An effort is made in a later section to modify the model to allow for the possible impact of unionism on the fringes of white-collar workers.

Basic Cross-Establishment Estimates

This section presents least squares estimates of fringe Equations 11 and 13, using cross-establishment data. This analysis finds that, *with total compensation held fixed*, unionism significantly raises fringe spending, particularly on life, accident and health insurance, pensions, and vacation and holiday pay, and that it has its greatest impact on firms that are small or

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tion by least squares. With $\ln F_i^w$ as part of the dependent variable, $\ell_i \beta - \lambda \ell_i^w$ is uncorrelated with the explanatory variables. While in many problems a value of $\lambda = 1.0$ can be defended in terms of the de-Finetti exchangeability criterion, this is not the case in the current problem. Blue-collar and white-collar workers are identifiably different and there is no reason to expect firms to treat them identically. Table 6 gives estimates conditional on prior values of λ.

[28]Sumner H. Slichter, James J. Healy, and E. Robert Livernash, *The Impact of Collective Bargaining on Management* (Washington, D.C.: The Brookings Institution, 1960), p. 445.

low-wage, or both. Since the calculations control for total compensation, the effect cannot be attributed to union monopoly wage gains but appears rather to represent the more complex aspects of union behavior discussed earlier.

The Linear Equations

Table 2 presents estimates of the impact of unionism on fringe benefits using linear Equations 11 and 13 for the entire private nonfarm sector and for the manufacturing subsector of the EEC sample. Lines 1 through 4 record the relevant statistical data for unionism, compensation, and size of establishment (in terms of nonoffice worker employment) while the remaining lines give the summary statistics. The regressions include additional controls described in the table note.

Column 1 gives means of the explanatory variables for all private industry, while column 2 presents estimates of Equation 11 for all private industry. The union coefficient is a moderate but highly significant .056, indicating that in the period studied establishments that were organized paid nearly 6¢ more per hour for fringes. Because of the simultaneity problem, however, this is likely to be an underestimate of the effect of unionism on fringes with compensation held fixed. Columns 3 and 4 correct for simultaneity by replacing total compensation per hour by straight-time pay plus required fringes on the right-hand side of the equation. The coefficients in the new regression, given in column 3, represent the structural parameters divided by $1 - b$, where b is the parameter on compensation. Column 4 gives the estimated structural parameters, obtained by solving for $\hat{b}(\hat{b}/1 - \hat{b} = .104)$, and multiplying coefficients by $1 - \hat{b}$. As expected, the simultaneity correction raises the estimated impact of unionism markedly, from 5.6¢ in column 2 to 10.1¢ in column 4. At the mean level of spending on voluntary fringes in the sample of 49¢, the final estimate translates into an elasticity of fringes with respect to unionism of .21 (= 10.1/49). The calculations in columns 6 through 8 give a similar result for the manufacturing subsector, with a final simultaneity corrected estimate of 7.8¢ or 13 percent of the

Table 2. Regression Estimates of the Impact of Collective Bargaining
on Voluntary Fringes (in Dollars per Hour) paid to Nonoffice Workers, 1967 – 72.[a]

Independent Variable	All Private (n = 10,088)				Manufacturing (n = 4074)			
	Mean and Standard Deviation	Least Squares Coefficients		Structural Parameters	Mean and Standard Deviation	Least Squares Coefficients		Structural Parameters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Collective bargaining	.49 (.50)	.056* (.008)	.117* (.009)	.101	.63 (.48)	.048* (.009)	.096* (.012)	.078
2. Total compensation per hour	3.52 (1.59)	.200* (.002)		.133	3.35 (1.00)	.260* (.004)		.184
3. Straight-time pay plus required fringes per hour	3.02 (1.33)		.154* (.003)		2.77 (.72)		.224* (.006)	
4. Nonoffice employment (in hundreds)	5.26 (16.00)	.018* (.002)	.024* (.002)	.021	7.58 (16.14)	.022* (.002)	.035* (.002)	.029
Summary Statistics								
R²		.696	.562			.764	.610	
S.E.E.		.225	.270			.174	.224	

[a] Dependent variable is dollars per hour spent on voluntary fringes, as defined in Table 1. Independent variables are measured in absolute units. Mean fringe for all private is 49¢ per hour; mean fringe for manufacturing is 58¢ per hour. In addition to the variables reported in the table, the following variables were included in the regressions: 50 industry dummies; 3 region, 1 SMSA, and 5 year dummies; ratio of office employment to nonoffice employment; and average years of schooling of workers, % white, % male, % < 30, % > 50. (These variables were measured for union and nonunion workers at a 3-digit industry level using data from the Current Population Survey tapes for May 1973 – 75, as described in the text.)
*Significant at .01 level.
Source: Bureau of Labor Statistics, *Expenditures for Employee Compensation Survey,* tapes for 1967 – 68, 1969 – 70, and 1971 – 72.

mean voluntary fringes of 58¢ per hour in the sample.

