

PUBLIC SECTOR EARNINGS AND THE EXTENT OF UNIONIZATION

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Many studies have examined the influence of union density (union members as a percentage of all workers) on earnings in the private sector, but few such studies have looked at the public sector. Using data from the 1991 Current Population Survey, this study estimates the determinants of earnings for state and local government employees in both the union and nonunion sectors. The extent of public sector unionization appears to be positively correlated with earnings for both state and local government workers and for those covered and not covered by collective agreements. Although the effect for non-covered employees is smaller than that for covered employees, both effects are larger than those typically found in similar estimates for the private sector. The authors also find that bargaining structure has some influence on earnings, with the most consistent effect being a positive influence of arbitration on the earnings of local government workers.

The rise of public sector unionism has generated an enormous volume of research on the theoretical and empirical relationships among bargaining laws, union membership, public sector employment, and earnings. The largest share of this literature examines the interplay among the legal environment, bargaining, and union membership. A large secondary share of the research focuses on the influence of

different dispute resolution procedures on earnings; and other studies examine the role played by public sector unionism in determining public sector employment levels.

Surprisingly little of this literature, however, examines the relationship between the extent of public sector unionization and the level of public sector earnings. This neglect contrasts sharply with the extensive literature studying the relationship between union density and earnings in the private sector. Numerous studies have found that the extent of unionization posi-

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tively influences the earnings of union members, non-members, or both (for example, Freeman and Medoff 1981; Mellow 1983; Curme and Macpherson 1991).

What little evidence there is on the public sector seems somewhat indirect and focused largely on "spillovers" to nonunion workers. In their introduction to *When Public Sector Workers Organize*, summarizing the research reported in that volume, Freeman and Ichniowski (1988) noted three pieces of evidence indicating that nonunion public sector employees benefit from the presence of union workers. First, earnings of nonunion public sector workers were found to be higher in states that favor collective bargaining. Second, public sector nonunion earnings increased especially quickly in these same states. Third, Zax and Ichniowski (1988) demonstrated that workers in unorganized departments of a municipality earned higher pay when workers in other departments were unionized than when they were not. Sanitation workers in particular were likely to benefit greatly when police and fire workers were unionized.

Although such findings strongly hint that the extent of public sector unionization within a jurisdiction might be positively associated with earnings, they do not prove the case. Indeed, Waters, Hill, Moore, and Newman (1994) found a paradoxical negative association between wages and the extent of public sector unionization. While the wage was taken to be exogenous and unionization endogenous, it remains hard to reconcile this finding with the evidence suggested by Freeman and Ichniowski.

More than being just a neglected corner of an academic map, this issue has growing public policy significance as courts have had to determine whether a public sector union can include costs associated with organizing when determining the level of payment under agency shop or "fair share" requirements. In a series of cases beginning with *Machinists v. Street* (367 US 740 (1961)), the Supreme Court has limited the fees unions can assess covered non-members (those covered by a collective bargaining agreement but electing not to

join a union) under union security provisions. In *Lehnart v. Ferris Faculty Association*, the Supreme Court said unions could include the cost of all activities that (1) were "germane" to collective bargaining activity, (2) were justified by the government's vital interest in labor peace and avoiding "free-riders" who benefit from union efforts without paying for union services, and (3) did not significantly add to the burdening of free speech that is inherent in the allowance of an agency or union shop (111 S.Ct. 1950 (1991)). If organizing new members increases union density and so earnings, it may follow that organizing expenses meet the test of being "germane."

The work reported here explores the relationship between public sector organization and earnings, using data from the 1991 outgoing rotation file of the Current Population Survey. Our analysis is performed in the context of a general model of the determinants of earnings of U.S. public sector workers in both the union and non-union sectors. We explicitly include differences in bargaining laws, as well as typical human capital controls, differences in state median income, and differences in private sector state occupational earnings. Also included are measures of both the extent of public sector unionization and the extent of private sector unionization. Equations are estimated under varying assumptions about the error structure and on subsamples to better control for differences in state labor relations climates.

Public Sector Density and Earnings

In formal models of public sector bargaining developed by Inman (1980, 1981) and expanded by Gyourko and Tracy (1989, 1991), the final bargained wage has been perceived as a function of the structure of bargaining, the private sector alternative wage, and the relative bargaining power of the union. While our estimates control for the first two factors, our primary focus captures a determinant of bargaining power. We present three theoretical arguments supporting the hypothesis that the relative bargaining power of the union increases

with the extent of public sector unionization. If these arguments are correct, public sector covered earnings that reflect bargaining power should also increase with the extent of unionization.

First, increased unionization decreases the ability of jurisdictions to substitute away from union labor (Freeman and Medoff 1981). This decrease in substitution generates a less elastic final demand for union services and a less elastic derived demand for unionized labor, and thus supports a higher optimal union wage. For instance, a unionized sheriff's department is far less likely to lose the duty of providing security at the county hospital to separate nonunionized "hospital guards" if the hospital is also fully unionized. (See Friedman 1984:108 for a community choice perspective on this example.)

Second, greater organization across jurisdictions can lower the cost of agreement for a given package. This effect occurs because earnings are "taken out of the competition" between communities (Tiebout 1956). The increased organization of one locality thus has a positive influence on wages that could be negotiated by unions in neighboring communities. Insofar as adjoining communities have similar degrees of organization, a strong correlation between the extent of organization and wages would emerge. Indeed, Mehay and Gonzalez (1986) presented evidence that competition between communities limited the ability of local public sector unions to increase wages. In particular, they found that union wage increases were moderated in those urban areas that had many jurisdictions and in which legal limits on annexation fostered "competition." It follows that the effect of this competition could be reduced by high degrees of organization across competing jurisdictions.

