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12 The Effects of Public Sector Unionism on Pay, Employment, Department Budgets, and Municipal Expenditures

Jeffrey Zax and Casey Ichniowski

Several recent reviews of the research on public sector union compensation effects conclude that the effects of public sector unions on compensation, while positive, are generally smaller than the effects of unions on compensation in the private sector (Lewin 1977; Mitchell 1978; Methe and Perry 1980; Ehernberg and Schwarz 1983; Freeman 1986; Lewis, chap. 6, this volume). However, compensation is only one of the issues with which unions might be concerned. In particular, limited empirical evidence suggests that public unions, in addition to their positive effects on compensation, also have positive effects on employment (Zax 1985a). Freeman (1986, 52) believes this is characteristic: "public sector unions can be viewed as *using their political power* to raise demand for public services, as well as using their bargaining power to fight for higher wages." He goes on to argue that while his proposition "requires empirical analysis . . . what is lacking, and needed, is a consistent analysis of public sector unionism on labor costs, employment and finances" (p. 62).

In this study, we pursue these issues by examining how municipal public unions affect employment and pay levels in their own functions and in other functions in their municipality, the overall budget allocation for their particular function and for other functions in their municipality, and the overall level of general expenditures in the municipality. We analyze the effects of public unions on this broad range of economic outcomes using an extensive data set on nearly 500 municipalities that

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maintain their own police, fire, sanitation, and streets and highways departments.

While we do find some function-specific exceptions to the following general pattern of the effects of public unions, our analysis generates these results:

1. The presence of a "bargaining unit" (one of two forms of public employee unionization analyzed in this study) in a function increases pay in that function significantly. Other forms of unionization that are not formally a "bargaining unit" (referred to as "organization" or "association" throughout) also raise pay levels significantly but by less than a "bargaining unit."
2. In all functions, bargaining units raise employment above what it would otherwise be given the union levels of compensation and thus increase total function expenditures. Associations, however, do not increase employment levels.
3. Despite the effect of a bargaining unit on the expenditures of its own function, total *general* expenditures of the municipality are not increased by bargaining units, implying that some other components of the expenditures of municipalities, outside of expenditures in those functions that we specifically analyze, will be lower when bargaining units are present in municipal functions.
4. The effects of bargaining units on the pay of employees in other departments are uniformly positive and frequently significant, but the estimates of bargaining-unit effects on employment levels in other departments in its municipality are consistently negative and frequently significant.

In single-equation models that do not control for function expenditures, bargaining units increase employment. In multi-equation models, unions increase function expenditures and reduce employment when function expenditures are held constant. These results suggest that the positive union-employment effects in single-equation models are attributable to positive union effects on function expenditures and to the derived effects on labor demand.

12.1 Union Influence on Public Sector Budgets and Pay Determination: Own and Cross-Departmental Effects

The central hypothesis of this research is that union power and influence manifest themselves at many levels of municipal finance. Therefore, this section briefly reviews the distinctive political, legal, and economic aspects of the public sector pay determination process. Unions intervene as voters, lobbyists, or negotiators at all accessible levels of that process. The potential effects of public employees' political power on municipal budgets have been considered theoretically. For example,

Courant, Gramlich, and Rubinfeld (1979) investigate how public employees could increase budgets through bloc voting in a model where citizens can move between jurisdictions.

The empirical investigations of public employees' political activity are primarily case studies and descriptive research. These studies contain detailed accounts of the wide range of political activity pursued by public employee labor organizations and provide persuasive evidence that the labor organizations participate vigorously in political processes.

Public employee labor organizations exert much of their political pressure through various forms of lobbying. Generally, public unions are some of the most significant lobbyists at all levels of government. For example, at the federal level, three public employee unions—the Post Office Clerks, the National Education Association, and the National Association of Letter Carriers—were among the top twenty-five spenders in lobbying activities as early as the 1960s (Moskow, Lowenberg, and Koziara 1970, 264). While there is no comprehensive listing of union expenditures at the state and local levels of government, public employee unions are again "prominent" in expenditure reports in states that require filing of lobbying expenditures (Moskow, Lowenberg, and Koziara 1970, 264–65).

This lobbying activity takes many forms. Local unions lobby at various levels of government, over a range of issues, and at various points in time relative to collective bargaining negotiations. For example, state legislatures have enacted supportive bargaining legislation and have legislated fringe benefits for municipal employees, such as pensions, insurance programs, and educational benefits. These same issues, including protective bargaining ordinances, may be legislated at the municipal level as well. Public sector unions may also lobby civil service boards to obtain pay and benefit increases they could not achieve through lobbying in legislatures or through collective bargaining.[1] One study of the political lobbying activity of public employee organizations uncovered numerous instances of direct lobbying of legislators by public unions to achieve their objectives:

> On the local level, the Los Angeles city council acknowledges that the Fire and Police Protective League . . . was instrumental in persuading the council to grant $40 million in pay increases to Los Angeles policemen and firemen. . . . Similarly, the firefighters in Syracuse, New York, were able to gain a mandatory forty-hour work week from the state legislature after failing to obtain this concession at the bargaining table. Again at the state level, Illinois fire and police organizations were . . . successful in obtaining a state-mandated minimum wage for uniformed personnel (Labor Management Relations Service 1972, 12).

The strategy of pursuing pay and benefit increases through legislation when they are denied in collective negotiations as practiced by the Syracuse fire fighters is sufficiently common to be known as "end-run" bargaining. Labor organizations can also make an end run to civil service boards to obtain benefits not obtained in bargaining.[2] Political activity of public employee labor organizations is not confined to direct lobbying in municipal councils, state legislatures, and civil service boards. It also includes activities such as letter-writing campaigns, demonstrations, and marches before seats of government, and even the use of petitions and referendum elections, sometimes referred to as "indirect lobbying," that force legislative responses (Labor Management Relations Service 1972, 7–8).

Lobbying by public employee groups in the budgetary process is designed to influence the overall size of the budget for their function and allocations across items within their function's budget. Craft (1970), for example, describes a three-tier process followed by teachers in California. He found that employee representatives first lobbied for revenue-increasing mechanisms such as tax increases, special assessments, and bond elections early in the budget-setting process. After an overall budget was set, employee representatives reviewed allocations for various items in the budget. Craft cites instances where the employees' representatives reduced line items for hiring new teachers, since they had better estimates of projected employee turnover. They were also able to restructure various educational programs to qualify for state or federal funding, thereby reducing other line-item commitments in the local budget. In all cases, any savings that became available in this "budget search" process were reallocated to the payroll expenditures of currently employed teachers.

Such a scenario suggests that this type of lobbying may not necessarily increase the overall budget, but it might lead to a relative reduction in nonpayroll items. Gallagher (1978) addresses this issue in his study of school district budgets. He finds that unionization did not decrease expenditures on any budget item that he investigated, and it increased payroll line items for bargaining unit and nonbargaining unit employees. If this result is general, it implies that union payroll gains must increase government expenditures by at least as much.

The legal framework for the budgeting process is a principal reason why employee unions devote such energy and resources to lobbying legislatures over budget size and budget allocations. Any state in which a court case specifically addresses the issue has ruled that legislatures have the final authority to appropriate funds (Henkel and Wood 1982). While the relevant court cases will often address the issue because a state or local legislature did not appropriate funds for a collective bargaining agreement between a union and a representative of the gov-

ernment's executive branch, the effect of the decisions may be an increase in union lobbying activity of the legislatures to avoid such a legislative veto. Interestingly, it has been argued that since state and local legislators are often part-time officials, they may have less time than members of the executive branch to assess the service needs in their community and might therefore respond more favorably than executives to requests or demands made by public employee representatives (Henkel and Wood 1982).

Furthermore, the political objectives of government officials and of public employees may often be in concert rather than in conflict. Elected officials invariably value public employee votes and may find that the political cost of those votes is small. Appointed officials and public employees may find that their objectives are mutually compatible. Niskanen (1975) and Ott (1980), in their theoretical studies, conclude that the "bureaucrat's" objective is to increase the size of his bureau. Larger departments offer, at a minimum, more employment; so this is an objective that public employees endorse as well.

These examples do not provide enough detail to determine how much public sector union members benefit from political activities pursued by their union. They also do not indicate how much political activity is engaged in by unorganized public employees. However, they are sufficiently vivid to encourage measurement of union-nonunion differentials other than the union-wage effect.

Finally, of course, public sector unions influence the pay determination process through collective negotiations at the bargaining table. While the preceding discussion highlights the multipronged lobbying efforts of public unions to influence pay, employment, and budgets, the collective bargaining process in the public sector has also been described as inherently "multilateral."

Multilateralism has been defined to exist when more than two distinct parties are involved in negotiations so that no clear dichotomy exists between employee and management organizations (Kochan 1974, 526). Stanley (1972, 2) provides an extreme example of the often fuzzy distinction between public employer and public employee organization. In Hartford, Connecticut, an American Federation of State, County, and Municipal Employees (AFSCME) business agent served as chairman of the Connecticut State Assembly Labor Committee.

We do not argue that all public unions operate in a similar fashion and with equal effect at various levels. The diversity of possible activity by public unions within budget-making and bargaining processes in different environments has already been documented (Derber et al. 1973; Horton, Lewin, and Kuhn 1976). Similarly, while our empirical models incorporate a number of the institutional aspects of the public sector "pay determination" process and union participation in those

processes, we cannot account for all possible details. The preceding discussion, however, does clearly indicate that public unions may affect budgetary outcomes. To the extent they are successful, they could stimulate an increase in the demand for their services.

