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5 The Evolution of Public Sector Bargaining Laws

Henry S. Farber

5.1 Introduction

It has been argued that the tremendous increase in collective bargaining among state and local government employees is largely the result of the passage of laws by states sanctioning and regulating the process of collective bargaining by government employees.[1] In 1955 less than a handful of states had laws defining the collective bargaining rights of public employees and virtually all of these prohibited bargaining. By 1984 all but a few states had adopted a policy in this area, and only a handful of states prohibited bargaining. Table 5.1 contains a breakdown of state laws governing the collective bargaining rights of public sector employees in 1955 and 1984 derived from the National Bureau of Economic Research (NBER) public sector bargaining law data set (Valletta and Freeman this volume, appendix B). While there are serious problems of causal inference in concluding that the emergence of public policy caused the increase in unionization, the emergence of public policy in this area along with public sector unionization represents an important puzzle for industrial relations scholars. If the public policy did cause the increase in unionization, then the problem is to explain the emergence of the public policy. If unionization (or the pressure for unionization) resulted in public policy to deal with it, then the problem is to explain the emergence of the unionization.

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Table 5.1 **Number of States with Laws Governing Collective Bargaining Rights**

	1955[a]		1984	
	No Law	Law	No Law	Law
State Employees	44	4	8	42
Police	45	3	8	42
Teachers	45	3	3	47

Source: Valletta and Freeman (this volume, appendix B).
[a]There were only forty-eight states in 1955.

The ideal would be to specify and estimate a full structural model of the determination of public sector legislation and unionization that afforded the opportunity to determine the direction of causality directly. However, estimation of such a model would strain the limits of the available data and econometric techniques. A difficult, if somewhat less ambitious, task is undertaken in this study: the specification and estimation of a reduced form model of the determination of state laws governing public sector bargaining.[2] The analysis is reduced form in that the direct effect of public sector unionization on public policy is not analyzed, and it is argued that public policy is a function of the combined sets of factors that affect public policy indirectly through their effect on public sector unionization as well as the factors that affect public policy directly.

The empirical analysis relies on the NBER public sector bargaining law data set (Valletta and Freeman, this volume, appendix B), which contains information on each state's laws governing collective bargaining by public sector employees for each year in the 1955–84 period. Information is available separately for laws governing each of five classes of employees (state employees, local police, fire, teachers, and other local employees). The analysis here deals with state employees, police, and school teachers as groups that are representative of public employees more generally and capture the important variation in laws across employee groups.[3] While a number of different aspects of each law are summarized in the data (e.g., collective bargaining rights, union security provisions, policy regarding strikes, alternative dispute settlement mechanisms), the analysis focuses on the fundamental policy regarding collective bargaining rights. This can range from a prohibition on bargaining to a requirement that public sector employers bargain with their employees. These data are described more fully in section 5.2.

In section 5.3 a model of the determination of the passage of legislation governing public sector collective bargaining is developed. This model describes the process that governs states' decisions regarding:

1) whether or not to enact a law governing public sector bargaining rights, 2) what type of policy to enact if a law is passed, 3) whether or not to change an existing policy, and 4) what type of policy to change to if a change is passed. The model is based on two central constructs: the first is intensity of preferences for or against public sector unionization; the second is the cost (ease or difficulty) of enacting or changing public policy in this area. Essentially, it is argued that a state will enact a policy or change its existing policy if its preferences differ from the value of the current policy (or no policy) by enough to outweigh the costs of the change.

The econometric framework is outlined in section 5.4. A Markov model of transitions from one category of law to another (or from no law to a particular type of law) *conditional* on the initial category is specified. The transition probabilities are derived directly from the theoretical framework developed in section 5.3.

An important part of the estimation of the model is to identify the factors that influence the intensity of preferences for public sector unionization and the costs of policy change. Section 5.5 contains descriptions of the explanatory variables used to measure variation in the costs associated with the legislative process. These include the number of days the state legislature meets, a measure of general legislative activity, an indicator of whether or not the legislature and the governorship are controlled by the same party, and a time trend. Section 5.6 contains descriptions of the explanatory variables used to measure variation in intensity of preferences. These include congressional voting records on labor issues, private sector unionization, income per capita, the relative size of the government sector, a time trend, and regional factors. The same set of variables is argued to measure variation in the value to a state of having no explicit policy.

The empirical results are presented in section 5.7. The most important factors found to be influencing the intensity of preferences for public sector unionization are the congressional voting records, southern region, income per capita, and the size of the government sector. Nothing measured in this study is found to influence the costs of legislative change in a systematic fashion. Section 5.8 contains an investigation of how well the model fits the data. It is found that the model can explain the overall distribution of laws at various points in time rather well. However, the model is less successful in explaining *which* states have laws of a particular kind at each point in time. In section 5.9 the results are summarized, and it is concluded that the model of legislative change developed in this study has some explanatory power but that more work needs to be done in defining and measuring variables that affect the costs of legislative change and the preferences for public sector collective bargaining.

5.2 Description of Bargaining Law Data

The NBER public sector bargaining law data set, described in detail in appendix B of this volume, contains a record of the legislative history of each state's policy regarding public sector collective bargaining. In constructing these data, a serious attempt was also made to incorporate policies toward public sector collective bargaining that originated from judicial decisions. However, because most existing policy in this area has a legislative foundation and because the measurement of judicially made policy is likely to be incomplete, the data can be thought of as representing a largely legislative history.[4] On this basis the analysis that follows is developed in terms of policy as being derived through a legislative process.

Overall, these data represent the best available comprehensive source of quantitative information on policy regarding public sector collective bargaining. The data are compiled separately for laws covering the three employee groups focused on here: state employees, police, and school teachers, and for each group information is collected regarding public policy governing their collective bargaining rights.

Since it is not possible to characterize parsimoniously the specifics of every law with respect to collective bargaining rights, the laws are categorized with regard to their general content. Four types of laws are defined, ranging from the least favorable for bargaining to the most favorable. The categories are defined in table 5.2. In the least favorable category, bargaining is prohibited, while in the most favorable category the employer is obligated to bargain with the union. In the two intermediate categories bargaining is more-or-less optional.

The evolution of laws governing collective bargaining rights of public sector employees is quite dramatic. Table 5.3 contains a breakdown of laws governing collective bargaining rights by state for each of the three employee groups in 1955 and 1984. It is clear that in the mid-1950s very few states had any policy at all regarding collective bargaining rights for public sector employees, and the laws in those states that did have a policy were not favorable to collective bargaining. By 1984 the large majority of states had adopted a policy, and these policies were largely

Table 5.2 **Categories of Laws Governing Collective Bargaining Rights**

Type	Definition
0	No legislative policy
1	Bargaining prohibited
2	Employer permitted but not obligated to negotiate with union
3	Union has right to present proposals and/or meet with employer
4	Employer has duty to bargain with union

Table 5.3 **Breakdown of Laws Governing Collective Bargaining Rights by Category[a]**

	State Employees		Police		Teachers	
Type of Law	1955	1984	1955	1984	1955	1984
No Law	44	8	45	8	45	3
1	3	8	2	4	2	4
2	1	6	1	9	1	12
3	0	4	0	2	0	1
4	0	24	0	27	0	30

Source: Valletta and Freeman (this volume, appendix B).