Third, public sector union earnings may increase because of the political effect of greater organization. (See Wellington and Winters [1971] for an early treatment of this issue.) As organization increases, unions may become more effective in achieving electoral, legislative, and political goals. This, in turn, moves the demand

curve for members' services outward (Freeman 1986). Thus, the trade-off that exists between wages and employment may be attenuated by political activity that allows both higher wages and greater employment. Zax (1989) and Zax and Ichniowski (1988) confirmed that employment is higher in municipal departments that bargain than in otherwise similar departments that do not bargain. Thus, unions may be able to increase wages as well as employment by political influence on the legislature or local equivalent. Extensive organization helps in this process because of the dual role of members as both employees and voters (Courant, Gramlich, and Rubinfeld 1979). In short, as the political strength of public sector unions increases, their relative bargaining power increases as well.

Although there is empirical support for these theories, the evidence is not unanimous. Valletta (1993) contended that the ability to shift demand, which others have found in cross-sectional studies, vanishes in more sophisticated longitudinal estimations. Similarly, Trejo (1991) argued that any positive effect of public unions on employment results from economies of scale in organizing, and that once the endogenous nature of union status is correctly modeled, there is no influence on employment. Further, the institutions of public sector labor relations may reduce the scope for direct use of power. Third-party procedures such as fact finding, mediation, and arbitration place greater value on factual presentation and comparisons than occurs in traditional private sector bargaining and may limit the gains from bargaining power.¹

However, these same institutions do leave ample room for gains associated with greater organization. Unions have gained strategic advantages from interest arbitration

¹Despite such constraints, the origins of many public bargaining statutes can be found in successful strikes by well-organized public employees. Police, firefighters, sanitation workers, and postal employees have used their pivotal position and organization to extract both substantial settlements and favorable institutional structures (Hebdon 1996).

processes that allow initial negotiation with communities in which favorable voluntary settlements are likely. These settlements then become comparables in interest arbitration in communities less likely to provide favorable settlements. Such a strategy depends on organizing across a wide variety of communities within a state. Unions may also use the many institutional procedures at their disposal (such as dispute resolution, grievance procedures, and civil service review) to create time and money costs for public managers and so increase union bargaining power. Increased union organization provides wider scope for such actions as well as the funds required to pursue them.²

Non-members may benefit from increased coverage because of union threat effects and the possibility that union positions are sufficiently attractive to generate queues. Podgursky (1986), Moore, Newman, and Cunningham (1985), Hirsch and Neufeld (1987), and Belman and Voos (1993) each confirmed that private sector nonunion workers in more unionized markets earn higher wages. This evidence has been taken to indicate that the threat effect, perhaps combined with the queuing effect, dominates any tendency for previously unionized workers to crowd the non-union labor market.³ Public employers may let union earnings set the standard for nonunion workers in the same governmental unit in order to avoid morale problems or further unionization. Such behavior becomes less costly when the extent of unionization within the unit is already high. Thus, a high degree of union coverage increases the earnings of those not covered as well. Moreover, the lobbying by public sector unions will usually not be sufficiently pointed to induce voters or legislators to

increase demand for union services alone. A general increase in demand for governmental services would be expected to increase the earnings of nonunion governmental workers.

Framing of the discussion in terms of the extent of organization is not inconsistent with the approach of those who have examined individual occupations to search for spillover effects. Ichniowski, Freeman, and Lauer (1989) used longitudinal evidence and found relatively small differences between the earnings of unionized and nonunionized police within a state but found that this shared level of earnings was determined by how favorable the state bargaining laws were toward public sector unionization. This evidence of a spillover effect within a specific occupation could easily be consistent with a more general elevation of all nonunion public earnings.⁴ The issue we examine is whether a general elevation in earnings within the state and local sectors is associated with the extent of unionization even after controlling for the bargaining laws. While single occupation studies are valuable, they will not capture spillovers across occupations.

Legal Environment

Meaningful estimation of the effects of public union density requires understanding and accounting for the differences among the various states in the public sector legal environment. In contrast with the unified and process-oriented laws governing the private sector, the laws regulating public workers are diverse and often intended to regulate the process, content, and outcomes of negotiations. States take radically different approaches to the fundamental issues of bargaining: whether bargaining is permitted at all; if so, what forms are permitted; how impasses are to

²Indeed, Hebdon (1996) found that the decrease in public sector strikes has been accompanied by an increase in grievance filings, civil service reviews, and unfair labor practice filings.

³Note that Lewis (1986) and Heywood (1988) have argued that some of the influence from the percentage organized may result from omitted variable bias.

⁴Delaney (1985) and Zwerling and Thomason (1995) each found substantial spillover effects for school teachers, with nonunion teachers benefiting as the extent of unionization increases.

be resolved; and whether and how violations of the bargaining laws are penalized. Even within states, different levels of government and occupations are often treated differently. The effects of varying statutory frameworks on the relation between organization and earnings is uncertain. They may limit the union's economic and political capacity to influence wage setting, but they may also reduce dispute costs to the point that unions may capture higher wages. (Contrast Currie and McConnell [1991] with Gunderson, Hebron, and Hyatt [1996] and with Ashenfelter and Bloom [1984].) Although the effects are far from clear, variations among state laws certainly have the potential to influence the earnings gain from increased levels of union organization, highlighting the necessity of controlling for legal environments.

Before we can examine the influence of the extent of public sector organization on earnings, we must identify the legal environment of each jurisdiction by a careful reading of the relevant statutes. Our effort to do so represents a partial updating of the National Bureau of Economic Research "Public Sector Collective Bargaining Law Data Set." While we do not replicate the breadth of those earlier data, we do capture the major legislative characteristics of each jurisdiction's bargaining environment (Appendix Table A1). Since legislation varies widely by occupation, we classify public sector labor relations laws separately for police and firefighters, primary and secondary teachers, post-secondary teachers, transit workers, other local employees, and other state employees.⁵ Legislation is also categorized by procedure: whether bar-

gaining is permitted (enabling legislation), whether strikes are permitted (strike legislation), whether interest arbitration can be invoked by one of the parties and covers compensation (arbitration), whether the parties can, by mutual consent, invoke binding arbitration (voluntary arbitration), and whether laws penalize job actions through fines or disciplinary procedures (penalty for job action). This categorization results in five dummy variables that will be entered as controls in the earnings equations.⁶

Following the literature, we expect the enabling legislation variable to have a non-negative effect on earnings. Such legislation confers legitimacy on the collective bargaining process, and while it does not compel action, it requires that the voice of the union be heard. The availability of binding arbitration should have a positive influence, while the signs on the strike and voluntary arbitration coefficients appear ambiguous, and penalties for job actions should have a negative effect.⁷

Table 1 is derived by merging our analysis of public sector bargaining laws with our data set of 7,680 state employees and 16,131 local government employees (the data set is described in the next section). Slightly more than half of state workers and nearly two-thirds of local workers are covered by enabling legislation. Approximately half the workers in each sector face penalties

⁶Although municipal laws are sometimes more favorable to bargaining than the laws of the corresponding state, our legal variables reflect only state codes. This is necessary both because of the difficulty in obtaining information on municipal bargaining laws and because our data set does not allow us to determine the municipality of employment.