These considerations lead us to believe that the "monopoly" union (Dunlop 1944) characterization is not representative of union behavior in the local public sector. The objectives of public sector unions include many aspects of employment conditions in addition to compensation. Theoretically, other objectives, such as employment increases, are obtainable if the employer's demand curve is not a constraint. With appropriate cooperation from the public employer, it need not be. More recently, the "efficient contract" construct has been refined to provide another framework for considering union-employer bargains (Fellner 1947; Hall and Lilien 1979; McDonald and Solow 1981). An "efficient" contract curve lies to the right of the labor demand curve so that employment exceeds the level on the employer's demand curve at the negotiated wage.

In sum, discussion of public sector unions' involvement in lobbying and budget-setting activity suggests that public unions devote substantial energies to expanding the surplus available to them by expanding public sector budgets. Absent any immediate disciplining mechanisms in which voting and mobility of citizens force municipal compensation and employment decisions to reflect their preferences for services perfectly, unions may not operate under the assumption of a fixed labor demand schedule or a fixed surplus. If public unions do increase overall municipal or function-specific budgets through simultaneous increases in pay and employment, this could correspond to an outward shift in the labor schedule and not a "monopoly union" or "efficient contract" framework. With empirical evidence below, we assess how well these theoretical frameworks describe union behavior in the local government sector.

12.1.1 Effects of Public Sector Unions on Other Departments

To add up the effects of public unions on a municipality's general expenditures, one must also consider how union effects on one function affect expenditures on another function. Here we briefly describe a number of ways that a union-induced change in expenditures in one department might manifest itself in other departments.

Panel 1 in figure 12.1 illustrates the basic proposition that unions in the public sector may shift the labor demand curve for their own services (department 1) from D_1 to D_2, thereby increasing relative wage and employment levels. In light of past research, we expect that increases in wages and employment are more likely the result of increases in the overall demand for the particular service and not a result of

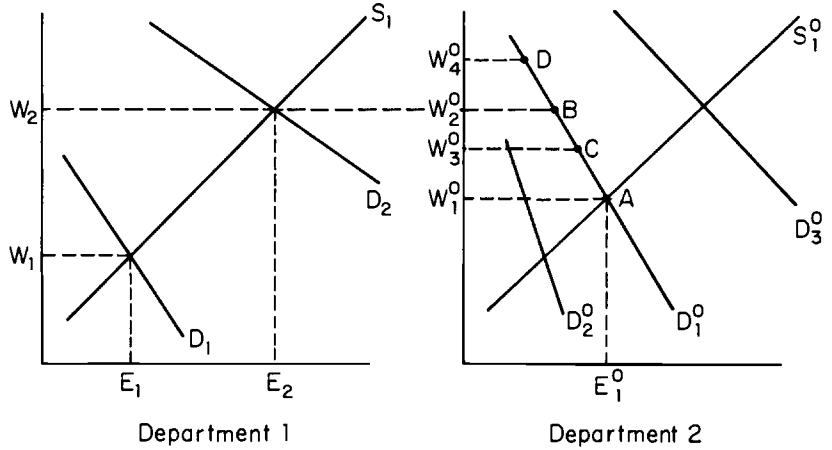

Fig. 12.1 The effects of public sector unions on pay and employment in their own and other departments. W = wages; E = employment level; D = demand for services; S = supply of workers. *Panel 1:* The effects of public sector unions on pay and employment in their own department. *Panel 2:* Possible effects of public sector unions on pay and employment in other departments.

decreases in the capital budgets (Gallagher 1978). A decrease in capital budgets in the face of increases in compensation would amount to a shift away from relatively less expensive inputs in the production of a given public service.

An increase in one function's expenditures may affect other functions' expenditures in a number of ways. First, a nonunion department, or a department with a relatively weaker union, may not be sufficiently protected inside the budget process and, as a result, have its own budget reduced. That is, a second department may fund the increases in the first department. In panel 2 of figure 12.1, a shift in department 2's demand from D_1 to D_2 would reflect such an effect.

One should also not rule out the possibility that positive pay "spillovers" on certain departments might exist or even that positive spillovers exist on most departments. If positive spillovers dominate, one would also be likely to observe increases in overall expenditure levels and tax revenues.

Positive spillovers in pay rates across functions, where an increase in pay from W_1 to W_2 in department 1 leads to an increase in department 2's pay, may occur by several mechanisms. Nonunion departments may receive an increase in pay via the "threat" effect, as public managers try to stave off unionization of other departments. Unions will also try to match the wage increases obtained by other departments.

This might correspond to a "whipsawing" tactic when negotiations are not simultaneous. A relatively weak union might also try to garner the increases obtained by a stronger one through some form of "coalition bargaining," where more than one union bargain jointly with their public employer. If a union or nonunion department 2 can maintain "parity" with department 1—a tactic often employed by fire fighters who seek parity with police—wages would move from W_1^0 to W_2^0. If, as illustrated in panel 2 of figure 12.1, this corresponds to a move from point A to point B, there will be an oversupply of workers to the second occupation. This "disequilibrium" result has been documented in cases of police and fire department parity with relatively long civil service job queues for fire fighter positions (Lewin 1973, 78–81). If pay spillovers do not operate through the mechanism of maintaining parity, the pay spillovers to department 2 may only be to a point like C on D_1^0, which corresponds to a wage of W_3^0 which is less than W_2^0. If department 2 enjoyed a relative pay advantage over department 1 prior to the shift in demand from D_1 to D_2 in department 1 (shown in fig. 12.1 as $W_1^0 > W_1$), employees in department 2, following a strategy of maintaining the relative wage differential between the two departments, may try to increase pay to point D. At point D, W_4^0 in department 2 is greater than W_2 in department 1. Clearly, positive pay spillovers as described come at the expense of decreases in relative employment levels.

It is also possible that union-induced increases in wage and employment levels in department 1 may lead to wage and employment increases in department 2. For example, if the "own department" effect is achieved through wage increases and "minimum manning" contract clauses via collective bargaining (which would require the legislature to appropriate funds for a larger budget), a union in a second department might bargain for both the wage and employment contract clauses in their contract. If this kind of spillover was prevalent, one would also observe that unionized cities are associated with higher levels of overall expenditures and therefore higher tax rates to raise the necessary revenues. In panel 2 of figure 12.1, this kind of spillover effect would correspond to a shift in the department 2 demand curve from D_1^0 to D_3^0.

Theories of the budget-setting process are not developed enough to predict which kinds of direct and indirect effects of public employee unions exist in U.S. municipalities. Previous studies have documented the diversity of arrangements among public sector unions, municipal executives, and state and local legislatures in the budget and pay determination process. While the descriptive studies provide a useful starting point for conceptualizing the budgeting process, they cannot document effects of unions without reference to some comparison group. Ultimately, discovering what direct and indirect effects the activities

of unions have on economic outcomes requires empirical investigation across a broad range of functions and municipalities.

12.2 The Sample and Data

Because the data set for this study is extensive, a complete list of variables and their precise definitions is given in a separate statistical appendix. Here we briefly describe the nature of the sample, several different classes of variables, and the dimensions along which variation exists for any given variable. As indicated in the statistical appendix, these data have been collected from several annual surveys conducted by the Governments Division of the U.S. Bureau of Census (1977, 1978, 1979, 1980, 1982), by the International City Management Association, and independent data collection efforts sponsored by the National Bureau of Economic Research.

The sample for this study consists of data on 463 municipalities. Data on these municipalities cover five years: 1977, 1978, 1979, 1980, and 1982. In addition, there are data specific to four functions in the municipalities: police, fire, streets and highways, and sanitation and refuse collection. The 463 municipalities in the sample are those that report having employment in all four functions across all five years. Across the five years and four functions, the sample can consist of up to 9,260 "municipality-function-years." For any one of the four functions, the sample can consist of up to 2,315 "function-years."

The empirical models consider several dependent variables: general municipal expenditures (other than educational and public utility expenditures); total expenditures on each of the four departmental functions; average payroll per employee in a function; and employment per capita in a function.

Two measures for unionization are available for a given function: bargaining unit (U) and other nonbargaining organizations or associations (O). The survey defines "bargaining unit" as: "A group of employees recognized as appropriate for representation by an employee organization for the purpose of collective bargaining or other discussions." An employee organization is defined as: "Any organization which exists for the purposes in whole or in part of dealing with the employer concerning grievances, personnel policies and practices, labor disputes, wages, rates of pay, hours of employment, or conditions of work." In our analysis, $U = 1$ when a bargaining unit is present, while $O = 1$ when an organization is present but a bargaining unit is not.

Also describing the bargaining environment is a detailed set of mutually exclusive bargaining laws. These are: duty-to-bargain with strikes permitted; duty-to-bargain with compulsory interest arbitration; other

duty-to-bargain statutes; statutes that permit bargaining but do not require employers to bargain with employee representatives, such as laws allowing employee representatives to "meet and confer with" or to "present proposals to" their employers; no explicit bargaining law; and a final category of laws that makes public employee bargaining illegal. These bargaining laws vary by function, and any amendments or new legislation during the 1977–82 period are reflected in year-to-year changes in these laws. In addition, there is a separate law variable that measures whether or not there is a right-to-work law for public employees in a given state.

While the economic effects of variables describing the bargaining environment, particularly U and O, are the focus of this study, it is important to include controls for other characteristics of the municipality that might influence the demand for municipal services or the supply of workers to that service. These variables are obtained from sources other than the *Survey of Governments,* and variation in these factors is only across municipalities. For financial and demographic characteristics, these variables refer to 1970 levels of the given measure, while variables measuring government structure refer to characteristics in 1979.[3]

Some of these variables may reflect differences in the tastes of the community for different services and may therefore be systematically related to different levels of demand. Such variables include: a dummy for whether the municipality is a central city; population and population changes; median years of schooling in the population; characteristics of the housing stock; and ability-to-pay measures such as median family income and percentage of families below the poverty level. If, for example, a higher percentage of one-unit structures corresponds to relatively high (low) demand for fire services, this variable will enter positively (negatively) in reduced-form fire-fighter pay equations. If median family income corresponds to an increase in the demand for all services, this variable would enter positively in all functions' reduced-form pay equations.