With respect to other variables, both compensation and size of establishment also positively influence expenditures on fringes. The simultaneity corrected estimate of the effect of an increase in compensation on fringes in all private industries is .133, which at the mean value of compensation ($3.52) and voluntary fringe spending ($.49) translates into an elasticity of .96 [= (.133/.49) x 3.52]. Finally, although the coefficient on number of nonoffice workers is small in absolute value, the number of office workers varies so significantly in the sample that a one standard deviation change in number of nonoffice workers has a sizeable effect on fringes, raising them by 34¢ (= 16.0 x .021), which exceeds the effect of a one-standard deviation change in total compensation on fringes of 21¢ (= 1.59 x .133).

The link between unionism and fringes is pursued further in Table 3, which contains estimates of the effect of collective bargaining on fringes using the logarithmic form. The log equations are limited to establishments with nonzero voluntary fringes, a restriction that eliminates 37 manufacturing establishments and 243 total establishments, most of which are nonunion. (This exclusion thus biases downward estimated union effects.)

Column 1 of Table 3 records the results of regressing ln voluntary fringes on the collective bargaining dummy for all private industry, with total compensation used to measure the size of the pay package. Unionism is accorded a highly significant positive coefficient of .109. Column 2 treats the problem of simultaneity between total compensation and fringes by instrumenting ln$C$ on ln straight-time pay: as would be ex-

Table 3. Further Estimates of the Effect of Collective Bargaining on
Voluntary Fringes Paid to Nonoffice Workers, Using Log Form, 1967 – 72.
(standard errors are in parentheses)[a]

Independent Variables [b]	All Private (n = 9845) [c]			Manufacturing (n = 4057) [c]		
	(1)	(2)	(3)	(4)	(5)	(6)
1. Collective bargaining	.109*	.178*	.510*	.109*	.150*	.681*
	(.019)	(.022)	(.064)	(.020)	(.023)	(.076)
2. Total compensation per hour [d]	1.523* (.022)			1.559* (.028)		
3. Total compensation per hour instrumented on straight-time pay per hour [d, e]		1.109* (.026)	1.132* (.030)		1.163* (.035)	1.308* (.045)
4. Nonoffice employment [d]	.089*	.097*	.122*	.084*	.097*	.124*
	(.004)	(.005)	(.006)	(.004)	(.005)	(.008)
5. Collective bargaining x nonoffice employment			− .048* (.008)			− .044* (.010)
6. Collective bargaining x instrument for total compensation			− .082* (.037)			− .272* (.053)
Summary Statistics						
R²	.707	.636	.637	.760	.671	.675
S.E.E.	.544	.606	.605	.371	.434	.431

[a] Dependent variable is the ln of voluntary fringes paid per hour, with voluntary fringes as defined in Table 1.
[b] For a list of the additional variables included in these regressions, see footnote a to Table 2.
[c] We eliminated 243 establishments from the total private sample, and 17 from the manufacturing sample, for paying no fringes.
[d] These variables are also in ln units, as specified.
[e] Obtained by regressing ln total compensation per hour on ln straight-time pay per hour and all variables in the regressions, with separate estimates for all private and manufacturing samples.
*Significant at better than .01 level.
Source: Calculated from Bureau of Labor Statistics, *Expenditures for Employee Compensation Survey*, tapes for 1967 – 68, 1969 – 70, and 1971 – 72.

pected, the union coefficient rises while that on compensation falls. Column 3 examines the possibility that the union effect differs among firms with different levels of pay and size by interacting the collective bargaining variable with size of firm and total compensation. The interaction terms obtain sizeable significant coefficients that imply very different union effects on smaller and lower-paid establishments than on larger, higher-paid establishments, as is indicated below:

	Union Effect By Size and Compensation		
	One Standard Deviation Below Mean	Mean	One Standard Deviation Above Mean
Size	.292	.199	.106
Compensation	.235	.199	.163

Source: Calculated from Table 3 at mean levels of other variables.