⁷The ambiguity associated with the strike variable reflects the fact that strike statutes provide considerable discretion to the public authority in deciding when and for whom strikes are permitted. Strikes may be permitted only when the public body can use the strike to gain what it sees as a favorable outcome, or they may be permitted for use in creating more bargaining power for the union (as was once common in the private sector). The ambiguity of the voluntary arbitration variables reflects a process that, because of the need for mutual consent, seems unlikely to systematically favor one party or the other.

⁵These laws are often complex and difficult to interpret. For example, some states have statutes covering police and fire, while others may only grant bargaining rights to one group or the other. Although we have made every effort to assure that our legal indicator variables reflect the actual coverage of bargaining laws, the occupation codes used by the Current Population Survey are not always congruent with statutorily defined occupational groups. This mismatch may cause some measurement error, but we believe it is slight.

for job actions. Legislation permitting strikes covers less than one-third of local employees and 18% of state employees. Legislation mandating interest arbitration covers 10% of local employees and only 7% of state employees. The small proportion of employees covered by arbitration (although the figure is greater for voluntary arbitration) is surprising given the wide attention paid to these procedures in the literature. The statistics indicate that state legislatures are more willing to provide for bargaining than for binding means of resolving bargaining disputes and are more likely to mandate bargaining and dispute resolution for local than for state governmental units.

Initial Estimation and Results

Without fear of contradiction, it may be stated that the influences we investigate are complex, reinforcing, and potentially simultaneous. Our estimation assumes that public sector union density, as well as legal structure, influences wages. The causal relations underlying wage determination may be more complex, with legal structure a precursor of organization. In addition, private sector unionization may be a determinant of public sector wages, as well as public sector unionization and public sector bargaining laws. The income level in a state may influence the extent of both private and public sector unionization and may help determine public sector bargaining laws. Taken together, these potential interrelations suggest a need for complex sets of equations determining public wages, public union density, and legal structure.

We follow a simpler course of estimating a single equation system and controlling for the more important dimensions of these relationships. We have chosen this course because the relationships among the various factors are too complex, and not well enough understood, to be readily sorted out into a multi-equation system. As a consequence, the estimations we present only consider the durability of the direct correlation between public sector organization and public sector earnings and do

Table 1. Extent of Public Sector Bargaining Legislation and Organization.

Variable	Local	State
Enabling	66%	55%
Strike	27	18
Arbitration	10	7
Voluntary Arbitration	21	18
Penalty for Job Action	49	50
Union Coverage	50	38

Note: These figures represent workers covered by various provisions as a percentage of the public sector work force.

Sources: Appendix Table 1 and the outgoing rotation files of the 1991 CPS.

not inquire into the more complex causal relations. In the next section we will make a modest attempt to focus on a narrower class of legal environments to address at least some of these concerns. Nonetheless, we recognize that some variables that we treat as exogenous, such as our controls for legal structure, may be viewed as endogenous by others.⁸

All earnings equations are estimated on the 1991 outgoing rotation file of the Current Population Survey (CPS). The sample is limited to nonagricultural workers between the ages of 18 and 65 in either the state or local government sector. This results in a sample of 7,680 state workers and 16,131 local workers. Estimations are performed separately for those covered and those not covered by collective bargaining.

⁸To get some idea of the complexities involved, consider just the notion that legal structure influences public sector union density while that same union density may be a determinant of legal structure. While the former is a frequent maintained hypothesis, the latter could easily follow if public sector labor laws respond to issues that grew out of public workers gaining sufficient organizational strength. Note that the appropriate system of equations would be five endogenous legal variables, all dummy variables, and an endogenous union density variable, with all six variables estimated simultaneously. As daunting as those requirements are, the issue of earnings (our focus) is not even yet in the system of equations.

The dependent variable is always the log of hourly earnings. The list of control variables conforms with other research based on the CPS and includes a constant, years of education, years of potential experience, the square of experience, two dummies for race, one dummy for female, three dummies for urban area size, three dummies for major region of the country, controls for the one-digit occupation, and a variable to capture part-time status. The legal dummies are matched to the individuals through the detailed occupation and location controls provided by the CPS.

The variable of primary interest is a constructed measure of union density. This measure, the percentage of each state's public work force who report union membership or coverage by a collective bargaining agreement, is calculated separately for the state and local work forces for each state and then entered in the relevant estimation. Collective bargaining coverage is used rather than union membership because it better reflects the group directly affected by bargaining. It includes employees who, despite belonging to professional associations that bargain, fail to classify themselves as union members. Thirty-eight percent of local employees and 50% of state employees report being either union members or non-members covered by collective bargaining (Table 1).⁹

The initial estimation includes just the individual controls and the coverage measure. The estimations are then repeated with the addition of the legal variables discussed in the previous section. Next, variables designed to control for state-specific supply and demand influences are added to the legal variables. Finally, private sector

union density for each state is added to the equation already including the legal and state variables.

The first two columns of Table 2 summarize the estimations with the coverage and five legal environment variables for local public employees. The coefficients for the individual control variables are typical for a public sector sample (a return to education of around 6% and a return to experience of around 2%) and the large sample size ensures that nearly all of the controls are statistically significant. The individual controls by themselves explain about one-third of the variation. (Full estimates for these equations, and all others discussed in this paper, are available from the authors on request.)