[a]There were only forty-eight states in 1955. See table 5.2 for law category definitions.

favorable to collective bargaining. For all three employee groups, approximately half of the fifty states had adopted a policy of requiring employers to bargain with their employees' unions. While the frequency distributions of type of policy in 1984 are relatively close for the three employee groups, public policy is more favorable for bargaining, on average, for teachers than for the other two groups, and somewhat more favorable for police than for state employees. In 1984 more states had laws requiring bargaining and fewer laws prohibiting bargaining with teachers than with the other two groups. Similarly, more states had laws requiring bargaining with police than with state employees.

If we consider each year in a given state to be an opportunity for the state to modify its public policy, then there are a total of 1,490 observations on the evolutionary process for each of the three employee groups.[5] Table 5.4 contains breakdowns of these processes in the form of cross-tabulations by employee group of the current year's legislative category by the previous year's legislative category. What is obvious is that for all groups most of the 1,490 observations are on the diagonals, meaning that there is generally no change in policy. In fact, of the 1,490 opportunities to change policy, changes occurred only 52 times for state employees, 52 times for police, and 61 times for teachers.

Of the 52 changes in policy regarding state employees, 39 of these were initial enactments of a policy, 6 of which prohibited bargaining. Of the 13 changes in an existing policy, all involved a change to a more favorable law.[6] Of the 52 changes in policy regarding police, 40 of these were initial enactments of a policy, 4 of which prohibited bargaining. Of the 12 changes in an existing policy, all but one involved a change to a more favorable law. Of the 61 changes in policy regarding teachers, 45 of these were initial enactments of a policy, 3 of which prohibited bargaining. Of the 16 changes in an existing policy, all but 2 involved a change to a more favorable law.

Table 5.4 **Cross-Tabulation of Current Collective Bargaining Policy by Previous Year's Policy[a]**

Lagged Policy	Current Policy				
	0	1	2	3	4
			A. State Employees		
0	748	6	13	8	12
1	0	169	0	0	1
2	0	0	127	1	6
3	0	0	0	96	5
4	0	0	0	0	298
			B. Police		
0	742	4	14	5	17
1	0	89	1	0	2
2	0	1	191	0	5
3	0	0	0	47	3
4	0	0	0	0	369
			C. Teachers		
0	657	3	18	5	19
1	0	89	2	0	1
2	0	2	233	1	5
3	0	0	0	50	5
4	0	0	0	0	400

[a]See table 5.2 for category definitions.

Since most of the "action" is in the initial implementation of a public policy regarding bargaining, an important focus of the analysis is on the pattern of emergence of these policies, both across states and over time. There is also a significant amount of change to existing policy that must be accounted for. However, the dominant set of observations consists of those where policy is unchanged, and the theoretical and empirical framework must be able to accommodate this fact.

5.3 Theoretical Framework

A simple model of the passage of legislation governing public sector collective bargaining relies on two factors. First, the intensity of preferences for or against public sector unionism is an important determinant both of the passage of any law and the particular type of law passed. Where preferences in a state are very favorable toward unionization, the state will be more likely to have a pro-union bargaining law. Similarly, where preferences in a state are very unfavorable toward

unions, the state will be more likely to have an anti-union bargaining law. The second factor is the difficulty of passing legislation independent of the intensity of preferences for or against unionization. This difficulty level is termed the costs of enacting legislation, and it is argued to be largely a function of the structure of the legislative process. A key feature of the model is the independent nature of the intensity and the costs. Any factors that affect the difficulty of passing legislation in a way that is related to intensity are subsumed in the intensity measure.[7]

Suppose that a law governing the collective bargaining rights of public sector employees can be characterized along a single dimension and that the optimal value of a law (intensity of preference) in this dimension is denoted by R_{it} in state i and year t. A higher value for R_{it} denotes preferences that are more favorable toward bargaining. Suppose further that a loss function, L_{it}, with regard to collective bargaining policy can be defined simply as the absolute value of the deviation of the value, V, of the current policy, j, from the optimal value R_{it}. This loss function is

$$L_{it} = |R_{it} - V_j|. \tag{1}$$

If it was costless to enact a policy or change an existing policy, then in each period each state would minimize L_{it} by choosing j such that $V_j = R_{it}$. In other words, the policy each period would reflect the currently optimal policy. However, it is generally costly to introduce a new policy or to change an existing policy due to friction in the political process.

Consider first the case where a state has no policy in place. How will that state decide whether to introduce a policy or to remain without a policy? Denote the value of no policy by V_{0it}, so that the loss function evaluated at no policy is simply

$$L_{it.0} = |R_{it} - V_{0it}|. \tag{2}$$

If the cost of introducing a policy is C_{it}, then the state will find it optimal to introduce a policy only if the loss from introducing the law (C_{it}) is smaller than the benefit derived from elimination of the loss from no policy. This condition is

$$|R_{it} - V_{0it}| > C_{it}\,, \tag{3}$$

assuming that the state is able to introduce a policy that has a zero loss associated with it ($V_j = R_{it}$).[8]

Note that this formulation does not impose a particular value to "no policy" relative to the actual policies. The value of no policy has state and time subscripts because there is generally a *de facto* policy implicit in no official policy that is likely to be state specific and change over time. For example, no official policy in a generally pro-union state will

have a different value than no official policy in a generally anti-union state.

The available data group the laws into the discrete categories defined in table 5.2. In order to derive the decision rules for states that have an existing policy, define V_j as the value of a law in category j. Given the definition of the four categories (excluding no policy) in table 5.2, it is natural to assume that $V_1 < V_2 < V_3 < V_4$.

Once a state has a policy in place, it is assumed that this policy can be maintained costlessly, but that a change in policy entails incurring some level of cost, C_{it}, that is independent of the particular policy in place. In this case a state will decide to change its old policy if and only if the loss associated with the current policy is greater than the loss associated with the best alternative policy plus the cost of change. It is further assumed that a state cannot retreat to having no explicit policy regarding public sector collective bargaining once a policy is enacted.[9]

Using the same notation as above, a state with a category 1 law (prohibiting bargaining) will want to change that law if

$$R_{it} > K_1 + C_{it}. \tag{4}$$

where $K_1 = (V_1 + V_2)/2$. The value K_1 can be interpreted as the point of indifference (in R) between category 1 and category 2, and as long as preferences exceed this indifference point by enough to outweigh the cost of the change, then the state will change its policy. It is not necessarily true that the state will adopt policy 2 if this condition holds. This condition is simply necessary and sufficient for the state to desire a change to one of the other (higher) categories.