Columns 4 through 6 of Table 3 present similar computations for the manufacturing subsector. The results are essentially the same, with sizeable union effects in regressions 4 and 5, giving elasticities of fringe spending to unions of .109, without the simultaneity correction and .150 with the correction. The interaction of bargaining with the size of the blue-collar work force in regression 6 parallels that for all industries in regression 3, while the interaction with total compensation is larger.

All told, the results in Table 3 support the hypothesis that trade unionism influences the composition of the compensation package, raising the fringe proportion, particularly in smaller firms, as predicted, and in low-paying firms as well.

Specific Fringes

Which voluntary fringes are most affected by trade unionism? To what extent does the union effect operate by raising the likelihood that establishments will have a particular fringe program? To what extent does it operate by raising the amount spent by establishments with a particular program?

Table 4 presents calculations designed to answer these questions. Columns 1 and 2 record the cents per hour spent in 1967 – 72 on the major fringes in the average establishment and the proportion of establishments that then provided the various fringes. They show that the most important fringes in terms of expenditures and availability were health, accident, and life insurance, vacation and holiday pay, overtime premiums, and pensions, with shift differentials, sick leave, and bonuses of nonnegligible but lesser significance.

Column 3 examines the impact of collective bargaining on expenditures for fringes using the linear model (Equation 11) with straight-time pay plus required fringes as the measure of compensation and with all the variables listed in Table 2 used as controls. Because each fringe is too small to create a simultaneity problem, the column records the actual regression coefficients, rather than the simultaneity-corrected structural parameters. The regressions show that unions had their greatest positive effect on pensions, on life, accident, and

health insurance, and on vacation and holiday pay, and had negative effects on overtime premiums, sick leave, and bonuses.

Column 4 reports estimates of the effect of collective bargaining on the provision of fringes, using a linear probability model and the same set of controls as in previous calculations. The estimates show that part of the union effect takes the form of changes in the probability that an enterprise will provide fringes. During the period studied, for example, trade unionism significantly raised the probability that pensions would be provided, by a striking .24 points in manufacturing and a .29 points overall. Unionism also raised the probability that an enterprise would provide life, accident, and health plans, overtime premiums, holiday pay, and shift differentials, while reducing the probability that sick leave and bonuses would be provided.

Column 5 turns to fringe expenditures by establishments *that had the specified fringe* in 1967 – 72. It records the estimated impact of unionism from the OLS regression of fringe spending on straight-time pay and required fringes, and the standard control variables. These calculations isolate the impact of collective bargaining on the level of spending, conditional on provision of the given fringe. The smallest fringe expenditures are ignored in the calculations as being too small to merit attention. The estimates show that unionism affected the amount spent on most major fringes, with positive significant coefficients for all of the main fringes except pension plans and, in the all-industry sample, overtime. In all private industrial firms with life, accident, or health insurance programs, for example, expenditures per hour were 4¢ higher in the union sector; among firms with vacation programs expenditures were 2¢ higher, and so forth.

What factors explain the differential effect of unionism on the fringes distinguished in Table 4? Is the fact that unionism has its most sizeable positive effect on pensions, insurance, and vacation fringes, while having a negative effect on overtime spending, sick leave, and bonuses, consistent with the model presented earlier?

While a full explanation of the differen-

Table 4. Estimates of the Effect of Collective Bargaining on Specific Fringes, 1967 – 72.[a]

| | | | Coefficients and standard errors (in parentheses) for effect of bargaining on | | |
Sector and Fringe	Cents per hour spent on fringe, all establishments	Proportion of establishments with fringe	Cents per hour spent on fringe, all establishments [b]	Linear probability of fringe [c]	Cents per hour spent on fringe, establishments with fringes only [d]
All Private Industry					
1) Life, accident, health	10.1	.850	4.8* (0.2)	.08* (.01)	3.9* (.03)
2) Vacation	8.3	.836	1.6* (0.2)	– .03* (.01)	1.9* (0.2)
3) Overtime premiums	10.1	.836	– 0.5 (0.4)	.03* (.01)	– 0.7 (0.4)
4) Pension	9.4	.626	3.9* (0.4)	.29* (.01)	0.3 (0.5)
5) Holidays	5.2	.778	0.8* (0.1)	.01 (.01)	0.8* (0.1)
6) Shift differentials	1.1	.294	0.3* (0.1)	.17* (.01)	—
7) Sick leave	1.1	.351	– .05* (0.1)	– .10* (.01)	—
8) Bonuses	1.8	.271	– 1.4* (0.3)	– .13* (.02)	—
Manufacturing					
1) Life, accident, health	11.9	.952	4.5* (0.3)	.06* (.01)	4.0* (0.3)
2) Vacation	12.1	.960	2.8* (0.3)	– .01 (.01)	2.9* (0.3)
3) Overtime premiums	10.9	.955	– 1.4* (0.4)	.05* (.01)	– 2.0* (0.4)
4) Pension	9.3	.747	2.9* (0.5)	.24* (.02)	0.5 (0.6)
5) Holidays	7.3	.941	1.6* (0.1)	.03* (.01)	1.5* (0.1)
6) Shift differentials	2.1	.563	0.4* (0.1)	.23* (.02)	—
7) Sick leave	1.0	.314	– 0.4* (0.1)	– .12* (.02)	—
8) Bonuses	1.4	.292	– 1.7* (0.3)	– .19* (.02)	—