The top half of Table 2 presents the results for those covered by collective bargaining and the bottom half presents the results for those not covered. Focusing first on the local covered sector, the size of the coefficient on the extent of coverage is large and significant. In the first two columns the coefficient is close to .5, indicating that a ten percentage point increase in local sector coverage is associated with slightly more than a 5% increase in earnings, holding all other determinants constant.¹⁰ This coefficient is substantially larger in magnitude than those reported in studies of the private sector.¹¹

The pattern of coefficients on the legal variables is roughly consistent with findings reported in the literature. Enabling legislation does not affect the wage, the right to strike and penalties for striking are negative partial correlates of earnings, and mandatory arbitration is a large positive partial correlate, boosting earnings by 8%. The effects of the right to strike and job penalties are quite modest and the signifi-

⁹In a state in which coverage varies among municipalities and counties, state average union coverage for local government employees will not measure actual coverage for some local governments accurately. This type of measurement error mirrors that in studies of the private sector that use union density by industry or region rather than plant- or firm-specific measures of coverage.

¹⁰This follows from subtracting one from the natural base being raised to the power .05 (the .5 coefficient times a .10 increase in coverage).

¹¹For example, Lewis's (1986:148) commonly cited range for union coverage effects by industry is based on coefficients typically less than one-half this estimate.

Table 2. Effects of Selected Variables on Earnings in the Local Sector.
(Dependent Variable: Natural Log of Hourly Earnings; t-Statistics in Parentheses)

<i>Variable</i>	<i>Basic Equation</i>	<i>Plus Legal Variables</i>	<i>Plus Household Income 85 and Reservation Wage</i>	<i>Plus Private Sector Density</i>
Covered by Union (n = 8168)				
Union Density	.4926 (13.17)	.5413 (12.60)	.3166 (6.58)	.2578 (4.60)
Enabling Legislation		-.0008 (0.06)	.0198 (1.51)	.0240 (1.82)
Right to Strike		-.0251 (2.00)	-.0183 (1.59)	-.0164 (1.16)
Arbitration		.0731 (5.29)	.0731 (5.32)	.0794 (5.66)
Voluntary Arbitration		-.0423 (3.40)	-.0422 (3.38)	-.0467 (3.69)
Penalty for Job Action		-.0211 (2.09)	-.0018 (0.19)	.0032 (0.30)
Household Income 85			.0354 (3.69)	.0260 (2.54)
Reservation Wage			.3844 (9.08)	.3861 (9.12)
Private Union Density				.3430 (2.24)
R-Squared	.3598	.3662	.3717	.3738
Not Covered by Union (N = 7964)				
Union Density	.2838 (7.53)	.3142 (7.01)	.1711 (3.52)	.2177 (4.10)
Enabling Legislation		-.0105 (0.80)	.0170 (1.24)	.0128 (0.92)
Right to Strike		.0142 (1.02)	.0098 (0.70)	.0072 (0.52)
Arbitration		.0729 (3.47)	.0785 (4.28)	.0716 (4.28)
Voluntary Arbitration		-.0319 (1.94)	-.0269 (1.63)	-.0195 (1.16)
Penalty for Job Action		-.0103 (1.02)	-.0050 (0.48)	-.0118 (1.12)
Household Income 85			.0454 (4.20)	.0511 (4.59)
Reservation Wage			.2672 (6.57)	.2655 (6.53)
Private Union Density				-.3726 (2.19)
R-Squared	.4320	.4357	.4542	.4543

Source: Outgoing rotation file, 1991 CPS.

cance of both is sensitive to the inclusion of other variables. The negative effect of strike legislation is somewhat counter-intuitive, given that limits on the right to strike effec-

tively constrain the unions' use of bargaining power. It may be that strike legislation is available only where collective bargaining units are weak. Legal public sector

Table 3. Effects of Selected Variables on Earnings in the State Sector.
(Dependent Variable: Natural Log of Hourly Earnings; t-Statistics in Parentheses)

<i>Variable</i>	<i>Basic Equation</i>	<i>Plus Legal Variables</i>	<i>Plus Household Income 85 and Reservation Wage</i>	<i>Plus Private Sector Density</i>
Covered by Union (n = 2941)				
Union Density	.5502 (9.31)	.6259 (7.96)	.5186 (5.70)	.6445 (5.93)
Enabling Legislation		.0418 (1.56)	.0248 (0.91)	.0073 (0.25)
Right to Strike		-.1058 (5.32)	-.0704 (3.45)	-.0199 (3.67)
Arbitration		-.0551 (2.09)	.0375 (1.34)	.0314 (1.14)
Voluntary Arbitration		-.0777 (3.98)	-.0667 (3.49)	-.0592 (3.01)
Penalty for Job Action		-.0198 (1.24)	-.0040 (0.25)	.0037 (0.22)
Household Income 85			.0616 (4.19)	.0783 (4.70)
Reservation Wage			.4366 (6.91)	.4173 (6.54)
Private Union Density				-.5485 (2.12)
R-Squared	.3654	.3794	.3796	.4008
Not Covered by Union (N = 4739)				
Union Density	.2872 (6.45)	.3883 (5.37)	.3636 (5.29)	.3726 (5.01)
Enabling Legislation		-.0257 (1.19)	-.0246 (1.14)	-.0259 (1.18)
Right to Strike		-.0437 (1.89)	-.0478 (2.05)	-.0482 (2.07)
Arbitration		.0125 (0.43)	.0682 (2.27)	.0674 (2.24)
Voluntary Arbitration		-.0173 (0.66)	-.0667 (3.45)	-.5919 (3.09)
Penalty for Job Action		-.0021 (0.16)	-.0005 (0.04)	.0175 (0.013)
Household Income 85			.0502 (3.39)	.0519 (3.32)
Reservation Wage			.2967 (5.62)	.2964 (5.62)
Private Union Density				-.0717 (0.32)
R-squared	.4635	.4672	.4731	.4731

Source: Outgoing rotation file, 1991 CPS.

work stoppages would then more likely be an instrument of managers than of unions. Closely related to this, governments usually restrict strikes to those performing nonessential services. Such units might be the

weakest and those for which the government could outlast a strike. Finally, voluntary arbitration statutes have a puzzling negative affect on the wages of covered local employees. We will return to this after

reviewing the results for the other employee populations.