Other control variables may indicate factors influencing the supply of workers to a particular service. An alternative wage variable, median earnings of male operatives in 1970, should be negatively related to the supply of workers to municipal functions, and therefore would be positively correlated with pay in such functions in a reduced-form specification.

Additionally, the statistical appendix lists a number of variables describing various characteristics of the municipal government. Since pay and employment decisions are filtered through a politically influenced budget process, characteristics of the government may affect these economic outcomes. If results in this sample parallel those found in

previous research, we would expect to find governments with city managers paying relatively higher salaries (see, for example, Edwards and Edwards 1982; Ehrenberg 1973; or Zax 1985b), and when city councils are elected at large, municipal work forces will likely be both larger and better paid (Zax 1985b).

The empirical strategy of this study is as follows: First, we estimate compensation and employment as a function of all exogenous variables—city demographics and wealth, city government structure, geographic and time dummy variables, bargaining law variables, and union variables. These single-equation estimates impose relatively little structure on the data and serve as a straightforward method of describing average differences in pay and employment between union and nonunion municipal departments, ceteris paribus. We then construct a three-tier thirteen-equation budgeting model. In addition to the compensation and employment equations for each of the municipal functions, this system includes equations for total expenditures in each function and one equation for general municipal expenditures. The validity of the structure of this system depends on the validity of the a priori restrictions it imposes, but if those restrictions are accepted, it provides a much richer description of union effects on municipal finance.

12.3 Single-Equation Models

The basic proposition of this study, that public sector unions may affect pay, employment, other department expenditures, and general municipal expenditures, calls for the simultaneous estimation of a system of equations. However, as a foundation for that analysis, we estimate several cross-section pay and employment equations. Specifically, we estimate:

$$(1) \qquad \mathrm{PAY}_{ift} = \alpha_1 + \beta_1 \vec{X}_i + \beta_0 O_{ift} + \beta_u U_{ift} + \epsilon_{ift},$$

$$(2) \qquad \mathrm{EMP}_{ift} = \alpha_2 + \gamma_1 \vec{Y}_i + \gamma_0 O_{ift} + \gamma_u U_{ift} + \lambda_{ift}.$$

The equations vary across municipalities (i), functions (f), and years (t). The set of exogenous variables that enter the pay equation ($\vec{X}$) do not have to be the same as those that enter the employment equation ($\vec{Y}$). Since observations vary over time, X and Y include a set of five dummy variables for the year of the observation.

If bargaining units do increase the demand for their services, we expect both β_u and γ_u to be significantly positive as a preliminary indication of increased demand due to the activities of public unions. If the nonbargaining unit organizations have effects similar to the effects of bargaining units, β_0 and γ_0 will likewise be positive.

Table 12.1 reports the coefficients on the bargaining unit and organization variables in the reduced-form pay and employment equations. The sample for the table 12.1 equations is 463 municipalities pooled across four functions and five years—or 9,260 "municipality-function-year" observations. In the average monthly payroll per employee equation, a bargaining unit is associated with a significant increase of $60.26 in the average monthly pay of a municipal employee, or 4.8 percent of average compensation. Employees in departments with nonbargaining unit organizations also receive significantly higher pay than employees in nonunion departments. The increase is $10.99, or 0.87 percent of the average pay in the sample. As judged by an F-test, the coefficients on the U and O variables are significantly different from one another. The magnitude of the estimated union effects on pay are in keeping with the magnitude observed in many previous studies on this topic—generally positive and significant, but less than the compensation differentials generally associated with private sector unions.

Table 12.1 **The Effects of Public Sector Bargaining Units and Organizations on Pay and Employment; N = 9,260 City-Function-Years[a] (t-statistics in parentheses; coefficient as percentage of mean of dependent variables in brackets)**

	Pay Per Full-Time Employee	Employment Per 10,000 Capita
Mean of Dependent Variable	1256.91	15.5
1. Union	60.26***	1.71***
	(9.11)	(9.06)
	[0.048]	[0.110]
2. Association	10.99*	−0.364**
	(1.81)	(2.10)
	[0.009]	[−0.023]
R^2	0.750	0.655

[a]Other controls include: three function dummy variables; four year dummy variables, eight geographic divisional dummy variables; 1970 population and population changes between 1960 and 1970 and between 1970 and 1980; the percentage of the population that is Hispanic, black, of foreign stock, has a high school education, is below the poverty level; median family income; median value of housing; percentage of housing that is one-unit structure; median education; median earnings of male operatives; the ratio of nonworking to working persons; the percentage of workers in white-collar occupations; a central city dummy variable; eight variables describing characteristics of the municipal government; six bargaining laws for public employees (arbitration, strikes permitted, duty-to-bargain, bargaining permitted, no law, and bargaining illegal); and a dummy variable for whether or not a public sector right-to-work law exists. The control variables do not include other functions' unionization.

***Significant at the 0.01 level, two-tailed test.

**Significant at the 0.05 level, two-tailed test.

*Significant at the 0.10 level, two tailed test.

In the traditional "monopoly union" framework for conceptualizing positive union wage effects, positive pay effects of unions are achieved through bargaining power that forces employers up a labor demand curve, thereby increasing pay at the expense of employment levels. In a reduced-form equation, one might therefore expect the relatively higher paid union departments in the public sector to operate with smaller departments. As suggested in section 12.2, however, the lobbying activity of public sector unions in the budgetary process might allow these employee organizations to counter this effect by increasing demand for their services.

From the coefficients in the second column of table 12.1 on the bargaining unit and organization variables in the employment-per-capita equation, one finds preliminary support for the latter framework for bargaining units. Despite the significant positive pay effects observed in the first column, bargaining units are associated with relatively larger municipal departments. The bargaining unit coefficient, 1.71, corresponds to 11 percent of the mean of the dependent variable. Other types of employee organizations significantly reduce employment by 0.364, or 2.3 percent. The magnitude of the estimated effect of bargaining units on employment is similar in magnitude to the previous estimate by Zax (1985a) using a different data set for an earlier, but overlapping, time period.

In table 12.2, the bargaining unit and organization effects are allowed to vary by function by estimating separate pay and employment equations for each of the four functions. The coefficients from the four function-specific pay equations are listed in columns (1)–(4), while coefficients from the four employment equations are listed in columns (5)–(8). The general pattern observed in table 12.1 is observed across the functions with an occasional function-specific exception: bargaining units are associated with relatively larger and better paid departments, while organizations appear to increase pay. In the function-specific equation, organizations have no significant effect on employment. The pay effect of bargaining units exceeds the effect of organizations in all functions.

The lone exceptions to this overall pattern are that neither form of unionization increases pay significantly in the sanitation function, and that police bargaining units do not have relatively larger departments. Still, police bargaining units are not associated with any significant declines in employment. Interestingly, this cross-section result concerning the union effect on police employment replicates the result obtained by Victor (1977), who found that unionized fire departments had relatively larger departments but found no employment effect for police unions.

Before exploring this initial set of results concerning the effects of "own" unionization in greater detail in a structured system of equations

Table 12.2 **The Effects of Public Sector Unions and Associations on Pay and Employment in Function-Specific Equations; N = 2,315 City-Years[a] (t-statistics in parentheses; coefficient as percentage of mean of dependent variables in brackets)**

	Monthly Pay Per Full-Time Employee				Employment Per 10,000 Capita			
	(1) Streets and Highways	(2) Police	(3) Fire	(4) Sanitation	(5) Streets and Highways	(6) Police	(7) Fire	(8) Sanitation
Mean of Dependent Variable	1130.28	1382.66	1440.49	1073.99	9.88	24.70	18.19	9.06
1. Bargaining Unit	57.51***	52.79***	64.87***	10.59	0.80**	−0.29	2.13**	1.41***
	(4.05)	(4.21)	(13.25)	(0.74)	(2.44)	(0.35)	(6.15)	(4.18)
	[0.051]	[0.038]	[0.045]	[0.009]	[0.081]	[−0.012]	[0.117]	[0.156]
2. Organization	29.14***	28.64*	48.73***	−0.42	−0.26	0.36	−0.17	−0.22
	(2.60)	(1.90)	(3.18)	(0.04)	(0.98)	0.42	(0.42)	(0.95)
	[0.026]	[0.021]	[0.034]	[0.001]	[0.026]	[0.015]	[0.009]	[−0.024]
R^2	0.682	0.746	0.758	0.695	0.321	0.603	0.486	0.650

[a]Other controls are those listed in footnote a of table 12.1 except that no function dummy variables can be included in the models for this table.

***Significant at the 0.01 level, two-tailed test.

**Significant at the 0.05 level, two-tailed test.

*Significant at the 0.10 level, two-tailed test.

in which union effects on general expenditures and on function expenditures are allowed to affect department-level pay and employment, we lay the foundation for the effects of public employee unions on function and total municipal expenditures by considering how unionization in one function does or does not affect pay and employment outcomes in other departments. The function-specific pay and employment equations presented in table 12.2 are therefore expanded to include the unionization measures of other functions. Table 12.3 presents the coefficients on the bargaining unit variables of the given function and the bargaining unit variables in the other three functions. Because bargaining units were shown to be associated with both higher pay and more employment, we focus on the bargaining unit effects in table 12.3. The coefficients that measure the effects of a bargaining unit on the pay and employment in the same function, listed in row 1, are similar to those presented in row 1 of table 12.2 from models without the cross-bargaining unit and cross-organization variables included. However, the magnitudes of several "own bargaining unit" effects decrease in magnitude. Still, the only "own bargaining unit" coefficient that becomes insignificantly different from zero after adding the "other unionization" variables is the police bargaining unit coefficient in the police pay equation (column 2, line 1). In this reduced-form model, police unions are not found to increase police pay levels. It should be noted that the presence of bargaining units in police departments and bargaining units in other departments, particularly in fire departments, are highly correlated. In this way, the positive effect of fire unionization on police pay will more often than not be enjoyed by a police department with a bargaining unit since fire units are usually found in municipalities with police units. In fact, of the 1,367 municipality-years in which a fire bargaining unit is present, 1,246, or 91.3 percent, occur in observations in which a police bargaining unit is also present.