The conditions to move from each of the policy categories are derived similarly and are:

$$\begin{aligned}
&\text{Start with \#1: } R_{it} > K_1 + C_{it}\,, \\
&\text{Start with \#2: } R_{it} < K_1 - C_{it} \text{ or } R_{it} > K_2 + C_{it}\,, \\
&\text{Start with \#3: } R_{it} < K_2 - C_{it} \text{ or } R_{it} > K_3 + C_{it}\,, \text{ and} \\
&\text{Start with \#4: } R_{it} < K_3 - C_{it}\,,
\end{aligned} \tag{5}$$

where

$$\begin{aligned}
K_1 &= (V_1 + V_2)/2, \\
K_2 &= (V_2 + V_3)/2, \text{ and} \\
K_3 &= (V_3 + V_4)/2.
\end{aligned} \tag{6}$$

If the appropriate inequality conditional on the initial policy is not satisfied, then the state will retain its existing policy. If the appropriate

inequality is satisfied so that the state decides to change its policy, the state will move to the category that yields the lowest value for the loss function.

Given that a state decides to enact a new policy or to change its existing policy, the state will use a similar decision rule in selecting the optimal category of law. The loss function is minimized by selecting the category of law whose value is closest to R_{it}. The category of law that minimizes the loss function is defined by the interval on the real line delimited by the K_1 that R_{it} falls in. For example, the lowest value law (category 1) will be chosen if $R_{it} < K_1$, where $K_1 = (V_1 + V_2)/2$. Similarly, they will choose category 2 if $K_1 < R_{it} < K_2$, where $K_2 = (V_2 + V_3)/2$. The complete set of conditions is

(7) Choose 1 if: $R_{it} < K_1$,

Choose 2 if: $K_1 < R_{it} < K_2$,

Choose 3 if: $K_2 < R_{it} < K_3$, and

Choose 4 if: $R_{it} > K_3$,

where the breakpoints are defined in equation (6).

There are two key features of this model from the standpoint of the empirical analysis carried out in succeeding sections. First is that the model allows the central construct of intensity of preferences (R_{it}) to affect three important elements of the evolution of public policy regarding collective bargaining in the public sector: 1) the process that determines whether a state has a policy at all, 2) the process that determines whether the state adjusts its law to reflect current conditions, and 3) the particular kind of law that is adopted in an ordered response context. The second key feature of the model is that the central construct of costs of adjustment (C_{it}) makes it possible for changes in policy to be relatively rare events. This is because the costs of policy change will provide a disincentive to change policy in response to small changes in preferences.

5.4 Econometric Specification

The basic approach taken to the econometric specification is to assume that there are 1,490 (48 states × 30 years + 2 states × 25 years) observations for each employee group on the current state of policy regarding public sector collective bargaining rights conditional on the policy that prevailed at the end of the previous year. Thus, the probabilities of having a particular policy in a given state-year are specified *conditional* on the previous policy, and these probabilities are used to form a likelihood function that is maximized with respect to a set of

underlying parameters that are common to the various conditioning events.

The econometric framework used for this task is an extension of a standard ordered probit model. Conditional on the previous policy (or no policy), the specification will indicate the probability of the joint event of 1) change or no change in that policy and 2) choice of the particular policy that was implemented where there was a change. This is essentially a Markov model of the transition probabilities based on the frequencies in table 5.4. The contribution of the theory is that it provides a way to specify each of the transition probabilities in this matrix as a function of the same set of underlying parameters and in terms of a coherent model.

Equations (5)–(7) define the decision rules that determine whether or not a state will enact or change policy and what sort of policy will be enacted if there is a change. These depend on the values of the cost of changing policy (C_{it}), the intensity of preference (R_{it}), the value of no policy (V_{0it}), and the threshold values (K_1, K_2, and K_3).

The cost of changing policy (C_{it}) is a fundamentally unmeasurable quantity that is modeled empirically as the latent variable Y_1 for a given observation where[10]

$$Y_1 = X_1\beta_1 + \epsilon_1. \tag{8}$$

The vector X_1 represents observable variables that affect the cost of policy change; β_1 is a vector of parameters; and ϵ_1 is a random component. Similarly, intensity of preferences (R_{it}) is a fundamentally unobservable quantity that is modeled empirically as the latent variable Y_2 for a given observation where

$$Y_2 = X_2\beta_2 + \epsilon_2. \tag{9}$$

The vector X_2 represents observable variables that affect the intensity of preferences; β_2 is a vector of parameters; and ϵ_2 is a random component. A third underlying construct is the value of no policy (V_{0it}). This is specified simply as

$$Y_3 = X_3\beta_3 , \tag{10}$$

where the vector X_3 represents observable variables that affect the value of no policy, and β_3 is a vector of parameters. There is no stochastic element in this construct.

The particular variables in the X vectors are discussed in section 5.5. It is assumed that ϵ_1 and ϵ_2 have independent standard normal distributions. Given the qualitative nature of the outcomes, it is not possible to identify the variances ϵ_1 or ϵ_2 together with the scale of β_1, β_2, and β_3. Thus, the variances are normalized to one. The means of ϵ_1 and ϵ_2 are normalized to zero, because systematic unobservable

factors are subsumed in the constant terms in $X_1\beta_1$, $X_2\beta_2$, and $X_3\beta_3$. The zero correlation restriction is imposed for analytical convenience, but it is consistent with the argument made in section 5.3 that the factors affecting intensity of preferences and costs of policy change are independent by construction.

Given these specifications for the costs of policy change, the intensity of preferences, and the value of no policy, along with the model outlined in the previous section, it is possible to write the probabilities of all possible outcomes for each of the conditioning sets (initial policies). Let J_t represent the type of law in place in state i in year t. The index J_t can take on any of the five values 0, 1, 2, 3, 4, where 0 represents no policy and 1 through 4 represent the four categories of collective bargaining rights law described in table 5.2. These are the five conditioning events that define the five rows of the Markov transition matrix. The transition probabilities are defined as

$$P_{mnt} = Pr(J_t = n | J_{t-1} = m) \text{ for } n, m = 1 \ldots 5, \tag{11}$$

where P_{mnt} represents the probability that a state with law category m in year $t - 1$ has law category n in year t. These probabilities sum to one for each conditioning event such that

$$\sum_{n=0}^{4} P_{mnt} = 1 \qquad \forall m = 0, 1, 2, 3, 4. \tag{12}$$

The various P_{mnt} depend on the same set of parameters and are defined in detail in this chapter's appendix.[11]

It is straightforward to formulate the likelihood function for this model based on the probabilities for the various events outlined in this section and presented in the appendix. The associated log-likelihood function is

$$\ln(L) = \sum_{t=55}^{84} \sum_{i=1}^{50} \sum_{m=0}^{4} \sum_{n=0}^{4} I_{mnit} \ln(P_{mnt}), \tag{13}$$

where I_{mnit} is an indicator variable that equals one if state i had law m in year $t - 1$ and law n in year t. The variable I_{mnit} equals zero otherwise.[12] Computation of this likelihood function involves evaluation of nothing more complex than bivariate normal cumulative distribution functions (CDFs), and these are readily computable using numerical approximations. The empirical analysis consists of maximization of this likelihood function with respect to the free parameters of the model (β_1, β_2, β_3, K_1, K_2, and K_3).