The results for the local non-covered work force are presented in the bottom panel of Table 2. Local sector coverage is positively associated with the level of non-covered earnings, with a coefficient close to .3 in the first two initial estimates. The gain from increased union density to non-covered local employees is thus about 60% of that for covered employees. The effect of union density on wages again remains larger than that usually found in private sector studies. The only legal variable to maintain significance is arbitration.

Table 3 presents estimates for the covered and non-covered work forces in the state sector. The coefficient on public sector coverage in the first two columns is slightly larger than that in the local covered sector equations (closer to .6 than to .5). The coefficient for the non-covered state sector seems similar in size to that in the local non-covered sector. The coefficient on voluntary arbitration is negative for the covered sector. Coefficients on the right to strike are negative, significant, and larger in magnitude than in the local equation. Enabling legislation may have a weak positive influence for covered state employee earnings.

The estimated negative effect of voluntary arbitration in the local covered, local non-covered, and state covered sectors is puzzling. The bilateral nature of the process suggests that there should be no systematic relationship to wages. It may be that such statutes reflect weakness in public employee organizations. Mandatory dispute resolution has been intended as an institutional alternative to the disruption that accompanied illegal strikes and the means of addressing the issues that accompanied effective unionism. Passage of mandatory arbitration statutes has usually occurred in the wake of increased organization and mounting workplace activity by public sector employees. The very lack of a compulsory element in voluntary arbitration statutes suggests that public employee unions failed to create conditions or generate the political power to make a manda-

Table 4. Projected Earnings
Based on Column 2 of Tables 2 and 3.

<i>Extent of Coverage</i>	<i>Covered</i>	<i>Non-Covered</i>
Local		
High Coverage (70%)	15.30	13.24
Low Coverage (30%)	13.24	12.43
State		
High Coverage (73%)	13.20	11.74
Low Coverage (27%)	10.33	10.12

tory dispute resolution procedure palatable to legislatures. It may be that the variable for voluntary arbitration is then a measure of the weakness of employee organizations, and reflects the lower wage consonant with such weakness.

The flavor of the results so far can be summarized by examining projected wages for a "typical" employee under a "low" coverage and a "high" coverage regime. The characteristics of the non-covered workers are entered into the equations for both the covered and non-covered workers from their governmental sector. Two estimates are made for each projection: one with the coverage rate one standard deviation below its mean and one with the coverage rate one standard deviation above its mean. The top of Table 4 shows projections for the local sector workers. These projections, which hold constant all variables in column 2 other than public coverage, indicate a substantial influence. The move from low coverage to high coverage is associated with a \$2.06 per hour increase for covered and a \$.81 per hour increase for non-covered local employees. For state employees the increase is \$2.87 and \$1.62 for covered and non-covered employees, respectively.

Basing his conclusion on a review of two dozen studies of public sector wages, Lewis (1988) found the typical union gap in the public sector to be between 8% and 12%.¹²

¹²Of course, different groups of public sector workers were recognized as having different union differentials. Lewis highlighted transit workers, school teachers, and nurses as having among the largest differentials.

As a check on our estimates and on the statistical significance of the effects of individual union coverage, we combine the subsamples and estimate earnings equations for the entire local and entire state sectors. These have specifications identical to those in Tables 3 and 4, with the addition of a dummy variable measuring whether or not the individual is covered by a union contract.

In an equation analogous to that in the second columns of Tables 3 and 4, the union differential in the local sector is 10.1%, with a t-statistic of over 14. The union differential in the state sector is 7.4%, with a t-statistic of 6.4. Combined estimates such as these constrain the coefficients on the explanatory variables to be identical between the covered and non-covered subsamples. Nonetheless, the coefficient on public sector coverage density remains large and highly significant (.3762, with t-statistic of 10.6, for the local sector, and .4468, with a t-statistic of 8.8, for the state sector) despite a union membership coefficient roughly within the range suggested by Lewis.

Additional Estimates and Discussion

The results presented in the previous section are subject to important caveats that demand alternative estimations. First, there may be unmeasured state-level effects that put upward pressure on earnings and are correlated with public sector unionization. For example, some states may have an industrial mix associated with both higher earnings and unionization.¹³ Obviously, including an income measure in an earnings equation is somewhat suspect and raises the issue of simultaneity. The hope is

to control for omitted factors that might influence a state's unionization by directly including the measure. The measure included is median household income in 1985 in thousands of dollars. This measure, which predates the sample, was chosen to reduce the likelihood of simultaneity problems.¹⁴

A related concern is that unmeasured supply and demand conditions may influence private sector earnings in a state and that private sector earnings may be a major determinant of both public sector earnings and public sector unionization. Thus, the correlation between public sector unionization and earnings could actually be driven by uncaptured supply and demand conditions within states and within occupations in those states.

To control for that possibility, we generate a private sector alternative or reservation earnings variable. This measure is the average private sector hourly earnings for each major occupation for each state. Including it in the equation should go far toward capturing the influence of private sector earnings on those in the public sector, as the earnings of public sector clerical workers in Wisconsin will be conditioned on the average private sector clerical earnings in Wisconsin. The results including both the income and private sector reservation wage are summarized in the third column of Tables 2 and 3. Both are included as natural logs to mirror the dependent variable.

The coefficients on both the income and reservation wage measures are positive and highly significant in all four equations. These are obviously strong statistical determinants of public sector earnings. The influence of these results on the role of public sector union density appears to differ by the level of government. In the local sector the coefficient on union density drops to about half its previous size among both covered and non-covered workers.

¹³There are two prominent arguments for a positive correlation between income and unionization. First, if the benefits of union membership are normal goods, then increased income should be associated with increased "consumption" of union membership. Second, income may proxy for conditions, such as job stability, that make the benefits of union membership, such as pensions, more valuable.

¹⁴The results are not qualitatively different if state median income from 1969 or 1959 is substituted.