The effects of bargaining units on pay and employment in other departments also reveal an interesting pattern. Except for sanitation bargaining units (which do not increase pay in their own departments), point estimates of the effects of bargaining units in other functions on pay are always positive and often significant. Streets-and-highways bargaining units are associated with higher pay for police, fire, and sanitation workers. Police bargaining units have a significant positive effect on fire-fighter pay, while fire-fighter bargaining units increase the pay of police and sanitation workers significantly. For all four functions, the three "other" bargaining unit variables add significantly to the explanatory power of the pay equations as judged by an F-test. The cause of the significant negative pay effect of sanitation bargaining units on fire-fighter pay may be related to some kind of budgetary displacement due to the "own" positive employment effect of sanitation bargaining units.

Table 12.3 **The Effects of Own and Other Unionization on Pay and Employment in Function-Specific Equations; $N = 2{,}315$ City-Years for each function[a] (t-statistics in parentheses; coefficient as percentage of mean of dependent variables in brackets)**

	Monthly Pay Per Full-Time Employee				Employment Per 10,000 Capita			
	(1) Streets and Highways	(2) Police	(3) Fire	(4) Sanitation	(5) Streets and Highways	(6) Police	(7) Fire	(8) Sanitation
Mean of Dependent Variable	1130.28	1382.66	1440.49	1073.99	9.88	24.70	18.19	9.06
1. Own Bargaining Unit	58.60***	13.71	31.07*	−24.20	0.98**	0.31	2.65***	3.29***
	(3.12)	(0.74)	(1.67)	(1.37)	(2.25)	(0.60)	(5.47)	(8.01)
	[0.052]	[0.010]	[0.022]	[−0.023]	[−0.099]	[0.013]	[0.146]	[0.363]
2. Other Functions' Bargaining Units								
a. Streets and	—	55.47***	34.18*	31.00*	—	−0.20	−0.30	−2.57***
Highways	—	(2.95)	(1.66)	(1.78)	—	(0.38)	(0.56)	(6.34)
Union	—	[0.040]	[0.024]	[0.029]	—	[−0.008]	[−0.016]	[−0.284]

b. Police Union	28.58	—	48.37**	3.56	−0.63	—	−0.42	0.48
	(1.55)	—	(2.42)	(0.21)	(1.47)	—	(0.81)	(1.20)
	[0.025]	—	[0.34]	[0.003]	[−0.064]	—	[−0.023]	[0.053]
c. Fire Union	25.75	27.42*	—	47.61***	−0.30	−0.87*	—	−1.12
	(1.52)	(1.61)	—	(3.04)	(0.76)	(1.80)	—	(3.07)
	[0.023]	[0.20]	—	[0.044]	[−0.030]	[0.035]	—	[−0.124]
d. Sanitation Union	−23.45	−26.63	−47.12**	—	−0.38	−0.28	−0.61	—
	(1.23)	(1.39)	(2.25)	—	(0.85)	(0.52)	(1.11)	—
	[−0.021]	[−0.019]	[−0.033]	—	[−0.038]	[−0.011]	[−0.034]	—
3. *F*-test (3,2262): Do bargaining units in all other functions significantly affect dependent variable?	Yes	Yes	Yes	Yes	Yes	No	No	Yes
R^2	0.685	0.749	0.760	0.699	0.327	0.605	0.490	0.661

[a]Other controls are those listed in footnote a of table 12.1 except for the function dummy variables.

***Significant at the 0.01 level, two-tailed test.

**Significant at the 0.05 level, two-tailed test.

*Significant at the 0.10 level, two-tailed test.

While bargaining units tend to increase pay in other functions, the relatively higher pay is occasionally associated with significantly lower employment levels in other departments. In all but one case (i.e., the effect of a police bargaining unit on sanitation employment), the point estimate of the coefficients are negative but generally not significantly different from zero. The three insignificant "other" bargaining unit coefficients in the streets-and-highways employment equation, when taken as a set, are significant determinants of streets-and-highways employment as judged by an F-test. For the police and fire employment equations, bargaining units in the three other departments jointly are not significant determinants of employment, while in the sanitation employment equation, the streets-and-highways bargaining unit variable adds to the explanatory power of the model.

Absent relatively elastic demand for these services, it does not appear that bargaining units in a given function are necessarily funding the pay and employment increases in their own departments with reductions in the payroll of other departments. That is, other departments generally receive relatively higher pay as a result of a bargaining unit in another department. While the positive pay spillovers observed in these equations occasionally come at the expense of lower employment, there is no obvious evidence (given positive pay spillovers) that expenditure increases due to employment and compensation effects of a bargaining unit in a given department come from a decline in expenditures of one or more of the other three functions.

Before interpreting these results further and speculating about the mechanisms by which bargaining units increase the pay and/or employment in their own function and in other functions, we estimate a system of equations to assess the effects of public sector unions more thoroughly. General municipal expenditures and total function expenditures as well as the pay and employment in the various departments are dependent variables in this system. If a similar pattern of "own" and "other" bargaining unit effects emerges from this more complete analysis, there will be more confidence in these basic, reduced-form, cross-section equation results.

12.4 Municipal Budgeting Systems

This section develops and estimates a hierarchical model of municipal budgeting, which permits unions to affect general municipal expenditures; expenditures for streets and highways, police, fire, and sanitation; as well as employment and compensation levels in each of these functions. It identifies three stages of the budgeting process and estimates the effects of unions at each level. Importantly, results from this more elaborate model support the conclusion that bargaining units

increase both employment and compensation in their own departments. The results indicate that these joint effects are made possible by the effect of bargaining units on overall expenditures in their own function. Finally, results from this model strengthen the conclusion that the spillover effects of bargaining units on other departments increase compensation, but only at the expense of reductions in employment.

All models described in this section are variations on a single structure. Each is a system of thirteen equations. Eight equations estimate the determinants of compensation and employment levels in streets and highways, police, fire, and sanitation. Four equations estimate the determinants of *total* expenditures in streets and highways, police, fire, and sanitation functions, where total function expenditures include nonpayroll as well as payroll expenditures. The last equation estimates the determinants of general expenditures in each municipality.

These endogenous variables represent outcomes determined at three levels of a municipal budgeting hierarchy: employment and compensation are the outcomes at the lowest, most disaggregate level of this hierarchy. The systems model these pay and employment outcomes as dependent upon the outcomes of municipal budgeting decisions at higher levels of aggregation. Total expenditures for streets and highways, police, fire, and sanitation per 10,000 capita represent an intermediate budgeting level. Total function expenditures include payrolls, payments to other factors of production, and service purchases from other levels of government through intergovernmental transfers. The single equation for general expenditures per 10,000 capita represents the highest, most aggregate level of the budgetary process. General expenditures include all municipal expenditures except those on education and utilities. Expenditures on streets and highways, police, fire, and sanitation are, on average, 38.9 percent of general municipal expenditures. The remainder includes expenditures on central administration, finance, and parks and recreation, for example. Both function and general expenditures are measured as dollars per year, in contrast to payrolls which are measured as dollars per month.[4]

The following analyses begin with the simplest model of interactions across the three levels of this budgeting hierarchy: outcomes at lower levels are dependent on predetermined outcomes at higher levels. This is a recursive model, in which the electorate and elected officials first determine the level of general expenditures. Then, dependent on the level of general expenditures, they allocate shares for expenditures in each function. Lastly, given function expenditures, the municipality and its workers agree on compensation and employment levels.

More sophisticated models of budgeting interactions would allow outcomes at lower levels of the budgeting process to enter into the determination of outcomes at higher levels. For example, if compensation

often rises unexpectedly, function expenditures may be, in part, determined by payrolls. While this section begins by analyzing the recursive model, it goes on to compare the recursive model with other models which allow feedback from the lower levels of the budgeting process to the upper levels.

The conceptual budgeting process underlying the recursive system of endogenous variables also implies a specification for the exogenous variables: the level of general expenditures is determined by citizens' wealth, by their tastes for public as opposed to private consumption, and by institutional factors. Therefore, the exogenous variables in the equation for general expenditures include demographic and economic characteristics of city residents, structure of municipal government, year, and geographic division dummy variables. Given the level of general expenditures, its allocation among individual functions is determined again by citizens' wealth and tastes and by institutional organization. The array of exogenous variables in equations for function expenditures is the same as that appearing in the equation for general expenditures.

Citizens have two sets of concerns in this process. One, the level of taxation, is effectively determined by general expenditures.[5] The other is service levels. Given the level of taxation and the level of services provided by a function, citizens should be indifferent to compensation and employment levels; they should not care whether the services they receive are produced by a few high-paid workers or many low-paid workers. With function expenditures—as proxies for service output[6]—included among the explanatory variables in equations for compensation and employment, demographic and economic characteristics of city residents are irrelevant. However, the employment and compensation variables do depend on the range of labor relations practices that are legal in each state. Therefore, variables identifying the legal environment are included in these equations.[7] The purpose of these models is to identify the extent to which the "total" union effects on compensation and employment, estimated in section 12.3, are attributable to union activity at the higher levels of the municipal budgeting process. Therefore, all equations contain union variables. The specification of exogenous and endogenous variables in the recursive model is represented in figure 12.2. (When "feedback" from lower levels of the process to higher levels are allowed, the arrows between the endogenous variables would no longer be unidirectional.)