One shortcoming of the Markov approach used here and implicit in the likelihood function is that it assumes there is no correlation across time and within states in the errors ϵ_1 and ϵ_2. It is certainly likely to

be true that there are persistent unmeasured factors that affect the intensity of preferences and the costs of policy change within states. However, the appropriate technique for dealing with this problem is not clear. A fixed effect estimator, which includes a separate intercept for each state (perhaps in Y_1, Y_2, *and* Y_3) imposes too high a computational burden in a nonlinear model such as this. It also strains the limits of the information in the data. There are also difficult computational problems in using a random effects estimator.

While this section in conjunction with the appendix contains much tedious specification of probabilities, the overall structure of the two-equation model is clear. States will change their policy if their preference/cost structure changes so that a different policy is optimal net of the costs of the change. The policy that states will select if they do opt to change will be the option closet to their most preferred position. In the next two sections the observable variables that determine the cost of policy change, the intensity of preference, and the value of no policy are described.

5.5 The Costs of a Change in Public Policy

The costs of a change in public policy is a construct designed to capture how difficult it is to make a legislative change in policy. An important determinant of this is the structural makeup of the state government. While it is unclear exactly what organizational or political factors lead to higher or lower difficulty in implementing legislative change, three measures that are likely to reflect these underlying factors are used in this study.

The first is the number of days the state legislature is in session. The argument is that a legislature in session more days has a greater chance of passing a given piece of legislation. In addition, a legislature that meets frequently is argued to exhibit more professionalism. It should also be noted that a number of states had legislative sessions only every other year or had only perfunctory sessions every other year until recently. It is clear that these states are unlikely to pass important legislation in the "off" years, and a variable representing days in session will capture this phenomenon. The measure of legislative days was not available for 1983 and 1984, and the 1982 figure for each state was used for these years. The mean and standard deviation of this variable and the others discussed in this and the next section are contained in table 5.5.

The second variable used is the number of bills enacted by the state government (passed by the legislature and signed by the governor). The arguments used to justify this variable are similar to those for the number of days the legislature is in session. The data on the number

Table 5.5 Descriptions, Means, and Standard Deviations (s.d.) of Explanatory Variables

Variable	Mean (s.d.)	Description
COPE	0.504 (0.241)	Fraction of votes by state's delegation to U.S. House of Representatives consistent with AFL-CIO approved position on issues of interest to organized labor. (Source: AFL-CIO Department of Legislation, Congressional Voting Records.)
Union	0.231 (0.094)	Fraction of private sector work force in state unionized. (Source: U.S. BLS, Directory of Union Membership, 1964–80, See text for source prior to 1964 and after 1980.)
South	0.322	= 1 if southern census region.
Inc/Pop	3.10 (0.778)	Real income per capita in state in thousands of 1967 dollars. (Source: U.S. Regional Data Bank, Data Resources, Inc.)
Govexp/Inc	0.209 (0.0492)	Ratio of state and local government expenditures to total income. (Source: U.S. Regional Data Bank, Data Resources Inc.)
Year	69.6 (8.63)	Time trend has values equal to year 1955–84.
Legday	115.5 (101.6)	Number of days stated legislature met. (Source: *Book of the States*, various years.)
Nenact	494.4 (494.1)	Number of legislative enactments by state government. (Source: *Book of the States*, various years.)
Unified	0.622	= 1 if legislature and governorship controlled by same party. (Source: *Book of the States*, various years.)

of enactments were missing for a few observations, and values for these observations were imputed by interpolation from adjacent years.[13]

The final legislative structure variable used is a dummy variable that reflects whether or not the state legislature and the governorship are controlled by the same party. It is argued that where there is this unified control, the government will be able to achieve whatever it wants more easily. This could be favorable or unfavorable bargaining legislation.[14]

A time trend measured by year is included in the cost function in order to capture any secular change in the difficulty of legislative change

in this area. One argument for such a change is that as the public sector grew over this period and/or as public sector workers became more interested in unionization, the general pressure to articulate some policy with regard to public sector collective bargaining grew. That the pressure is not particularly for a positive or a negative policy, but simply for some policy, suggests that this factor belongs in the cost equation where a negative coefficient would indicate an increase over time in the likelihood of a change in policy.

5.6 Intensity of Preferences for Public Sector Collective Bargaining and the Value of No Policy

Perhaps the most important factor that would influence a state with regard to policy toward collective bargaining by public sector employees is the general attitude toward unions in the state. Three variables are used here to reflect these attitudes. The first is a measure of the "liberalness" on labor issues of the congressional delegation of the state. This is likely to be important to the extent that 1) legislators reflect the preferences of the voters in their states on labor issues and 2) these voters elect state legislators who also reflect these same attitudes. The measure used is the "COPE score" of the congressional delegation of the state. The Committee on Political Education (COPE) and the legislative department of the AFL–CIO regularly tabulate the voting records of individual legislators on issues of interest to the labor movement. On each issue, the legislative department defines a "right" vote and a "wrong" vote where, obviously, a right vote is favorable to unions and a wrong vote is unfavorable. The COPE score is calculated as the fraction of votes cast "right" by members of the state's delegation to the U.S. House of Representatives.[15]

The second measure of the state's general attitude toward unions is the extent of private sector unionization in the state. This may be an important determinant of the intensity of preferences for public sector bargaining laws for at least two reasons. First, where the extent of unionization is high, there is also likely to be more general pro-union sentiment. Second, a strong union movement may be able to lobby more effectively for legislation it wants, and favorable public sector bargaining legislation is likely to fall into that category. It proved very difficult to find a consistent time series for unionization by state, and what is used is not entirely satisfactory. Available from the U.S. Bureau of Labor Statistics (BLS) are state level figures on union membership for the even years from 1964 through 1980. These data were interpolated for the odd years to yield a consistent series for these seventeen years. While other series are available for selected years (e.g., Troy and Sheflin 1985, for 1960, 1975, 1980, and 1982), they were not collected on

a basis consistent with the BLS data, so they were not used here. A series from 1955 through 1963 was derived using data from the BLS on the aggregate extent of unionization for each year in conjunction with the state-level data available for 1964. Specifically, the interstate distribution of unionization was assumed to be the same over the 1955–63 period as it was in 1964. However, the level in each state was adjusted proportionally so that the employment-weighted average extent of unionization in each year from 1955 to 1963 agreed with the available annual aggregate BLS data. In other words, the 1964 state-level data were used to fix the relative unionization across states and the annual aggregate data were used to fix the overall level of unionization. An analogous technique was used to derive state-level data for 1981–84 using the 1980 relative unionization across states and the annual aggregate BLS data.