Despite this drop, the coefficient on union density retains strong statistical significance. In the state sector the coefficient on union density remains roughly the same size as before and retains statistical significance. Note that the enabling legislation variable takes the expected positive sign in the local covered sector but the penalty for job action loses significance. The other legal variables retain similar coefficients except in the state non-covered sector, where arbitration emerges with a large significant coefficient. Thus, even after the inclusion of an income variable and a private sector earnings variable, highly collinear with both public sector unionization and the independent variable, the role of public sector union coverage continues to be evident.

If conditions in the state, such as income, the mix of industries, or the occupational structure, affect overall unionization in the state, inclusion of private sector unionization may be warranted. Private sector unionization may play an important role in establishing social and political attitudes toward unionization and hence the extent of coverage in the public sector. If it does, addition of the private coverage variable might, by controlling for political climate, reduce the measured impact of both union coverage and the legal variables on earnings. Column 4 of Tables 2 and 3 adds the extent of private unionization by state to all previous variables.

Private sector union density has a significant and positive effect on the wages of local covered employees, but has either no statistically significant effect or a negative effect on the balance of our population. More relevant to our issue, the introduction of this variable had only modest effects on the estimates of the effect of public sector union density on wages. All four public sector union density coefficients remain large and statistically significant.

In a further attempt to control for state-level influences on earnings that might be correlated with unionization, we included a variable measuring the portion of each state's work force in manufacturing, communications, transportation, or utilities. This variable has a long history as a deter-

minant of unionization in empirical studies (see Ashenfelter and Pencavel 1969), and states with high proportions of workers in these industries can be expected to have higher earnings. Placing this variable in the specification of column 4 results in no meaningful changes. The variable itself is significant at the 10% level in the state covered equation and is otherwise insignificant. It results in only the very smallest of changes in the magnitude of the public percentage organized coefficients. The coefficients of all four public sector union density variables remain highly significant.

A second major concern is that the apparent role of public sector union density may originate from differences in state bargaining climates not adequately reflected by the legal variables. Once the sample is limited to a set of jurisdictions with similar climates, the results might vanish. To test for this possibility, we limited our sample to only those states that had enabling legislation and then re-estimated the set of equations in the second, third, and fourth columns of Tables 2 and 3 after omitting the enabling legislation variable. The results are summarized in Table 5 by presenting the coefficients on public sector union density. The sample sizes are smaller, reflecting the elimination of observations from states without enabling legislation.

The estimates provide no evidence that public coverage proxies some omitted bargaining climate variable in the state equations. The coefficient retains its size and significance or actually increases in size and significance for all estimates. The local level coefficients are reduced sharply in magnitude not by excluding states without enabling legislation but by the combination of that limitation and the inclusion of additional variables outlined earlier in this section. While the union density coefficient in the local covered sector maintains more than half its original size and retains significance, that in the local non-covered sector drops to a small fraction of its original size in Table 2 once the additional variables are added. It also loses statistical significance. Thus, within these states with similar bargaining climates, there is evi-

Table 5. Wage Effects of Public Sector Union Coverage in the Sample of States with Enabling Legislation. (Dependent Variable: Natural Log of Hourly Earnings; t-Statistics in Parentheses)

<i>Variables</i>	<i>Local Covered</i>	<i>Local Non-Covered</i>	<i>State Covered</i>	<i>State Non-Covered</i>
Legal Variables	.5691 (10.77)	.3750 (5.91)	.9295 (7.68)	.6102 (5.17)
Plus Household Income 85 and Reservation Wage	.2112 (2.42)	.0732 (0.97)	.6082 (4.60)	.4271 (3.29)
Plus Private Union Density	.1479 (1.93)	.0588 (0.66)	.6979 (4.37)	.5482 (3.81)
N	6583	4072	2300	1927

Source: Outgoing rotation file, 1991 CPS.

dence that union density may not play a role for local non-covered workers.

A third caveat concerns the aggregate nature of some of our data. Individual observations are the foundation of our estimates, yet the aggregated state variables are of primary interest. When aggregated data are merged into micro data, there may be an error associated with the aggregation that is not independent across observations. This problem, identified by Moulton (1990) in the context of merging industry-level data with individual observations, may cause standard errors to be underestimated. As a consequence, the levels of significance of aggregate variables, those variables in which we have a primary interest, may be inflated.

The solution is to estimate a variance components model that allows for an individual component and aggregate component in the error term. Assuming that the two error components are independent of each other, consistent estimates of both coefficients and standard errors can be obtained from a random effects model. Our concern with this issue is more than theoretical. While early research on private sector union density assumed no group error components, Belman and Voos (1993) have, indeed, found common city error components in their estimates.

At issue is whether the relationships established in the earlier tables will remain intact after accounting for state-level random effects. We therefore re-examine the progression of equations from Tables 2 and 3 in a framework that allows for random effects by state. Lagrange multiplier tests reject the hypothesis of no state error component for each specification.¹⁵ The coefficients and t-statistics of public sector coverage are summarized in Table 6. The first row presents the union density measure from the equation with only individual controls. The second row adds the legal dummies, the third adds the measures of state income and the private sector reservation wage, and the fourth adds private sector union density.

In general, both the coefficients and the t-statistics are a bit smaller in random effect estimates. The influence on the local covered sector is the most pronounced, with the final estimate on the public sector union density coefficient being identical to that in the local non-covered sector. Despite these changes, all coefficients retain close to the same magnitude as before, and they also retain significance throughout the estimations. Indeed, the final state sector estimations are virtually unchanged by the random effects estimation.

Thus, while the random effects results across the four sectors are not identical, they share a number of characteristics. The coefficient on public sector coverage remains positive and significant. Private sector unionization only influences the wage of local employees covered by collective bargaining, and its effect, although large in magnitude, barely achieves significance in a 10% test in the final estimation. Arbitration plays the most consistent role among the legal variables, having a positive and significant influence on earnings at the local level (with voluntary arbitration often

¹⁵The Lagrange Multiplier test examines the presence of an error component specific to each state. See Judge et al. (1987).