[a] Estimates in columns 3 – 5 are based on regressions with the following controls. For all private industry: 50 industry dummies, 3 region dummies, 1 SMSA dummy, 5 year dummies, ratio of office to nonoffice workers, and 5 measures of average characteristics of workers: years of schooling, % white, % male, % less than 30, and % more than 50 years of age; straight-time pay plus required fringes per hour; nonoffice employment. For manufacturing industry: 20 industry dummies and all of the other controls used for the total private sector.

[b] Based on regression of cents per hour spent on fringe on collective bargaining coverage and all control variables described in footnote a.

[c] Coefficient and standard error (in parentheses) based on linear probability regression of dichotomous measure of presence of fringes on collective bargaining coverage and all of the control variables described in footnote a.

[d] Based on regression of dollars per hour on fringe on collective bargaining coverage and all control variables described in footnote a with sample limited to establishments having the relevant fringe. Number of establishments = total number fringe group x proportion given in column 1.

*Significant at .01 level.

Source: Calculated from Bureau of Labor Statistics, *Expenditures for Employee Compensation Survey*, tapes for 1967 – 68, 1969 – 70, and 1971 – 72.

tial effects of unionism on the specific fringes lies beyond the scope of this article, the findings in Table 4 at least appear to be consistent with both models of the union given earlier. Those models suggested that unionism would raise fringes that involved deferred compensation and that were likely to be favored by older workers. Pensions fit both categories; health and life insurance are likely to be especially desired by older workers; and vacation pay has a strong seniority component, which should also make it favored by the more senior employees. As for the fringes that fare less well under unionism, the negative impact of unionism on bonuses is presumably attributable to standard-rate wage policies, which reduce managerial discretion in awarding pay. Such a policy is consistent with the median voter model but not necessarily with the optimizing cartel model.[29] The negative impact of unionism on overtime premiums can be attributed to the higher rates at unionized establishments, which should discourage management from using overtime. The negative impact of unionism on sick leave is somewhat more difficult to explain, but may reflect the greater policing of sick leave in organized plants, which tend to operate more "by the book" than nonorganized plants. Since the models presented earlier relate to worker preferences, what is needed to check further their ability to explain the pattern of fringes paid in organized as opposed to unorganized plants is detailed information about worker preferences and actual union behavior at bargaining tables. Such information is not available in our establishment data set.

The Union Effect on Total Compensation

If unionism raises fringe benefits by substantial amounts, standard estimates of the union pay effect, which for reasons of data availability are generally limited to wages, understate the full impact of collective bargaining on compensation per hour. How large might this understatement be?

[29]For a discussion of how the median voter model is consistent with the standard-rate policies, see Richard B. Freeman, "Unionism and the Dispersion of Wages," *Industrial and Labor Relations Review*, Vol. 34, No. 1 (October 1980), pp. 3–23.

Estimates of the magnitude of the bias due to neglect of the effect of unionism on fringes can be made by comparing separate regressions of straight-time pay and of total compensation per hour on collective bargaining coverage and the relevant control variables. With a logarithmic equation, the resultant estimates of the collective bargaining effect in the EEC sample are:

Effect of Unionism on Total Compensation and Straight-Time Pay, EEC Sample, 1967–72. (Standard errors in parentheses)

	All Private Industry	Manufacturing
Straight-time pay per hour	.148* (.008)	.082* (.011)
Total compensation per hour	.173* (.009)	.105* (.011)

*Significant at .01 level.
Source: Regressions with full set of controls, including 50 industry dummies for all private industry and 20 industry dummies for manufacturing. See Table 2 for list of controls.