Within this specification are a number of different "union effects." First, there are effects of own-unionization on general and function expenditures as well as on compensation and employment. The coefficients of own-union variables in compensation and wage equations are "direct" union effects. Second, the effects of own unionization on

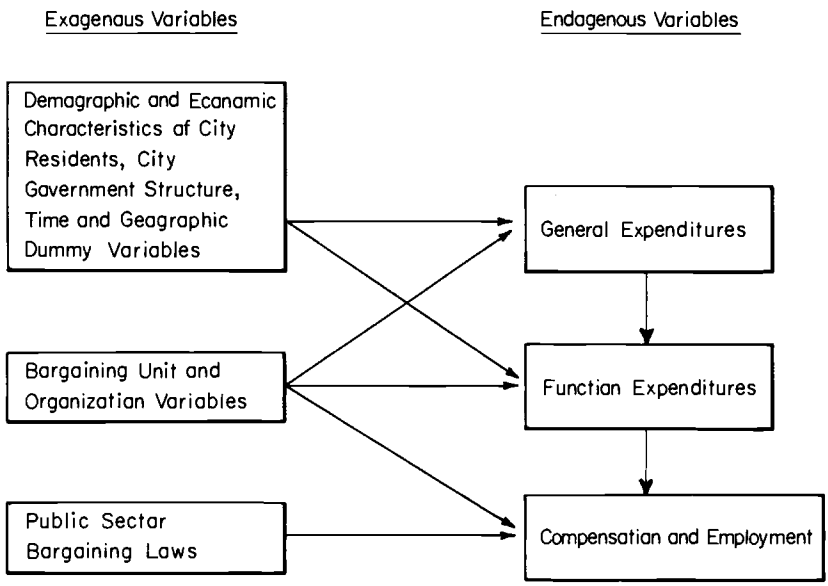

Fig. 12.2 Municipal budgeting model

general and function expenditures will have "indirect" effects on compensation and employment outcomes in the same function. The simple recursive model incorporates two chains that create such "indirect budgetary effects" on the ultimate levels of employment and compensation: the effects of own unionization on function expenditures, coupled with the effects of function expenditures on compensation and employment; and the effects of unions on general expenditures, coupled with the effects of general expenditures on function expenditures and those of function expenditures on compensation and employment. Third, these systems identify "indirect spillover effects"—effects of unionization in one function on outcomes in another—on total function expenditures, compensation, and employment. Specifications of the equation systems are based on much stronger assumptions than are the single-equation models of the previous section. In return, they yield the richer characterization of municipal union effects presented below.

12.4.1 Recursive System

Within the recursive system of figure 12.2, the simplest specification of union effects includes only variables measuring the presence of own-bargaining units or organizations in equations for compensation, employment, function expenditures, and general municipal expenditures. This recursive system is estimated by seemingly unrelated regression analysis. Results of this estimation are presented in table 12.4. Column

Table 12.4 **Effects of Own Unionization on Own Compensation and Employment, Own Expenditures and General Expenditures, No Cross-Unionization Spillovers: Estimates from Recursive System of Equations (*t*-statistics in parentheses; coefficient as percentage of mean of dependent variable, in brackets)**

Union Measure	(1) Effect on Own Payroll Per Employee	(2) Effect on Own Employment Per 10,000 Capita	(3) Effect on Own Function Expenditures	(4) Effect on General Expenditures
Streets B. U.	25.11	0.312	62,327.00***	−97,761.00
	(1.60)	(0.85)	(3.19)	(0.54)
	[0.022]	[0.032]	[0.140]	[−0.024]
Streets Org.	18.56	−1.33***	49,038.00***	−138,990.00
	(1.45)	(4.62)	(3.19)	(0.86)
	[0.016]	[−0.135]	[0.111]	[−0.035]
Police B. U.	59.80***	−1.73***	26,512.00***	55,758.00
	(4.42)	(5.81)	(2.62)	(0.31)
	[0.043]	[−0.071]	[0.051]	[0.014]
Police Org.	42.02***	−0.342	6,050.00	−163,512.00
	(2.27)	(0.84)	(0.46)	(0.80)
	[0.030]	[−0.014]	[0.012]	[−0.041]
Fire B. U.	67.76***	−0.573*	39,157.00***	144,359.00
	(4.27)	(1.84)	(4.95)	(0.85)
	[0.047]	[−0.031]	[0.105]	[0.036]
Fire Org.	83.20***	−0.504	−18,961.00**	367,368.00**
	(4.31)	(1.30)	(2.00)	(2.00)
	[0.057]	[−0.028]	[−0.051]	[0.092]
Sanitation B. U.	29.09*	−0.384	35,319.00***	−335,187.00*
	(1.84)	(1.03)	(3.44)	(1.81)
	[0.027]	[−0.041]	[0.162]	[−0.084]
Sanitation Org.	41.22***	−2.17***	9,432.00	197,761.00
	(3.57)	(8.24)	(1.36)	(1.34)
	[0.038]	[−0.232]	[0.043]	[0.049]

Notes: B. U. = bargaining unit; Org. = organization. Specification of equations and control variables are described by figure 12.2.

***Significant at the 0.01 level, two-tailed test.

**Significant at the 0.05 level, two-tailed test.

*Significant at the 0.10 level, two-tailed test.

1 presents coefficients on own-bargaining unit and own-organization variables in the equations for compensation per employee. Both bargaining units and organizations have significant positive effects on compensation for police, fire, and sanitation workers, when function expenditures are held constant. Effects are positive but insignificant for streets and highways. The percentage estimates given below the *t*-statistics demonstrate that these direct compensation effects are of similar magnitudes to those of the single-equation models in table 12.2, ranging from 1.6 percent to 5.7 percent of payroll per employee.

In contrast, the employment effects in these models, holding function expenditures constant, are of opposite sign to those of the single-equation models. The coefficients in column (2) demonstrate that either the bargaining unit variable or the organization variable has a significant negative effect on employment in all four functions, holding function expenditures constant.[8] The form of unionization in each of the four functions that has a significant negative effect on employment is the most common form of unionization in that function. For example, organizations have significant negative direct effects on employment in streets and highways and in sanitation. In streets and highways, 17.1 percent of all departments have bargaining units, but 38.5 percent have organizations without bargaining units. In sanitation, the corresponding percentages are 11.5 percent and 42.1 percent. Bargaining units have significant negative direct employment effects for police and fire; 58.4 percent of police and 61.0 percent of fire departments have bargaining units; 8.3 percent of police and 11.4 percent of fire departments have only organizations. These reductions in relative employment in models with total expenditures held constant are particularly large in the functions with fewer employees: organizations cause losses equal to 23.2 percent of mean sanitation employment and 13.5 percent of mean employment in streets and highways.

This budgeting model differs from the single-equation models in that it estimates union effects on higher levels of municipal finance. Their effects on function expenditures are important. The coefficients in column (3) demonstrate that bargaining units have significant positive effects on expenditures in all four functions, holding municipal general expenditures constant. These effects are large; equivalent to at least 5.1 percent of mean expenditures in the case of police, and to as much as 16.2 percent in the case of sanitation.

The equation for general expenditures in this system includes variables for bargaining units and organizations in all four functions. Estimated union effects on general expenditures are inconclusive. The point estimates given in column (4) vary erratically in sign, magnitude, and significance. They sum approximately to zero. However, all eight

variables are jointly significant in the equation. These estimates seem to indicate that municipal unions do have significant effects on general expenditures, but that these effects are not well captured by a specification that attributes separate effects to each bargaining unit and organization. These coefficients do suggest, however, that union-induced increases in function expenditures do not cause increases in general expenditures. They may, instead, cause reallocations of general expenditures away from other functions.

If the budgeting process is recursive, as specified in the model from which these estimates are taken, then the estimated union effects in column (2) indicate that the effects of unions on employment, through union activity at the lowest level of the process, are to reduce employment in return for compensation gains. The positive union function expenditure effects of column (3) suggest that the indirect effects of union participation in the budgeting process at the function expenditure level may be responsible for the positive union employment effects observed in the single-equation models. These "indirect budgetary" effects on compensation and employment are the product of union effects on function expenditures, and function expenditure effects on function compensation and employment, as given by:

$$(3) \qquad \frac{\partial(\text{Pay or Emp})}{\partial U} = \frac{\partial(\text{Function Expenditure})}{\partial U} \cdot \frac{\partial(\text{Pay or Emp})}{\partial(\text{Function Expenditure})} .$$

Similarly, the consequence of the union effects on general expenditures for employment and compensation outcomes is given by the product of union effects on general expenditures, general expenditure effects on function expenditures, and function expenditure effects on function compensation and employment, as given by:

$$(4) \qquad \frac{\partial(\text{Pay or Emp})}{\partial U} = \frac{\partial(\text{General Expenditure})}{\partial U} \cdot \frac{\partial(\text{Function Expenditure})}{\partial(\text{General Expenditure})} \cdot \frac{\partial(\text{Pay or Emp})}{\partial(\text{Function Expenditure})} .$$

According to equations (3) and (4), then, estimates of general expenditure effects on function expenditures, and of function expenditure effects on function compensation and employment, are needed to calculate total union effects. The estimated relationships between general expenditures and expenditures in these four central functions, and between function expenditures and compensation or employment, are significant but not particularly large in absolute terms. Function ex-

penditure effects on compensation and employment, for example, are uniformly positive and significant, with *t*-statistics exceeding 9.00. Coefficients on the function expenditure variable in compensation equations vary from 0.000307 to 0.000856. With respect to employment, coefficients on function expenditure variables vary from 0.00000373 to 0.0000302. Together, estimated compensation and employment effects imply elasticities of monthly payrolls per capita (compensation per employee per month multiplied by employees per capita) with respect to annual function expenditures that are similar across functions, varying from 0.025 in streets and highways to 0.071 in fire, at mean levels of compensation and employment. Multiplying these elasticities of monthly payrolls by twelve yields elasticities of 0.301 and 0.857 for annual payrolls.[9]

Similarly, general expenditure has uniformly positive and significant effects (all *t*-statistics exceed 7.00) on expenditures in each of the four functions. These effects indicate that an additional dollar of general expenditure results in additional sanitation expenditures of $0.013, additional fire expenditures of $0.0296, additional police expenditures of $0.0394, and additional streets and highways expenditures of $0.0570. These effects are equivalent to elasticities ranging from 0.24 for sanitation to 0.51 for streets and highways at mean expenditure values.