Table 6. Wage Effects of Public Sector Union Coverage in the Random Effects Model. (Dependent Variable: Natural Log of Hourly Earnings; t-Statistics in Parentheses)

Variables	Local		State	
	Local Covered	Non-Covered	Local Covered	Non-Covered
Union Density Alone	.4361 (5.02)	.2373 (2.34)	.4136 (4.78)	.2809 (4.36)
Plus Legal Dummies	.4098 (4.82)	.2716 (2.67)	.5784 (5.53)	.3875 (5.26)
Plus Household Income 85 and Reservation Wage	.2723 (2.88)	.1992 (1.95)	.5499 (4.77)	.3730 (5.21)
Plus Private Sector Density	.2485 (2.34)	.2473 (2.14)	.6718 (5.33)	.3894 (4.85)
N	8168	7964	2941	4739

Source: Outgoing rotation file, 1991 CPS.

having an offsetting negative influence). The arbitration variable is also positive and significant in the final specifications for covered state employees, but it is never significant for non-covered state employees. Indeed, no legal variables are statistically significant in the non-covered state sector.

The role of the legal variables can be further examined with an F-test for the hypothesis that coefficients on the legal variables are jointly equal to zero, or that the legal variables do not add to the explanatory power of the equation. The first test, presented in the first row of Table 7, compares the model with only the public sector coverage measure to one that also includes the legal dummies. The second test compares a model with the public and private sector union density measures, the reservation wage, and household income to one that also includes the legal dummies, with the full set of individual controls remaining in all estimations.

The hypothesis that the legal controls do not add explanatory power is rejected for all tests in the local sector. The hypothesis that the controls do not add explanatory power can also be rejected for covered state employees. For non-covered state employ-

Table 7. Wage Effects of Legal Variables: Joint Tests.

Test	Local		State	
	Local Covered	Non-Covered	Local Covered	Non-Covered
F Stat. (5,inf.) 1st Test	16.32**	5.85**	8.50**	1.20
F Stat. (5,inf.) 2nd Test	16.37**	4.80**	6.80**	2.71*

*Indicates the null hypothesis of no influence on explanatory power can be rejected at the 5% level; **at the 1% level.

ees the hypothesis can be rejected only in the second test and only with a 5% threshold. These findings generally confirm the role of the legal variables and show that union coverage is influential both in those sectors where the legal structure has strong effects and in those where the legal structure seems to have a weaker effect.

Finally, alternative specifications varied the construction and treatment of the crucial public sector union density. First, the 1984 percentage of the state and local sector unionized by state replaced the 1991 measure. The 1984 measure might be more nearly exogenous, but its use did not change either the private sector unionization results or the public sector unionization results. This presumably follows from the extremely high correlation between the 1984 and 1991 measures (well above .9). Second, we retained the 1991 measure but included a second variable measuring the change in public sector unionization by state from 1984 to 1991. This second variable was significant only in the local covered sector, did not change the positive significance of the 1991 private unionization measure in that sector, and did not generally disturb the size and high significance of the public sector unionization coefficients in any sector.¹⁶

¹⁶The small average value of the change measure raises the specter that the variable is dominated by measurement error.

Conclusion

We began with the hypothesis that the extent of public sector union density is an independent determinant of the level of public sector earnings. Several considerations suggest that bargaining power, a traditional determinant of earnings, increases with public sector union density. Testing this hypothesis required the merging of a variety of state-level data with individual-level data. Developing the state data entailed identifying the legal environment for different groups of workers within each jurisdiction. That identification is one contribution of this paper.

The role of public sector coverage was confirmed for covered and non-covered employees in the state and local sectors in all of the initial estimates. The relevant coefficients were large and most often statistically significant. The effects in the covered sector were larger than those in the non-covered sector, and the effects at the state level were larger than those at the local level. These results were largely unchanged even when we added variables reflecting legal environment, state income, occupational earnings, and private sector collective bargaining coverage, and even when we limited attention to those states with enabling legislation. Re-estimation with an allowance for random effects had only modest effects on the coefficients and significance of the coverage measure.

The OLS models suggest that legal variables play an important role in wage determination for local and state covered employees. Of these variables, arbitration has the largest and most robust effect, but there is also some evidence that strike legislation and voluntary arbitration reduce wages for local employees. In the random effects estimations, legal structure had no earnings effects in the non-covered sector. Individual tests of significance could not pass any conventional level, and tests for group significance also indicated limited effects for the legal variables. The stronger role of arbitration at the local level may reflect the greater willingness of state legislators to place binding restrictions on local govern-

ments. Further, the effect of arbitration on earnings of non-covered local employees may differ for different groups of employees. For non-covered employees eligible to join unions, there might be a threat effect. A failure to meet the "union" wage would be an invitation to employees to organize to gain access to arbitration and the concomitant comparability standards used to establish earnings. For employees not eligible to join unions, such as managers, the effect may follow the need to keep wages in line with those of covered employees in order to maintain morale.

Private sector coverage increased public earnings only in the local covered sector. The presumption was that heavily unionized environments create a climate supportive of higher wages for public workers. However, public coverage does not simply proxy a climate created by high levels of private coverage; it has a strong independent effect. Thus, local sector covered workers gain from organization in the private sector, but they also gain from organization in the public sector.

The finding that public sector coverage plays a role in earnings determination has important ramifications. The Supreme Court requires a showing that non-union members covered by a union contract benefit from a union expenditure in order for that expenditure to be chargeable to non-members. Through examining cross-sectional differences in union density between jurisdictions, this study indicates that there is a robust positive relationship between increased union coverage and earnings. As pointed out, this relationship is larger than that found in typical private sector studies. Voos (1983) found that increases in organizing expenditures are associated with increases in union membership. That finding, taken together with the results of this study, suggests that increased expenditures on organizing by public sector unions that result in increased union density may relate directly to increased earnings. This amounts to an economic rationale for allowing organizing expenditures to be charged to covered non-members under the *Lenhart* guidelines.