In all private industry, the impact of unionism on total compensation in 1967–72 was .173, 17 percent above the impact of unionism on straight-time pay. In manufacturing, the union coefficient rises by 25 percent from .082 to .105. The union impact on fringes is therefore important not only in changing the composition of the wage bill but also in increasing the magnitude of the union effect on total pay.

The Union Effect on Total Fringe Expenditures

Finally, since unions raise straight-time pay and since straight-time pay influences fringes, the *total* impact of unionism on fringe spending will *exceed* the estimates in Tables 2 through 4, which hold total compensation fixed. To estimate the total effect of unionism on fringes, we add together the effect of unionism on fringes when compensation is fixed and the effect of unionism on compensation multiplied by the effect of compensation on fringes using the formula in Equation 1.

Taking the estimate from the logarithmic equations of Table 3, we obtain in all private industry $b_{FC \cdot UX} = 1.11$ and $b_{FU \cdot CX} = .18$; in manufacturing $b_{FC \cdot UX} = 1.16$ and $b_{FU \cdot CX} = .15$. The above compensation regressions give $b_{CU \cdot X} = .17$ (all private) and .11 (all manufacturing). Plugging these numbers into Equation 1 yields estimated *total* union effects of .36 (all private) and .28 (manufacturing) compared to effects via the *composition* of compensation of .18 and .15. It appears that unions raise *total* spending on fringes about equally through raising the fringe share of compensation and through raising the level of compensation. The union effect on fringe spending far exceeds the union effect on straight-time pay in terms of ln points (though not, of course, in terms of absolute dollars).

Establishment Specific Factors and Spillover Effects

The analysis thus far has ignored the possibility set out earlier that omitted establishment factors correlated with unionism could be biasing the estimated coefficients. In this section, the omitted variable problem is dealt with by estimating Equation 15 and then expanding the model to allow for the possible effect of unionism on the fringes of white-collar workers within an establishment. Estimates of the impact of collective bargaining on fringes turn out to be sensitive to omitted establishment factors and to the effects of blue-collar unionism on white-collar fringes.

Omitted Factor Model

Columns 1 and 2 of Table 5 present estimates of the blue-collar fringe Equation 16, which adjusts for omitted establishment factors by including $\ln F_i^w$ and the characteristics of white-collar workers in the basic regression model. According to the analysis, when omitted establishment variables are correlated positively with unionism, white-collar fringes will enter positively in the regression and the coefficient on collective bargaining will fall. In the all-private-industry computations in column 1, the collective bargaining coefficient is .13, which is 28 percent below the .18 obtained in Table 3.

In manufacturing, the collective bargaining coefficient is .09, which is 40 percent below the value obtained in Table 3. The noticeable drop in the impact of unionism suggests that the previous cross-section estimates of the union impact were biased upward by omission of correlated establishment factors.

The least squares estimates of Equation 16 do not, however, yield consistent estimates of the union effect. As pointed out earlier, the part of the residual in the equation that comes from the white-collar fringe equation (ℓ_i^w) is correlated with $\ln F_i^w$ so that when the partial correlation between U_i and $\ln F_i^w$ is nonzero, least squares yield a biased estimate of the coefficient on unionism. The potential magnitude of the bias can be assessed by treating $\lambda \ell_i^w$ as an omitted variable correlated with $\ln F_i^w$ and applying standard bias formulae. Let $b_{FU \cdot X}$ be the auxiliary regression coefficient of $\ln F^w$ on U_i, conditional on all other variables and let $r_{FU \cdot X}$ be the accompanying partial correlation coefficient and let $P (0 \leq P \leq 1)$ be the ratio of the variance of ℓ^w to the variance of $\ln F_i^w$. Then the bias on c due to omission of ℓ^w from the calculation is determined by:[30]

$$(17) \quad \operatorname*{plim}_{n \to \infty} \hat{c} = \frac{b_{FU \cdot X}}{1 - r_{FU \cdot X}^2} \; P\lambda \; + c$$

while the bias in estimating λ is

$$(18) \quad \operatorname*{plim}_{n \to \infty} \hat{\lambda} = \lambda \, [1 - P/(1 - r_{RU \cdot X}^2)].$$

Regressing $\ln F_i^w$ on U_i and all of the variables in Equation 16 yields for all private industry: $b_{FU \cdot X} = .10$, $r_{FU \cdot X} = .04$; and for manufacturing: $b_{FU \cdot X} = .14$, $r_{FU \cdot X} = .08$. Hence, $b_{FU \cdot X}/(1 - r_{FU \cdot X}^2)$ is .10 in all private industry and takes on the value of .14 in manufacturing. With these magnitudes, the coefficient on unionism will not be greatly affected by the omission of ℓ^w unless P is a very large number. The parameter P is the ratio of the random (measurement error) variation of $\ln F^w$ to the total variation in $\ln F^w$. Assume, as an upper bound, that

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[30]Zvi Griliches and V. Ringstad, *Economies of Scale and the Form of the Production Scale* (Amsterdam: North Holland Publishing Co., 1971), p. 197.