The third measure of general attitudes toward unionization is a dummy variable for states that are in the south. While it is well known that unionization is lower in the south, there may be negative attitudes regarding unions in the south that go beyond the lower extent of unionization. Evidence is provided by Farber (1983, 1984) not only that workers in the south are less interested in unionization than workers outside that region but also that workers in the south who do want union jobs are less likely to be able to find union jobs, perhaps for institutional reasons. He also finds that the existence of right-to-work laws in many states in the south does not account for this inability to find union jobs.

Three other measures that may be related to the intensity of preferences for public sector unionization are also used. The first is the level of per capita income in the state. Where per capita income is higher, it may be that the citizenry demands more public services and values them more highly so that public employees have more power that they can use to create an environment favorable to unionization. Alternatively, the citizenry may view unionization of public employees as a normal good, so they create an environment favorable to public sector unionization where incomes are high. The precise measure used is real per capita income in 1967 dollars.

The second measure is designed to reflect the size of the government sector. Where the government sector is larger, public sector employees are likely to have more power and influence that they can use to promote legislation favorable to public sector collective bargaining. The measure used is the ratio of state and local government expenditures to income in the state.

The final measure used is a time trend measured by the year (1955–80). This measure is included to capture a secular increase in preferences for public sector unionization. It reflects the hypothesis that the

reason for the implementation of many favorable public sector bargaining laws over this period is simply a secular improvement in public attitudes regarding public sector unionization and/or a secular increase in public employees' demands for unionization.

The value of no explicit policy toward public sector bargaining depends heavily on the underlying attitudes toward unionization in the state. For example, attempts to unionize by public sector employees in a state very hostile to collective bargaining are likely to meet with strong resistance from employers, the populace, and possibly the courts. The result is a de facto unfavorable public policy toward unionization. Similarly, attempts to unionize by public sector employees in a state that is sympathetic to collective bargaining are likely to meet with less resistance (and perhaps implicit acceptance) from employers, the populace, and the courts. The result is a de facto favorable public policy toward unionization. On this basis, the same set of variables argued to determine the intensity of preference for unionization are argued to determine the value of no policy.

5.7 Empirical Results

The econometric specification derived in section 5.4 was estimated by maximum likelihood using the data from the NBER public sector bargaining law data set described in section 5.2.[16] The first panel of table 5.6 contains the definitions of three vectors of explanatory variables that are used in the estimation: 1) Z_1 contains only a constant, 2) Z_2 contains the full set of five explanatory variables described in section 5.5 for the cost of policy change, and 3) Z_3 contains the full set of seven explanatory variables described in section 5.6 for the intensity of preference and the value of no policy.

The second panel of table 5.6 contains a summary of eight specifications (various combinations of the Z's) used to estimate the model for each of the three employee groups. The first specification is a baseline with only constants in the three vectors (cost of policy change, intensity of preference, value of no policy). This model has a total of six parameters: three constants and three breakpoints. The second specification is fully unconstrained in that the full set of variables for each of the three vectors is included: 1) Z_2 for the cost of policy change vector, 2) Z_3 for the intensity of preference vector, and 3) Z_3 for the value of no policy vector. This specification has a total of twenty-two parameters. The next three specifications in turn have only a constant in one of the three vectors. The final three specifications have only a constant in two of the three vectors.

The last panel in table 5.6 contains maximized log-likelihood values for each of the eight specifications for each of the three employee groups. These are used to evaluate the various specifications.

Table 5.6 **Model Summary**

A. Vector Definitions[a]

Z_1	Z_2	Z_3
Constant	Constant Legday Nenact Unified Year	Constant COPE Union South Inc/Pop Govexp/Inc

B. Model Specifications

	1	2	3	4	5	6	7	8
Cost of Policy Change	Z_1	Z_2	Z_2	Z_2	Z_1	Z_2	Z_1	Z_1
Intensity of Preference	Z_1	Z_3	Z_3	Z_1	Z_3	Z_1	Z_3	Z_1
Value of No Policy	Z_1	Z_3	Z_1	Z_3	Z_3	Z_1	Z_1	Z_3
# of Parameters	6	22	16	16	18	10	12	12

C. Log-Likelihood Values

Employee Group	1	2	3	4	5	6	7	8
State Employees	−280.0	−250.4	−254.7	−265.8	−252.2	−276.6	−256.0	−266.8
Police	−272.7	−242.9	−247.1	−258.8	−243.6	−270.4	−247.4	−259.5
Teachers	−316.3	−270.0	−281.5	−294.2	−273.5	−311.0	−284.1	−296.7

[a]See table 5.5 for variable definitions.

Before comparing the different specifications, it is useful to examine the estimates of the unconstrained model (specification 2).

The results are not encouraging with regard to the determinants of the cost of policy change. For state employees, (table 5.7A), none of the variables seem to affect the cost of policy change significantly in the hypothesized direction. Only the number of bill enacted (Nenact) has a coefficient that is significantly different from zero at conventional levels, and that has the wrong sign. The results are no better for police (table 5.7B) or teachers (table 5.7C). Again, none of the variables hypothesized to affect the cost of policy change have coefficients that are significantly different from zero in the appropriate direction. In addition, the hypothesis that all of the coefficients in the cost of policy change vector except the constant term are zero cannot be rejected using a likelihood-ratio test at any reasonable level of significance for any of the three employee groups. These tests are based on comparisons of the log-likelihoods for specification 5 with those for specification 2. The conclusion is that the set of variables used to determine the cost of policy change is not appropriate for any of the three employee groups.

The intensity of preference function performs better. For state employees, the COPE scores are significantly positively related to preference while in the south preferences are significantly lower. It is interesting that after controlling for the COPE scores and for South, the extent of private sector unionization is not a significant determinant of preference for public sector collective bargaining for state employees, and it has the wrong sign. The value of per capita income is marginally significantly positively related to preference, but the size of the government sector, as proxied by the ratio of state and local government expenditures to total income, is not significantly related. There is no significant time trend in preferences. The estimates of the determinants of intensity are similar but somewhat less well determined for police and teachers. In all three cases the hypothesis that all of the coefficients in the intensity of preference vector except the constant term are zero *can* be rejected using a likelihood-ratio test at any reasonable level of significance. These tests are based on comparisons of the log-likelihoods for specification 4 with those for specification 2. The conclusion is that the set of variables used to determine the intensity of preference has significant explanatory power for all three groups.