These relatively low elasticities indicate that union effects on both function and general expenditures will be dampened as they are transmitted through to changes in compensation and employment. Table 12.5 presents the indirect budgetary effects of unions on compensation and employment as calculated from equations (3) and (4). Table 12.5 also lists the "direct effects" of unions on pay and employment in equations that hold general and function expenditures constant (presented previously in table 12.4, columns 1 and 2). The total effect of unions on pay or employment is the sum of the direct effect and the two indirect budgetary effects.

First, the indirect effects on compensation and employment through general expenditures (labeled "Indirect Effect—General Exp.") are uniformly small in comparison to direct effects.[10] Similarly, there is a dampening of the effect of bargaining units on function expenditures before it finally influences compensation outcomes. Nevertheless, these effects (displayed in row 7 of table 12.5, labeled "Indirect Effect—Function Exp.") remain substantial. All indirect effects of bargaining units through function expenditures are positive on compensation, reinforcing the direct effects of unions on compensation. This indirect bargaining unit effect is smallest for police, at 27 percent of the direct union compensation effect. For streets and highways, it attains 76 percent of the direct effect.

Table 12.5 **Total Union Effects on Own Payroll Per Employee and Employment Per Capita (total effect as percentage of mean of dependent variable in brackets)**

	I. Streets and Highways		II. Police		III. Fire		IV. Sanitation	
	Effect on Payroll Per Employee	Effect on Employment Per 10,000 Capita	Effect on Payroll Per Employee	Effect on Employment Per 10,000 Capita	Effect on Payroll Per Employee	Effect on Employment Per 10,000 Capita	Effect on Payroll Per Employee	Effect on Employment Per 10,000 Capita
Organization:								
1. Indirect Effect—General Exp.	−0.243	−0.00295	−3.88	−0.178	9.1	0.328	0.916	0.0622
2. Indirect Effect—Function Exp.	15.1	0.183	3.64	0.167	−16.2	−0.573	3.39	0.230
3. Direct Effect	18.6	−1.33	42.0	−0.342	83.2	−0.534	41.2	−2.19
4. Total Effect	33.5	−1.15	41.8	−0.353	76.3	−0.779	45.5	−1.90
5. Percent of mean of payroll or employment variable	[0.038]	[−0.117]	[0.030]	[−0.014]	[0.053]	[−0.042]	[0.042]	[−0.203]
Bargaining Units:								
6. Indirect Effect—General Exp.	−1.71	−0.0208	1.31	0.0600	3.66	0.129	−0.644	−0.0437
7. Indirect Effect—Function Exp.	19.1	0.232	16.0	0.732	33.5	1.18	12.7	0.862
8. Direct Effect	25.1	0.312	59.8	−1.73	67.8	−0.573	29.1	−0.384
9. Total Effect	42.5	0.523	77.1	−0.938	105.0	0.736	41.2	0.434
10. Percent of mean of payroll or employment variable	[0.030]	[0.053]	[0.056]	[−0.038]	[0.073]	[0.040]	[0.038]	[0.047]

Equally important, the indirect effects of bargaining units on employment through expenditures are always positive. In the cases of fire and sanitation, positive indirect union employment effects through function expenditures exceed in absolute value the negative direct union employment effects. This produces a net positive effect of bargaining units on employment. In streets and highways, positive indirect effects reinforce positive direct effects. As in the single-equation results of table 12.2, only in police is the net bargaining unit effect on employment negative. For police, the indirect union effect through police expenditures increases employment, but not by enough to nullify the large negative direct union effect.

Indirect effects of organizations through function expenditures are similar to those of bargaining units, but less striking. These indirect effects of organizations on compensation and employment are positive, with the exception of fire fighters. The indirect effects of organizations on compensation are less pronounced than they are for bargaining units. The positive employment effects of organizations through function expenditures are not large enough to reverse negative direct employment effects of organizations for streets and highways, police, and sanitation.

The results obtained from the recursive model of municipal budgeting contain several important insights into the effects of municipal unions. First, unions directly increase compensation and reduce employment when function expenditures are held constant, though union employment effects are positive when function expenditures are not controlled. Second, unions have positive effects on expenditures in their respective functions. Third, for all forms of unionization in all functions (except for the relatively uncommon fire fighter "organization"), there are positive function expenditure effects of unions that increase the demand for labor. The "indirect budgetary" effects of bargaining units are large enough to reverse the negative direct effects of bargaining units on employment in all functions except police.

12.4.2 Cross-Department Union Effects

The recursive thirteen-equation system that generates the results in tables 12.4 and 12.5 is reestimated to allow cross-department spillover effects. Columns (1)–(4) of table 12.6 present the coefficients on all functions' bargaining unit and organization variables in compensation equations for the four functions. The coefficients along the diagonal of columns (1)–(4) correspond to direct "own-department" effects. The coefficients in columns (1)–(4) suggest that police unionization has the strongest effect on compensation in all municipal functions; that is, in all four functions' compensation equations, the coefficient on the police bargaining unit variable is larger than any of the other union variables' coefficients. This suggests that police unionization is

Table 12.6 **The Effect of Unions on Payroll Per Employee and Employee Per 10,000 Capita in Own and Other Departments, Estimates from Recursive System of Equations (*t*-statistics in parentheses)**

	Payroll Per Employee			
Union Measure	(1) Streets and Highways	(2) Police	(3) Fire	(4) Sanitation
Streets B. U.	72.96**	106.32***	93.34**	84.49***
	(2.25)	(3.40)	(2.49)	(2.76)
Streets Org.	53.09*	72.63***	64.70*	62.85**
	(1.86)	(2.60)	(1.93)	(2.29)
Police B. U.	113.42***	110.80***	201.40***	117.46***
	(3.78)	(3.70)	(5.69)	(4.04)
Police Org.	121.69***	91.20**	130.67***	107.55***
	(3.39)	(2.54)	(3.07)	(3.11)
Fire B. U.	56.94**	67.39**	46.93	80.79***
	(1.96)	(2.35)	(1.35)	(2.87)
Fire Org.	9.08	35.55	61.53	−17.51
	(0.28)	(1.12)	(1.59)	(0.56)
Sanitation B. U.	30.00	16.01	5.04	−2.41
	(0.94)	(0.50)	(0.13)	(0.08)
Sanitation Org.	−15.78	5.04	8.01	2.40
	(0.60)	(0.19)	(0.26)	(0.09)

Note: Specification of equations and control variables are described by figure 12.2. B. U. = bargaining unit; Org. = organization.

***Significant at the .01 level, two-tailed test.

**Significant at the .05 level, two-tailed test.

*Significant at the .10 level, two-tailed test.

a critical determinant of compensation of all functions' employees, not just police. Unionization in streets and highways also has important effects on compensation elsewhere. Fire-fighter unionization is less influential, as measured by its effects on own compensation levels and on the compensation levels in other functions. Unions in sanitation have the least pronounced effects on other departments.

The results in table 12.6 demonstrate that, in this specification, unionization in two of the four functions, police and streets and highways, has significant positive effects on compensation levels in their own departments. In both, own compensation effects are larger than those reported in table 12.4, column (1), where no cross-departmental spillover effects were allowed. The positive effects of fire bargaining units and organizations on own compensation are approximately one-quarter less than those of table 12.4 and insignificant. Unionization in sanitation

Table 12.6 (continued)

Employees Per 10,000 Capita			
(5) Streets and Highways	(6) Police	(7) Fire	(8) Sanitation
1.24**	−1.00*	−0.780	−2.73***
(2.30)	(1.67)	(1.26)	(5.09)
−0.557	−0.885	−0.490	−2.30***
(1.15)	(1.64)	(0.88)	(4.80)
−2.54***	−1.00***	−3.15***	−1.79***
(4.94)	(5.04)	(5.35)	(3.52)
−2.10***	−0.774	−0.154	−2.14***
(3.47)	(1.13)	(0.22)	(3.56)
−0.815	−0.781	0.362	−2.01***
(1.64)	(1.41)	(0.63)	(4.09)
−0.139	−0.564	−0.816	0.0276
(0.25)	(0.92)	(1.29)	(0.05)
0.937*	−0.430	−0.902	1.97***
(1.72)	(0.70)	(1.43)	(3.62)
0.0336	−0.538	−1.15**	0.00914
(0.07)	(1.07)	(2.22)	(0.02)

has own compensation effects that are not significantly different from zero.