Table 5. Estimates of the Effect of Collective Bargaining
on the Voluntary Fringes of Nonoffice and Office Workers,
Corrected for Omitted Establishment Effects, 1967 – 72.

Independent Variables [a]	Nonoffice Worker Fringes		Office Worker Fringes	
	All Private Industry	Manufacturing	All Private Industry	Manufacturing
1. Collective bargaining coverage, nonoffice workers	.14* (.02)	.10* (.02)	.13* (.02)	.10* (.02)
2. ln compensation of nonoffice workers [b]	1.00* (.02)	1.06* (.03)		
3. ln fringes of office workers	.33* (.01)	.33* (.01)		
4. ln compensation of office workers	– .17* [c] (.02)	– .17* [c] (.02)	1.91* [b] (.08)	1.99* [b] (.07)
Summary Statistics				
R^2	.70	.74	.35	.36
S.E.E.	.536	.378	.751	.571

[a] For a list of the additional variables included in these regressions, see footnote a to Table 2. Note also that these regressions include variables for the % white, mean years of schooling, % > 30 yrs., and % < 50 yrs. for office workers in the relevant 3-digit industry and a $0 – 1$ variable for which 1 = collective bargaining coverage of office workers.

[b] Coefficient obtained by instrumented variables technique, with instruments being straight-time pay of nonoffice workers and other variables in the regression.

[c] Coefficient obtained by instrumented variables technique, with instruments being straight-time pay of office workers and other variables in the regression.

*Significant at better than .01 level.

Source: Estimated from Bureau of Labor Statistics, *Expenditures for Employee Compensation Survey,* tapes for 1967 – 68, 1969 – 70, and 1971 – 72.

half of the variance in $\ln F^w$ is due to ℓ_i^w so that $P = 1/2$. With this value of P, Equation 18 implies that $\hat{\lambda}$ overstates λ by a factor of 2, giving an estimate of λ of $2/3$. With $P = 1/2$ and $\lambda = 2/3$, then Equation 17 tells us that $\hat{c}$ understates c by about .03 $[= 1/2 (.10)]$ in all private industry and by .05 $[=1/3 (1.4)]$ in manufacturing.

As a result, the impact of unionism on expenditures for fringes (total compensation fixed) drops to .11 $(= .14 - .03)$ in all private industry and to .05 $(= .10 - .05)$ in manufacturing. These estimates are markedly smaller than those obtained in Table 3 but still indicate that the impact of unionism is far from negligible. We conclude that, while omitted within-establishment factors may account for some of the estimated sizeable impact of collective bargaining on fringes, a substantial separate effect remains.

Spillover Model

The omitted establishment model analyzed thus far has ignored the likelihood that organization of blue-collar workers will cause firms to raise the fringes of white-collar workers. To the extent that such patterns are significant, the estimates that attempt to correct for omitted firm factors without adjusting for such spillover will bias downward the true union impact. While analysis of within-firm effects is complicated, it is possible by modifying the model of Equation 14 to 16 to obtain a rough notion of the impact of correcting the blue-collar fringe equation for spillovers. The key to a spillover analysis is a white-collar fringe equation in which white-collar fringes depend not only on white-collar compensation and related variables but also on the presence of unionism in the plant:

$(19)\ln F_i^w = a^w + b^w \ln C_i^w + c^w U_i^w + s^w U_i +$
$\qquad d^w X_i + h_i + \ell_i^w,$

where s^w is the coefficient linking white-collar fringes to blue-collar unionism and where $E(U_i h_i) \neq 0$, as before.