The value of no policy function is not very well determined for any of the three employee groups. None of the estimated coefficients are significantly different from zero for any of the groups. For both state employees and police, the hypothesis that all of the coefficients in the value of no policy vector except the constant term are zero cannot be rejected using a likelihood-ratio test at any reasonable level of

Table 5.7 **Markov Model of Public Sector Bargaining Laws**[a]

A. State Employees

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	3.60	Constant	3.60	−7.54
	(2.28)		(4.09)	(4.31)
Legday	0.000298	COPE	2.50	−1.55
	(0.00137)		(1.16)	(1.25)
Nenact	0.000695	Union	−4.95	6.89
	(0.000244)		(3.80)	(4.19)
Unified	−0.324	South	−1.32	0.731
	(0.237)		(0.661)	(0.749)
Year	0.00221	Inc/Pop	0.945	−0.758
	(0.0343)		(0.658)	(0.741)
		Govexp/Inc	0.922	2.05
			(3.93)	(5.88)
		Year	−0.0429	0.0911
			(0.0598)	(0.0665)

Summary Statistics	*Breakpoints*
LLF = −250.4	$\hat{K}_1$ 2.00
	(0.487)
N = 1,490	$\hat{K}_2$ 2.71
	(0.393)
χ^2 statistic = 59.2[b]	$\hat{K}_3$ 3.20
	(0.471)

B. Police

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	2.87	Constant	2.69	−5.82
	(1.37)		(7.87)	(0.841)
Legday	0.000686	COPE	2.08	−0.889
	(0.00143)		(1.63)	(1.71)
Nenact	0.000112	Union	−3.36	3.78
	(0.000254)		(5.36)	(5.64)
Unified	0.00581	South	−1.36	1.09
	(0.00232)		(0.779)	(0.829)
Year	0.00681	Inc/Pop	1.01	−0.541
	(0.0204)		(0.921)	(0.949)
		Govexp/Inc	1.17	0.194
			(5.15)	(6.24)
		Year	−0.0432	0.0705
			(0.115)	(0.124)

Summary Statistics	*Breakpoints*
LLF = −242.9	$\hat{K}_1$ 1.35
	(0.502)
N = 1,490	$\hat{K}_2$ 2.53
	(0.361)
χ^2 statistic = 59.2[b]	$\hat{K}_3$ 2.77
	(0.369)

Table 5.7 (continued)

C. Teachers

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	3.16	Constant	1.47	−5.92
	(1.47)		(5.08)	(5.39)
Legday	0.00252	COPE	1.76	−0.846
	(0.00150)		(1.29)	(1.38)
Nenact	0.0000210	Union	−1.29	1.79
	(0.000292)		(3.94)	(4.28)
Unified	−0.0432	South	−1.89	1.85
	(0.194)		(0.965)	(1.02)
Year	−0.00158	Inc/Pop	0.727	−0.0958
	(0.0220)		(0.645)	(0.690)
		Govexp/Inc	1.99	−1.18
			(4.76)	(6.24)
		Year	−0.0174	0.0640
			(0.0805)	(0.0868)

Summary Statistics	*Breakpoints*
LLF = −269.9	$\hat{K}_1$ 1.09
	(0.44)
N = 1,490	$\hat{K}_2$ 2.60
	(0.288)
χ^2 statistic = 92.8[b]	$\hat{K}_3$ 2.81
	(0.307)

[a]See table 5.5 for definitions and summary statistics of variables. Specification 2 is used from table 5.6. The numbers in parentheses are asymptotic standard errors.

[b]The χ^2 statistic is the likelihood ratio test statistic of a constrained model with constants only (six parameters).

significance. However, for teachers this hypothesis *can* be rejected, suggesting that the value of no policy does vary systematically in the measured dimensions for teachers. These tests are based on comparisons of the log-likelihoods for specification 3 with those for specification 2. The conclusion is that the set of variables used to determine the value of no policy has significant explanatory power only for teachers.

Overall, the estimates in table 5.7 are not terribly encouraging with regard to the model. It is true that for all three employee groups the hypothesis that all parameters except the three constant terms and the three breakpoints are zero (specification 1) can be rejected against specification 2 at conventional levels of significance using a likelihood ratio test. However, as is clear from the above discussion, only the coefficients of the variables determining the intensity of preference are consistently significantly different from zero as a group. In no case are

the parameters of the cost of policy change function significantly different from zero, and only for teachers are the parameters of the value of no policy function significantly different from zero.

It may be that the estimation of three vectors of parameters for each group is putting an excessive burden on the data. Using the likelihood values in table 5.6 as a guide, more parsimonious specifications for each of the employee groups can be derived. For state employees and police a reasonable specification has only constants in the cost of policy change and value of no policy vectors but with the full set of parameters in the intensity of preference vector. This is specification 7, and it is nested in specifications 2, 3, and 5. Specification 7 cannot be rejected at conventional levels against any of these three alternatives for either state employees or police. For teachers a reasonable specification has only a constant in the cost of policy change vector but with the full set of parameters in the intensity of preference and the value of no policy vectors. This is specification 5, and it is nested in specification 2. As noted above, specification 5 cannot be rejected against specification 2 at conventional levels for teachers. On this basis the discussion of results proceeds using as preferred specification 7 for state employees and police and specification 5 for teachers.

Table 5.8A–B contains estimates of specification 7 for state employees and police. It is clear that the restrictions embodied in these specifications improve the precision of the parameter estimates considerably. For state employees (table 5.8A) the estimates suggest that intensity of preferences are significantly positively related to the COPE score and negatively related to being in the southern region. In addition, intensity of preferences is marginally significantly positively related to per capita income and per capita government expenditures. The results are similar for police (table 5.8B). Intensity of preferences are significantly positively related to the COPE score and marginally significantly negatively related to being in the southern region. In addition, intensity of preferences is significantly positively related to per capita income and marginally significantly positively related to per capita government expenditures.

Table 8C contains estimates of specification 5 for teachers, and the results are somewhat weaker with regard to specific parameters. The intensity of preferences are marginally significantly positively related to the COPE score and significantly negatively related to being in the southern region. However, the coefficients of per capita income and per capita government expenditures in the intensity of preference equation are small relative to their standard errors. The value of no policy is significantly positively related to union status and significantly negatively related to being in the southern region. However, the remainder of the estimated coefficients are small relative to their standard errors.