The off-diagonal elements in columns (1)–(4) of table 12.6 suggest several conclusions about spillover effects on compensation. First, these spillovers are positive. Only 2 out of 24 estimated cross effects are negative. Both are insignificant. The compensation spillover effects attributable to police unionization are most striking. Police bargaining units and organizations significantly increase compensation in all other functions. In addition, the effects of police unionization on compensation in any function are larger than the effects of unionization in any other function, including own-unionization. Similarly, unionization in streets and highways has positive effects on own and other compensation, but the effects of streets and highways unions are smaller and less significant than the effects of police unionization. Fire unionization is less influential; only fire bargaining units have significant spillovers, in all cases smaller than those attributable to bargaining units in streets and highways. Sanitation unionization, which has no effect on sanitation employees' compensation, has no effects on compensation in

any other function. Sanitation compensation levels are significantly increased by unionization in all other functions, but not by own unionization. This categorization of spillover strengths suggests that police unionization has the most important implications for the compensation of employees in other functions, followed by unionization in streets and highways, and then by unionization in fire. Sanitation unionization is of little importance in the determination of the compensation levels of municipal employees.

Coefficients for employment spillovers reported in columns (5)–(8) of table 12.6 also reveal a consistent pattern. All but one union variable in equations for other-function employment (i.e., the off-diagonal elements) have negative coefficients. The one positive coefficient is insignificant. Of the 23 negative cross effects, 9 are significant at the 5 percent level, another 2 at the 10 percent level. These negative employment spillovers are the natural counterparts of positive compensation spillovers.

Cross-function union employment effects are analogous to cross-function union compensation effects in another respect; they exhibit the same ordering of functions by union influence. Again, the effects of police unionization on employment in all functions are most striking. Police bargaining units significantly and substantially reduce employment in all functions. Bargaining units in streets and highways increase own employment—though by much less than it is reduced when police have either a bargaining unit or an organization. A streets and highways bargaining unit also reduces police and sanitation employment. In contrast to compensation equations, sanitation unionization has some impacts on employment in own and other functions. However, as with sanitation compensation, spillovers from unionization in other departments are important in the determination of sanitation employment. Sanitation employment is greatly reduced by bargaining units in any other function and by organizations in either streets and highways or police.

The results reported in table 12.6 demonstrate that *union compensation and employment spillovers are important in municipal labor markets*. Compensation spillovers are positive, and employment spillovers are negative, as in the single-equation estimates of table 12.3. Police unions dominate these spillovers, perhaps as a consequence of their public prominence and market power.[11]

12.4.3 Mutually Endogenous Dependent Variables

The model of the budgeting process used to obtain the results in tables 12.4–12.6 is restrictive in that decisions at lower levels of municipal finance are made only after decisions at higher, more aggregate

levels. This ordering prohibits budgeting "feedback" which may, in practice, be important. For example, given a predetermined value for general expenditures, a strong department may be able to capture such a large share that it compels the city to increase general expenditures above the limits originally set. Here, general expenditures should be modeled as dependent on function expenditures at the same time that function expenditures are dependent on general expenditures. A strong union might be so successful in obtaining payroll increases that function expenditures have to be increased. In this example, function expenditures, function compensation, and function employment are mutually dependent.

Statistically, the system of exclusions among exogenous variables depicted in figure 12.2 provides sufficient identification to remove these restrictions in the recursive model. The validity of the specified endogeneities can also be tested statistically. Such tests, in themselves, are uninformative with regard to the effects of unions on compensation, employment, and municipal finance. However, it is important to compare the union coefficients in the recursive system above to those obtained from respecifications that permit mutual endogeneity to check whether the union effects in the recursive system are merely artifacts of endogeneities that the recursive model suppresses. If the description of union behavior implied by the recursive model is correct, union coefficients should change predictably as the interactions allowed between dependent variables increase. In particular, compensation equations should show reduced union effects when employment levels are included among the explanatory variables. Union compensation effects should be smaller in this specification because it holds the level of employment constant, when in fact unions achieve their effects at this level by accepting employment reductions. Similarly, the negative union employment effects of the recursive system should be reduced or removed when compensation is held constant. In the absence of compensation increases, unions have no reason to permit employment reductions.

Table 12.7 presents own union coefficients with respect to compensation and employment from a specification including own function employment in compensation equations and own function compensation in employment equations. In addition, general expenditures, as well as own function expenditures, are among the explanatory variables for compensation and employment.[12] The comparisons of these coefficients with those of table 12.4 are entirely consistent with the above predictions. Union effects on compensation are generally smaller and less significant when employment is held constant than when it is not controlled. In all functions, the effects of at least one form of

Table 12.7 **Effects of Own Unionization on Own Payroll Per Employee and Employment Per 10,000 Capita[a] (*t*-statistics in parentheses)**

Union Measure	Effect on Own Compensation	Effect on Own Employment
Streets B. U.	121.25***	1.90***
	(5.37)	(5.14)
Streets Org.	4.52	−0.0125
	(0.25)	(0.04)
Police B. U.	2.96	0.0494
	(0.21)	(0.17)
Police Org.	45.30**	0.922**
	(2.06)	(2.08)
Fire B. U.	52.63***	0.850***
	(3.00)	(2.87)
Fire Org.	71.22***	1.18***
	(3.18)	(3.11)
Sanitation B. U.	46.56**	0.807**
	(2.07)	(1.96)
Sanitation Org.	−35.42**	−0.694**
	(2.19)	(2.36)

Notes: B. U. = bargaining unit; Org. = organization.

[a]These estimates are taken from a system of equations that permit complete mutual endogeneity among the dependent variables. See text for complete discussion.

***Significant at the 0.01 level, two-tailed test.

**Significant at the 0.05 level, two-tailed test.

*Significant at the 0.10 level, two-tailed test.

unionization on employment are significantly positive when compensation is held constant, while all significant employment effects are negative when it is not.

Statistically, this model severely restricts union activity along all dimensions of the pay determination process. A union in this model affects payroll expenditures only through transfers from other factors used in the function. In one sense, the effects in table 12.7 suggest that, with general expenditures, function expenditures, and employment held constant, municipal unions still have sufficient strength to achieve positive compensation gains. With general expenditures, function expenditures, and compensation held constant, unions are still able to increase employment.[13]

In sum, union direct effects on compensation and employment in models with mutual endogeneity among all dependent variables reinforce the description of direct union effects on compensation and employment obtained from the simpler recursive system of equations. Own union and cross-union effects differ between the recursive and

completely endogenous systems, but they differ as predicted under the assumption that, at the level of compensation and employment determination, municipal unions demand higher compensation and accept lower employment levels. In conjunction with single-equation estimates of positive union employment effects, these results provide further support for the conclusion that unions achieve employment gains through increases in demand for services rather than at the bargaining table. This is not to say that a bargaining unit does not obtain some work-force clauses in collective negotiations that serve to increase employment levels. However, such effects must coincide with increases in function expenditures that allow any such work-force clauses to increase the level of employment.

Union effects on function expenditures also depend on the specification of endogeneity. Equation systems including own function payrolls among explanatory variables for function expenditures enrich the description of union activity at this level of the budgeting process beyond that deduced from the recursive model. Own payrolls have significant positive effects (t-statistics all exceed 6.00) when included among explanatory variables for function expenditures. Their inclusion reduces own bargaining unit effects on function expenditures to insignificance. This change confirms that union-induced increases in function expenditures are principally devoted to funding higher payrolls; unions have positive effects when payrolls vary, but no effects when payrolls are held constant.

12.5 Conclusion

The principal theme emerging from the empirical evidence of this study is that municipal unions successfully employ a mix of strategies that rely on collective bargaining and political lobbying activity. Ultimately, this mix of strategies increases relative employment and compensation in the bargaining unit. The results are consistent with a strategy in which unions accept employment reductions in return for compensation increases in collective bargaining negotiations. However, their lobbying activity in the budgetary process has the effect of increasing own function expenditures and thereby increasing derived demand for their own services. This increase in derived demand raises the compensation of municipal employees beyond the increase won at the bargaining table. Furthermore, the increases in function expenditures lead to gains in employment that often exceed the losses in employment attributable to compensation gains won at the bargaining table. On net, then, public sector unions achieve both compensation and employment increases for their own departments. We do not rule out the possibility that these estimated effects are the result of specific contract clauses

concerning compensation and employment negotiated at the bargaining table; still our results indicate that even if these contract clauses are sequentially determined first, there must be increases in budget appropriations at some point to accommodate the pay and employment increases.

The second major theme that emerges from this study is that when a municipal union pursues its distinctive strategy of bargaining and lobbying, it can have important implications for municipal employees in other departments. Specifically, bargaining units for police and streets and highways increase pay significantly in other departments as well as their own. For some functions, especially sanitation, these compensation spillover effects are larger than the effect that own unionization has on compensation. These positive pay spillovers coincide with relative reductions in employment levels.

Within this general pattern, we find that bargaining units in some functions achieve most of the increase in compensation through collective bargaining activity; in other functions increases in compensation are more a result of increases in function expenditures; while in still other functions, most of the increase in compensation comes from spillover effects from other functions' bargaining units. For example, while a bargaining unit in any function increases own function expenditures, police bargaining units increase police expenditures by only 5.1 percent of average police expenditures. In the other three functions, bargaining units increase function expenditures by 10.5 percent to 16.2 percent of the mean expenditure level. While police bargaining units have the smallest effect on function expenditures, they have the largest effect on compensation through collective bargaining. They also have the largest effects on other departments' compensation. Increases in the compensation attributable to such spillover effects are larger than those attributable to the direct effects of bargaining units for sanitation workers.

The implications of these effects of municipal unions for public welfare may be positive or negative. Public unions may be effective in pursuing this strategy, in part, because they are abetted by elected and appointed officials whose objectives also include larger government. Governmental unions may achieve these objectives, in part, because citizen-taxpayers on the demand side of markets for municipal services cannot effectively express preferences "at the margin" for smaller governments and fewer taxes. To the extent that municipal union compensation and employment gains rely on these characteristics of the political process, they are exploitative.