Solving Equation 19 for h_i and substituting into the nonoffice worker fringe Equation 13 yields:

$(20)\ \ln F_i - \lambda \ln F_i^w = a - \lambda a^w + (c - \lambda s^w)U_i$
$\qquad + b \ln C_i - \lambda b^w \ln C_i^w - \lambda c^w U_i^w$
$\qquad + dX_i - d^w \lambda\ X_i^w + \ell_i - \lambda \ell_i^w,$

which is analogous to Equation 16 except that the coefficient on U_i no longer reflects the impact of unions on blue-collar fringes but rather the *difference* between the effect on blue-collar fringes and on white-collar fringes. To isolate the effect on blue-collar fringes represented by the parameter c, it is necessary to estimate λ and s^w. We can estimate s^w from Equation 19 if some way can be found to eliminate h_i. The most direct approach is to expand the model to include an equation for total white-collar compensation:

$(21) \qquad \ln C_i^w = A^w + \alpha^w U_i^w + \Gamma^w X_i$
$\qquad\qquad + \psi^w U_i + \phi^w h_i + w_i,$

where the compensation of white-collar workers depends on unionism of blue-collar workers through ψ^w, on their own (negligible) organization through α^w, on the other factors, X_i, and on the omitted establishment factor, with a scaling factor ϕ^w, which permits a different establishment effect on total compensation than on fringes.

Now Equation 21 can be solved for h_i and the resultant expression substituted into Equation 19 to obtain an equation relating the fringes of white-collar workers to the unionism of blue-collar workers with the omitted establishment factor eliminated:

$(22)\ln F_i^w = a^w - A^w/\phi^w + (s^w - \psi^w/\phi^w)U_i$
$+ (b^w + 1/\phi^w)\ \ln C_i^w + (c^w - \alpha^w/\phi^w)U_i^w$
$(d^w - \Gamma^w/\phi^w)X^w + \ell_i^w - w_i/\phi^w.$

There are two difficulties with estimating s^w from Equation 22. First, since $E(w_i C_i^w) \neq 0$, ordinary least squares estimates of Equation 22 will yield biased coefficients. To correct for this, an instrument is needed that

is correlated with C_i^w but not with w_i or ℓ_i^w. The obvious candidate is the compensation of blue-collar workers, C_i, since $E(C_i C_i^w) \neq 0$ while $E(C_i w_i) = E(C_i \ell_i^w) = 0$. Second, note that the coefficient on U_i in Equation 22 is not s^w but something less than s^w, $s^w - \psi^w/\phi^w$, the difference between the spillover effect of blue-collar unionism on fringes and on the compensation of white-collar workers. Thus, even consistent estimates of Equation 22 will underestimate s^w; as this operates against the model, we shall simply note that the equation stacks the deck against the union effect when $\psi^w > 0$ and proceed to estimate the equation.

Instrumental variable estimates of Equation 22 are given in columns 3 and 4 of Table 5. Note that in these equations the ln compensation of office workers is replaced by the estimated ln compensation of office workers, obtained from a regression on the ln compensation of nonoffice workers, in accord with the preceding argument, whereas in the equations for nonoffice worker fringes in the table, ln compensation of office workers is replaced by the estimated ln compensation of office workers, obtained from a regression on the ln straight-time pay of office workers. Taking the coefficient on unionism as a lower estimate of s^w suggests that unionism has at least a moderate impact on white-collar fringes, ranging from .10 in manufacturing to .13 in all industry. From these calculations, there would appear to be some validity to the industrial relations belief that trade unionism affects the compensation package of white- as well as blue-collar workers.

In the spillover model the coefficient on collective bargaining in Equation 16 is the difference between the union impact on blue-collar fringes and the within establishment λ parameter:

$(23)\ \ \hat{b} = c - \hat{\lambda}\hat{s}^w$ so that $c = \hat{b} + \hat{\lambda}\hat{s}^w$

We can solve Equation 23 for the desired parameter using the estimates in Table 5. In all private industry, the coefficient of collective bargaining $(\hat{b})$ in the nonoffice worker equation is .14; the coefficient of collective bargaining in the office worker equation $(\hat{s}^w)$ is .13. The estimated value of λ, the

Table 6. Estimates of the Effect of Unionism on the Fringes of
Nonoffice Workers, with Establishment Specific and
Union Spillover Effects, Conditional on Values of λ, 1967 – 72.