We have gone to considerable lengths to ensure that our results do not merely reflect state heterogeneity. Our estimates of the relationship between earnings and union density include five state-level legal variables, state median income, a state-level private sector reservation wage, a state-level private sector union density measure, regional fixed effects based on the underlying state variable, a state-specific industrial composition measure, and an estimator that allows for a state error component. Nonetheless, a next step in our research might be to examine less aggregated data by focusing on particular occupations while still

examining intrastate variation in aggregate union density. Further, while our estimates provide a reasonably sophisticated cross-sectional approach to measuring the relation between union coverage and earnings, our findings would be strengthened by evidence that expanded coverage within political jurisdictions increases member earnings. Obtaining such evidence, evidence that would depend on panel data on collective bargaining units or political jurisdictions, would be a natural next step in research on the relation between union density and earnings in the public sector.

Appendix Table A1

Legislative Characteristics of Jurisdictions' Bargaining Environments

<i>State</i>	<i>Police/Fire</i>	<i>Educ.</i>	<i>Post Secondary Education</i>	<i>Transit^t</i>	<i>Local</i>	<i>State</i>	<i>Other</i>
AL	p	p	p		p	p	
AK	e,a ⁵	e,s	e,s		e,s	e,s	e,a ¹¹
CA ¹³	e	e,s	e,s		e,s	e,s	
CO	21			e ⁴			
CT	e,a	e,a	e,a		e,a	e,a	
DE ¹⁵	e,p	e,p ⁶	e,p		e,p	e ⁶ ,p	
DC	e,a	e,a	e,a		e,a	—	
FL	e,p	e,p	e,p		e,p	e,p	
GA	e ¹⁶			e ²		p	
HA ⁷	e,a	e,s,v	e,s,v		e,s,v	e,s,v	
ID	e ¹ ,s ¹	e,s					
IL	e,a ^{5,8}	e,s	e,s		e,s	e,s	
IN		e,p,v				17	
IA	e,a,p	e,a,p	e,a,p		e,a,p	e,a,p	
KS	e	e	e		e ²²	6	
KY	e ¹						
LA				e,a			
ME ^{7,12}	e,a	e,a	e,a		e,a	e,a	
MD ²³		e,p					
MA	e,p,v	e,p,v	e,p,v		e,p,v	e,p,v	
MO	e,p ¹	e,p	e,p		e,p	e,p ⁶	
MN ⁸	e,a,p	e,s,p,v	e,s,p,v		e,s,p,v	e,s,p,v	
MT ¹⁸	e,a ¹ ,s ⁹	e,s,v	e,s,v		e,s,v	e,s,v	
NB	e,a,p	e,a,p	e,a,p		e,a,p	e,a,p	
NH	e,p,v	e,p,v	e,p,v		e,p,v	e,p,v	
NJ	e,a	e,v	e,v		e,v	e,v	
NM ¹⁰	p	p	p		p	p	
NV	e,a,p	e,p	e,p		e,p		

Continued

**Appendix Table A1
Continued**

<i>State</i>	<i>Police/Fire</i>	<i>Educ.</i>	<i>Post Secondary Education</i>	<i>Transit¹</i>	<i>Local</i>	<i>State</i>	<i>Other</i>
NY	e,a,p	e,p,v	e,p,v		e,p,v ²⁴	e,p,v	
NC	p	p	p		p	p	
ND		e,p					
OH ²⁵	e,a	e,s	e,s		e,s	e,s	
OK	e,p	e,p					
OR	e,a ⁵	e,s,v	e,s,v		e,s,v	e,s,v	
PA	e,s	e,s	e,s		e,s	e,s ³	e,a ¹⁹
RI	e,a,p	e,p	e,p		e,p	e,p	
SD	e,p	e,p	e,p		e,p	e,p	
TX	e,p ²⁶	p	p		p	p	
UT	p	p	p		p ²⁷	p	
VT	e	e,s ²⁰	e,a,p		e,s ²⁰	e,p	
VA	p	p	p		p	p	
WA	e,a	e	e		e		
WI ¹⁴	e,a,s,p	e,a,s,p	e,p		e,a,s,p	e,p	
WY	e ¹ ,a ¹						

Notes:

¹Only noted where transit employees are public employees, not Memphis formula private employees, and treated differently from other public employees.

a - Arbitration.

e - Enabling legislation.

p - Penalty for striking.

s - Strike allowed.

v - Voluntary arbitration.

1 - Firefighters only.

2 - Atlanta only.

3 - Prison guards may not strike.

4 - Denver only.

5 - Includes correctional.

6 - Do not negotiate wages.

7 - The only penalty is injunction against strikes; striking is a prohibited practice.

8 - Compulsory arbitration for "essential" employees, voluntary arbitration for others.

9 - Non-firefighters.

10 - Enabling legislation was passed in 1992.

11 - Hospital employees.

12 - Arbitration is not binding on wages, salaries, pension, or insurance.

13 - Under a 1985 California Supreme Court ruling, all public employees except public safety have a right to strike. All public employees but local government have enabling legislation, typically including factfinding and mediation in interest cases. Memoranda of agreement with fiscal impact must be approved by the appropriate legislative body. For local government employees, a memorandum of agreement is specifically not binding under the law. A reasonable argument might be made that California does not have enabling legislation except for police/fire and primary/secondary teachers.

14 - Exceptions to the MERA no strike provisions are very narrow.

15 - Penalties for higher education and for local and state government are based on court decisions.

16 - Firefighters only. Mediation is similar to factfinding or advisory arbitration.

17 - An executive order prohibits strikes by state employees.

18 - Right to strike based on state supreme court ruling 88LRM2012 1974.

19 - Correctional officers and court employees.

20 - Strikes are lawful after dispute resolution procedures are exhausted.

21 - There is enabling legislation for firefighters in Denver.

22 - Local options allow for voters to elect to be bound by provisions of the PEERA.

23 - Baltimore provides enabling legislation for city employees, as do Montgomery and Prince George counties.

24 - New York City provides binding arbitration for city employees.

25 - Binding arbitration for correctional staff, ambulance staff, and psychiatric hospitals.

26 - Cities may enact an authorizing ordinance, which may include binding arbitration.

27 - Salt Lake City has bargaining by local ordinance.

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