Table 5.8 **Markov Model of Public Sector Bargaining Laws**[a]

A. State Employees

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	3.41	Constant	−0.178	−1.95
	(0.186)		(1.69)	(0.351)
Legday	—	COPE	1.18	—
			(0.459)	
Nenact	—	Union	0.300	—
			(1.31)	
Unified	—	South	−0.821	—
			(0.313)	
Year	—	Inc/Pop	0.359	—
			(0.248)	
		Govexp/Inc	3.95	—
			(2.64)	
		Year	0.0116	—
			(0.0307)	

Summary Statistics	*Breakpoints*	
LLF = −256.0	$\hat{K}_1$	1.68
		(0.460)
N = 1,490	$\hat{K}_2$	2.40
		(0.322)
χ^2 statistic = −48.0[b]	$\hat{K}_3$	2.90
		(0.354)

B. Police

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	3.36	Constant	−0.274	−1.69
	(0.163)		(1.70)	(0.303)
Legday	—	COPE	1.31	—
			(0.448)	
Nenact	—	Union	−0.279	—
			(1.43)	
Unified	—	South	−0.497	—
			(0.260)	
Year	—	Inc/Pop	0.604	—
			(0.256)	
		Govexp/Inc	3.93	—
			(2.55)	
		Year	−0.00104	—
			(0.0308)	

Summary Statistics	*Breakpoints*	
LLF = −247.4	$\hat{K}_1$	1.31
		(0.356)
N = 1,490	$\hat{K}_2$	2.41
		(0.270)
χ^2 statistic = 50.6[b]	$\hat{K}_3$	2.63
		(0.267)

Table 5.8 (continued)

C. Teachers

Variable	Cost of Policy Change	Variable	Intensity of Preference	Value of No Policy
Constant	3.23	Constant	1.60	−6.02
	(0.151)		(5.00)	(5.31)
Legday	—	COPE	1.67	−0.751
			(1.29)	(1.38)
Nenact	—	Union	−1.62	1.94
			(3.62)	(0.396)
Unified	—	South	−1.78	1.72
			(0.778)	(0.805)
Year	—	Inc/Pop	0.630	−0.0404
			(0.610)	(0.668)
		Govexp/Inc	3.19	−0.894
			(4.79)	(6.22)
		Year	−0.0192	−0.0623
			(0.0773)	(0.0849)

Summary Statistics	*Breakpoints*	
LLF = −273.5	$\hat{K}_1$	1.01
		(0.429)
N = 1,490	$\hat{K}_2$	2.51
		(0.240)
χ^2 statistic = 85.6[b]	$\hat{K}_3$	2.73
		(0.264)

[a]See table 5.5 for definitions and summary statistics of variables. Specification 7 (state employees and police) and specification 5 (teachers) are used from table 5.6. The numbers in parentheses are asymptotic standard errors.

[b]The χ^2 statistic is the likelihood ratio test statistic of a constrained model with constants only (six parameters).

The estimates presented in this section do not provide strong support for the model. The cost of policy change, while it may be an important concept, is not measured adequately by the variables used here. Similarly, variation in the value of no policy is not explained by the data. The only systematic relationships found are for the variables that determine the intensity of preference. In particular, states with high COPE scores and states outside the south have preferences that are more probargaining. However, there is no evidence that state/years with a high level of private sector unionization, after controlling for COPE scores and the other measures, are significantly different in their preference for public sector bargaining laws. There is weaker evidence that state/years with higher levels of per capita income and per capita government expenditure are more favorably disposed toward public sector collective bargaining.

5.8 How Well Does the Model Fit the Data?

At this point, it is important to ask how well the model fits the data. While there is no consensus on an appropriate test of goodness-of-fit in a model such as this, two related concepts are used. The first asks how well the model can mimic the aggregate distribution of laws by category at five-year intervals. The second asks how well the model can differentiate the states that have a given category of law from those that do not at five-year intervals.

The parameter estimates for any given specification can be used to compute a predicted Markov transition matrix for any state i in any year t using the probabilities defined in the appendix. Denote this one-period transition matrix by $\hat{M}_{it}$ whose jkth element is the predicted probability that state i with law category j in year $t - 1$ will have law category k in year t. On this basis the estimated transition matrix for state i over a n-year period from 1955 to 1955 + n is

$$\hat{C}_{in} = \prod_{t=55}^{55+n} \hat{M}_{it} , \tag{14}$$

where π represents the matrix product. The average n-period transition matrix over m states is

$$\tilde{C}_n = \frac{1}{m} \cdot \sum_{i=1}^{m} \hat{C}_{in} , \tag{15}$$

where Σ represents the matrix sum. The jkth element of this matrix represents the average predicted probability that a state with category j law in 1954 will have category k law in year 1955 + n.

The average transition matrix was computed for n = 4, 9, 14, 19, 24, 29 (corresponding to the years 1959, 1964, 1969, 1974, 1979, and 1984) for each of the three employee groups. The preferred specifications were used for each of the employee groups. These are based on the estimates in table 5.8 for state employees, police, and teachers. First-order approximations to the standard errors of the elements of these matrices were computed using the "delta method."[17]

The first row of the transition matrix, $\tilde{C}_n$, contains the average probabilities that a state will have a law in each of the categories in year 1955 + n conditional having no law in 1954. Since fewer than a handful of states had any explicit policy regarding public sector collective bargaining in 1954, it is appropriate to focus on this row of the matrix. If the model fits the data well, it ought to be true that at each of the five-year intervals these transition probabilities ought to closely reflect the actual distribution of laws at that point in time. The underlying conceptual experiment is to assume that there were no laws in 1954 in any state and to start the process of evolution of laws according to the

estimated Markov process. The interesting questions are: 1) the extent to which the estimated Markov process can explain the movements over time in the fraction of states with a law in a given category, and 2) the extent to which by 1984 the cross-sectional distribution implied by the Markov process is similar to the actual distribution. The average estimated transition probabilities along with their asymptotic standard errors, as well as the actual distribution of laws for the six selected years, are contained in table 5.9 for the three employee groups. The estimated probabilities sum to one by now.

It is clear from the actual distribution of laws for state employees (table 5.9A) that most of the action in the enactment of laws was in the period from 1964 through 1979. This is indicated by the sharp rate of decline over this period in the proportion of states with no law. The predicted proportion with no law declined steadily from 1959 to 1984, but the model was not able to fully capture the steeper decline between 1964 and 1979. The model consistently underpredicted the fraction of

Table 5.9 **Actual and Predicted Distribution of Laws by Category[a], All Fifty States**

A. State Employees

Year	No Law	Category 1	Category 2	Category 3	Category 4
1959					
Actual	0.854	0.0625	0.0417	0.0417	0.0
Predicted	0.849	0.0472	0.0376	0.0284	0.0380
(s.e.)	(0.0379)	(0.0200)	(0.0141)	(0.0123)	(0.0247)
1964					
Actual	0.740	0.0800	0.100	0.0800	0.0
Predicted	0.697	0.0756	0.0703	0.0582	0.0995
(s.e.)	(0.0564)	(0.0318)	(0.0218)	(0.0198)	(0.0445)
1969					
Actual	0.540	0.120	0.120	0.0800	0.140
Predicted	0.539	0.0896	0.0929	0.0858	0.193
(s.e.)	(0.0572)	(0.0375)	(0.0273)	(0.0261)	(0.0530)
1974					
Actual	0.280	0.160	0.100	0.0800	0.380
Predicted	0.395	0.0864	0.0996	0.103	0.317
(s.e.)	(0.0484)	(0.0364)	(0.0304)	(0.0322)	(0.0494)
1979					
Actual	0.180	0.140	0.120	0.100	0.460
Predicted	0.288	0.0778	0.0953	0.108	0.431
(s.e.)	(0.0451)	(0.0337)	(0.0309)	(0.0357)	(0.0492)
1984					
Actual	0.160	0.160	0.120	0.080	0.480
Predicted	0.220	0.0712	0.0900	0.106	0.512
(s.e.)	(0.0497)	(0.0337)	(0.0312)	(0.0369)	(0.0634)