Measure	All Private				Manufacturing			
1. Value of λ	1.00	.75	.50	.25	1.00	.75	.50	.25
2. Coefficient & standard error for estimate of $c - \lambda s^w$	.073* (.026)	.098* (.022)	.122* (.020)	.147* (.020)	.003 (.028)	.038 (.024)	.074* (.021)	.109* (.021)
3. Estimate of s^w	.13	.13	.13	.13	.10	.10	.10	.10
4. Estimate of c (line 2) + (line 1 x line 3)	.203	.196	.187	.180	.103	.113	.124	.134

*Significant at .01 level.
Line 2: Based on regression of $\ln F_i - \lambda \ln F_i^w$ on union dummy and other independent variables: ln compensation of office workers, ln compensation of nonoffice workers (instrumented on straight-time pay), four region SMSA dummies, five year dummies, ratio of office to nonoffice employees, average characteristics of office and nonoffice workers and 50 (20) industry dummies in all private industry (manufacturing).
Line 3: Obtained from regression of ln fringes of white-collar workers in unionism and control variables, as given in Table 5.
Source: Calculated from Bureau of Labor Statistics, *Expenditures for Employee Compensation,* tapes for 1967 – 68, 1969 – 70, and 1971 – 72.

enterprise specific parameter, is .33, but by the bias arguments given on page 506, the actual value of λ may be twice as high. With $\hat{b}$ = .14, $\hat{s}^w$ = .13 and λ = .33, the estimate of c is .17. With $\hat{b}$ = .14, $\hat{s}^w$ = .13 and λ = .67, the estimate of c is .23. In manufacturing where $\hat{b}$ = .07 and $\hat{s}^w$ = .10, c is estimated to be .10 when λ = .33 and to be .14 when λ is .67. Taking account of the impact of unionism on white-collar fringes raises the estimated effect on blue-collar fringes in the omitted enterprise factor model to levels approaching those in the cross-section regressions of Table 3.

An important property of the new model is that the effect of unionism is essentially invariant to the within-establishment parameter, λ. Larger values of λ reduce the estimate of b but also raise $s^w \lambda$, with the result that the union coefficient remains about the same. Table 6 explores the invariance of the estimated union effects in terms of estimates of the components of Equation 23, conditional on specified values of λ. Line 1 records predetermined values of λ. Line 2 gives the coefficient (and standard error) on unionism from the resultant regression of $\ln F_i - \lambda \ln F_i^w$ on the various explanatory factors. As the value of λ increases, the estimate of $c - \lambda s^w$

drops, particularly in manufacturing. Line 3 records the values of s^w from Table 5. Line 4 uses Equation 23 to obtain the final estimate of c. The calculations show that while $c - \lambda s^w$ varies greatly with different values of λ, c does not. According to the final figures, in 1967 – 72 unionism raised fringe spending, all other factors the same, by from .18 to .20 log points in all private industry and by .10 to .13 points in manufacturing.

The estimates of the spillover model suggest that blue-collar unionism may have a sizeable impact on white-collar fringes, making the "brothers" type of correction for within-establishment omitted factors incorrect. These estimates should be viewed, however, solely as illustrative potential magnitudes of spillover impacts and not as a test of the existence of spillovers. The model estimated in Equation 19 to Equation 23 provides no test of the direction of causality of the linkages (any more than did the omitted factor model in Table 5); it measures the union influences solely by the presence of a contract in the plant, rather than by provision of specific fringes; and it is not based on the type of case histories that might provide sufficiently strong prior knowledge to permit definite conclusions from the calculations.

These errors of omission notwithstanding, the model does suggest the possibility that unionism affects office worker fringes as well as production worker fringes and highlights the danger of allotting all of the link between office worker and production worker fringes to omitted firm factors.

Conclusion

The analysis and findings of this paper can be summarized briefly. First, because of the political nature of unionism, which makes unions more representative of average than of marginal worker preferences and more sensitive to intensities of preference, and because of the role of unions as stable market institutions, and possibly because unions provide more accurate information about worker preferences for fringes than can be garnered from individual bargaining, unionism can be expected to raise the fringe share of the compensation package.

Second, estimates of the impact of unionism on the fringes of blue-collar workers show the expected positive effect, with the magnitude depending on the particular statistical model used for estimation. The estimated effect of unionism is sizeable in regressions that compare organized and nonorganized establishments; it is reduced when omitted firm factors are taken into account, but it is raised when allowance is made for the possible effect of blue-collar unions on the fringes paid white-collar workers in the same firm.

Third, the effect of unionism on fringes is especially large for deferred compensation plans favoring senior workers, such as pensions, insurance, and vacation pay, in accord with a priori expectations. This effect is greater for low-wage and small firms than for others.

Finally, because of the sizeable impact of unionism on fringes and the importance of fringes in the wage bill, standard estimates of the union wage effect understate the differential between unionized and otherwise comparable nonunion workers.