These are conventional objections to public sector unionism, but this characterization of the welfare implications of this study's findings may be misleading. Public unions may succeed in their objectives, in part,

because organized public sector employees are better prepared than other citizens are to assess service needs and to ensure effective service provision. Citizens support municipal unions with greater expenditures, in appreciation of their contribution to citizen welfare. Expressed somewhat differently, it cannot be determined whether the observed levels of pay and employment in nonunion departments correspond to service levels consonant with taxpayers' desires or to service levels that fall short of desired levels.

This study indicates that the extensive research on the effects of public sector unions should not be interpreted within a "monopoly effects" model of unionism. Rather, in a sector of the economy with distinctive institutional features related to the budget-setting process, unions achieve their objectives by influencing budget expenditures and not just levels of pay.

Statistical Appendix

The *Census of Population and Housing, 1970,* provides all the demographic variables used in this paper: 1970 population; 1960–70 population increase (%); 1960–70 population decrease (%); 1970–80 population increase (%); 1970–80 population decrease (%); 1969 families below poverty level (%); 1969 median family income; 1970 median value, owner-occupied one family homes; 1970 units in one-unit structures (%); 1970 black population (%); 1970 Spanish population (%); 1970 population under 18 years of age (%); 1970 population over 65 years of age (%); 1970 median year of school; 1970 male operative median earnings; 1970 nonworkers/worker ratio; 1970 persons over 23 years of age with more than 3 years high school (%); 1970 white-collar occupations (%); 1970 foreign stock (%).

Annual *Survey of Government* and *Census of Government* published by the U.S. Bureau of the Census report organization and bargaining characteristics of city employees by function, expenditures by function, full-time employment and monthly payroll by function. This information provides the following variables: dummy for streets organization, dummy for police organization, dummy for fire organization, dummy for sanitation organization; dummy for streets bargaining unit, dummy for police bargaining unit, dummy for fire bargaining unit, dummy for sanitation bargaining unit; October payroll/employee, streets; October payroll/employee, police; October payroll/employee, fire; October payroll/employee, sanitation; employment/10,000 capita, streets; employment/10,000 capita, police; employment/10,000 capita, fire; employment/10,000 capita, sanitation; October payroll per 10,000 capita, streets;

October payroll per 10,000 capita, police; October payroll per 10,000 capita, fire; October payroll per 10,000 capita, sanitation; annual expenditures for streets/10,000 capita; annual expenditures for police/10,000 capita; annual expenditures for fire/10,000 capita; annual expenditures for sanitation/10,000 capita; and annual general expenditures/10,000 capita.

Two private data sets of the International City Management Association describe local governments. The 1981 "Form of Governments Survey" provides the following variables: years since government form adoption, administration by city manager, nonpartisan city council elections, percent of city council at-large, and direct election of mayor. Its master file of American cities identifies cities in the categories of central city, suburban city, or independent city.

The National Bureau of Economic Research has compiled state laws governing local public sector unionization, as described by Valleta and Freeman (this volume, appendix B). This data set includes descriptions of legal bargaining rights, representation rights, and scope of bargaining for police, fire, and all other employees. This study characterizes the state legal environment with six dummy variables drawn from this compilation: strikes permitted, arbitration available, duty to bargain, bargaining permitted, no legal provisions for bargaining, state has right-to-work law. Variables for police and fire functions describe function-specific laws. Variables for sanitation and other noneducation functions describe the general laws for all other employees.

Notes

1. Local governments are more likely than not to have a civil service procedure. Unions will lobby civil service boards by introducing information during hearings on such matters as what comparison groups will be used in the calculation of "prevailing wages" (Lewin 1983, 133–34).

2. For example, Kochan (1974, 533) found that fire fighters in Madison, Wisconsin, were able to restore parity with police through a civil service board ruling after they had failed to obtain this objective in collective bargaining.

3. Cities that changed their form of government after 1977 are excluded from the sample.

4. Finance variables are drawn from a different data set, the U.S. Census of Governments Annual Survey of Finance. Complete data are not available for all cities included in the analysis of the previous section. The sample size for analyses described in this section is 336 municipalities, each with four functions, in each of five years.

5. Cities must ordinarily run a balanced budget on current account.

6. Municipal output measures are notoriously scarce and imperfect. None are available that cover the range of cities, functions, and years analyzed here.

7. Compensation and employment equations reported here also omit government structure, time, and geographic dummy variables. These exclusions are not necessary for identification of the equation systems.

8. Importantly, these are not arithmetic identities that cause a given variable (e.g., unionization) to have effects with opposite signs on pay and employment once function expenditures are held constant. Specifically, the total functions expenditure variable includes nonpayroll as well as payroll expenditures. In all four functions, there is a significant amount of variation in the payroll's share of total expenditures.

9. The Governments Division of the U.S. Census Bureau warns that the product of twelve and the payrolls in the surveyed month may not be a satisfactory estimate of annual payrolls.

10. In addition, most of the effects labeled "Indirect Effect—General Exp." are based on union coefficients in general expenditure equations that are individually insignificant. See table 12.4, column (4).

11. Union spillovers might also occur in the determination of function expenditures. However, when the recursive model that generates the estimates in table 12.6 is respecified to include measures of unionization in all functions among the exogenous variables in each equation for function expenditures, no particular pattern for the union variables in other departments' total expenditure equations is revealed. Importantly, union coefficients in compensation and employment equations are essentially unaffected by this respecification. The function expenditure equations do show some evidence of spillovers at this level of the budgetary process between police and fire, and between streets and highways and sanitation.

12. The particular specification from which these coefficients are taken permits complete mutual endogeneities: expenditures and payrolls in the four functions are among the explanatory variables for general expenditures; general expenditures and own function payrolls are among the explanatory variables for function expenditures; general expenditures and own function expenditures are among the explanatory variables for compensation and employment; and own compensation and own employment levels appear in each other's equation. This system is estimated using the three-stage least-squares technique. Employment variables in compensation equations and compensation variables in employment equations are all negative, with t-statistics exceeding 40. Estimated elasticities of employment with respect to compensation are -1.13 for police, -1.28 for fire, -1.66 for streets and highways, and -1.92 for sanitation.

13. This pattern of coefficients on the own unionization variables is virtually unaffected when the model is expanded to allow spillovers from other departments' bargaining units in the compensation and employment equations. The magnitudes of the spillover effects, as with the direct effects, are smaller in this model—in which employment is held constant in compensation equations, and compensation is held constant in employment equations—than they were in table 12.6. They are rarely significant. A few of the significant spillovers are of opposite sign of those in table 12.6. With own employment held constant, compensation spillovers can be negative; with own compensation held constant, employment spillovers can be positive. Put differently, the changes observed in the pattern of spillover coefficients (once employment is held constant in compensation equations and compensation is held constant in employment equations) are consistent with the hypotheses that spillovers work by reducing employment in order to match compensation levels in other departments.

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Comment

Harry J. Holzer

The paper by Jeffrey Zax and Casey Ichniowski is very appealing for a variety of reasons. They present some very straightforward hypotheses on a fundamentally important issue with regards to public sector unionism. These hypotheses are first supported by evidence from the institutional literature on municipal government and union political activities. They are then tested very thoroughly in a variety of statistical formats. It should also be noted that the authors themselves put together the very impressive set of data on municipal unionism which they used in their analysis (see appendix A, this volume).

By and large, I found the results of this work quite convincing. The evidence on own-union and cross-union wage and employment effects in the single-equation (reduced-form) estimates is fairly strong and seems robust.

With regards to the multiple-equations estimates (both recursive and simultaneous), I have a few more reservations. In particular, the use

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of own-service expenditures as a control variable in wage and employment equations may be problematic. The authors interpret this measure as a proxy for total value of output in that service, which in turn should reflect the shifts in demand that municipal unions are hypothetically causing through their political efforts. Indeed, the inclusion of this variable in the employment equations turns the original positive estimate of own-union effects into a negative one in most cases. However, it is at least possible that most of the variance in expenditures represents variance in employment for that service. If this is the case, the strong positive correlation between expenditures and both unions and employment may be causing the negative estimate of the union employment effect in these equations. It also may be causing the large demand elasticities (see Zax and Ichniowski, note 12) observed in the simultaneous equations. (On the other hand, the negative cross-union effects on employment observed even in the reduced-form estimates suggest that demand effects are not all spurious.)

The doubts I have about the existence of these negative employment effects in the own-union context raise another question in my mind: Is the labor demand framework the correct one for analyzing these issues? While the authors briefly mention the "efficient contracts" notion, it may deserve more consideration. This framework provides an alternative explanation for the absence of observed negative employment effects of unions—namely, that outcomes lie on a "contract curve" for bargaining which is not negatively sloped. If the latter is true, it would suggest that union work rules and other contract clauses are responsible for the observed union-employment relationship rather than their political activities. Sorting out these interpretations would require data on such activities as well as on nonwage components of union contracts. While obviously beyond the scope of this paper, it seems a worthwhile topic for further research.

Given the data that the authors have collected, a few other recommendations can be made. While the authors occasionally mention the correlations in unionization across services of the same city, a full listing of these (or of conditional probabilities of unionism in each function given that it is present in others) would have been quite useful. For it is possible that the absence of significant union effects on general expenditures might reflect multicollinearity between the union variables. An aggregate measure of municipal unionism (e.g., a weighted average across the four functions) might have been more appropriate in this case. Estimation of employment effects, with and without the legal measures included, would also have provided a direct test of whether or not the unions' political activities are the source of their ability to maintain employment despite rising wages. Finally, the authors might have made better use of the panel nature of their data by estimating

some fixed-effect equations for wages and employment. These equations would have eliminated at least some of the unobserved characteristics of cities (e.g., tastes for municipal services) which might be correlated with both unionism and those outcomes.

Having said this, I emphasize once again that the analysis presented presents several important and relatively convincing findings. I commend the authors for their efforts.

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