Table 5.9 (continued)

Year	No Law	Category 1	Category 2	Category 3	Category 4
			B. Police		
1959					
Actual	0.896	0.0625	0.0208	0.0208	0.0
Predicted	0.848	0.0365	0.0523	0.0138	0.0495
(s.e.)	(0.0349)	(0.0180)	(0.0161)	(0.00737)	(0.0269)
1964					
Actual	0.740	0.0600	0.140	0.0400	0.200
Predicted	0.689	0.0581	0.0994	0.0279	0.125
(s.e.)	(0.0510)	(0.0270)	(0.0247)	(0.0131)	(0.0458)
1969					
Actual	0.480	0.0800	0.200	0.0400	0.200
Predicted	0.519	0.0658	0.135	0.0410	0.238
(s.e.)	(0.0511)	(0.0292)	(0.0321)	(0.0186)	(0.0530)
1974					
Actual	0.260	0.0400	0.160	0.0400	0.500
Predicted	0.362	0.0576	0.151	0.0487	0.381
(s.e.)	(0.0434)	(0.0249)	(0.0379)	(0.0227)	(0.0501)
1979					
Actual	0.180	0.0600	0.180	0.0400	0.540
Predicted	0.248	0.0465	0.150	0.0504	0.505
(s.e.)	(0.0412)	(0.0207)	(0.0407)	(0.0244)	(0.0533)
1984					
Actual	0.160	0.0800	0.180	0.0400	0.540
Predicted	0.180	0.0397	0.146	0.0496	0.585
(s.e.)	(0.0453)	(0.0204)	(0.0425)	(0.0247)	(0.0690)
			C. Teachers		
1959					
Actual	0.896	0.0625	0.0208	0.0208	0.0
Predicted	0.858	0.0367	0.0608	0.00909	0.0375
(s.e.)	(0.0331)	(0.0184)	(0.0203)	(0.00479)	(0.0166)
1964					
Actual	0.740	0.0600	0.120	0.0600	0.200
Predicted	0.685	0.0483	0.130	0.0227	0.115
(s.e.)	(0.0538)	(0.0231)	(0.0341)	(0.0101)	(0.0381)
1969					
Actual	0.440	0.0600	0.240	0.0800	0.180
Predicted	0.460	0.0544	0.188	0.0381	0.259
(s.e.)	(0.0536)	(0.0219)	(0.0452)	(0.0169)	(0.0535)
1974					
Actual	0.160	0.0400	0.200	0.0400	0.500
Predicted	0.237	0.0592	0.213	0.0474	0.443
(s.e.)	(0.0421)	(0.0201)	(0.0485)	(0.0227)	(0.0561)
1979					
Actual	0.0600	0.0800	0.240	0.0200	0.600
Predicted	0.0962	0.0697	0.209	0.0470	0.578
(s.e.)	(0.0337)	(0.0267)	(0.0466)	(0.0242)	(0.0590)
1984					
Actual	0.0600	0.0800	0.240	0.0200	0.600
Predicted	0.0334	0.0836	0.202	0.0426	0.639
(s.e.)	(0.0237)	(0.0478)	(0.0484)	(0.0233)	(0.0813)

[a]Predicted probabilities based on estimates of specification 7 for state employees and police and specification 5 for teachers contained in table 5.8. The numbers in parentheses are estimated asymptotic standard errors.

states with category 1 laws (prohibiting bargaining) after 1964. Roughly speaking, the model predicted that this fraction remained constant at approximately 7.5 percent after 1964, while the actual distribution stabilized at approximately 15 percent after 1974. At the other extreme, the model did a slightly better job capturing the emergence of category 4 laws (requiring bargaining). The observed fraction of states with this type of law increased dramatically from 0 percent in 1964 to 46 percent by 1979. The model did not predict quite so rapid an increase, but the predicted probabilities of category 4 laws did increase more rapidly over the 1964 to 1979 period than either earlier or later. The cross-sectional 1984 distribution differs somewhat from the actual distribution in predicting too high a fraction with no law and too low a fraction with a category 1 law.

Examination of the actual and predicted distribution of laws for police (table 5.9B) yields similar conclusions to those for state employees, though the model does seem to fit somewhat better. The timing of the enactment of laws governing collective bargaining for police was concentrated between 1964 and 1979, and the model was not able to pick this up as well as it might have. The model did a better job fitting the fairly constant low probability of having a category 1 law. The model was also able to capture a large share of the rapid increase in the introduction of category 4 laws between 1964 and 1979. The predicted cross-sectional distribution for 1984 is quite close to the actual 1984 distribution.

Table 5.9C contains the actual and predicted distributions for laws governing teachers. The overall pattern of movement of the actual distribution of laws over time is quite similar to the two other groups. The model fits the data relatively well with the exception (common to the other two groups) that the rapid decline between 1964 and 1979 in the fraction with no law is not fully captured by the model. However the relative stability in the fraction with a category 1 law, the rapid increase in the fraction with a category 4 law, and the 1984 cross-sectional distribution are all captured quite closely.

Overall, the model seems to do a reasonable job in explaining the aggregate distribution of laws at given five-year intervals. A more difficult task for the model is to predict *which* states have laws of a given type at any point in time. One way to examine the ability of the model to predict which states will have laws of a given type is to examine the average predicted probabilities that a state will have a law of a given type in a given year *where the average is taken only over states with a law of that type*. For example, it is useful to examine the average predicted probability for states that have a category 1 law in a given year that those states will, in fact, have a category 1 law.

The average n-period transition matrix required for this exercise is defined similarly to that in equation (15) as

$$\tilde{C}_{nk} = \frac{1}{m_{nk}} \cdot \sum_{i \in S_{nk}} \hat{C}_{in} , \tag{16}$$

where S_{nk} is the set of states with category k law in year $1955 + n$, m_{nk} is the number of elements in S_{nk}, and $\hat{C}_{in}$ is defined in equation (14). The conceptual experiment is the same as that underlying table 5.9 in the sense that it is assumed that no states have laws in 1954 and that the process of evolution of laws is governed by the estimated Markov process. If the model predicted perfectly, then the estimated probability that a state with category j law in fact has a category j law would equal one. The estimated probability that the state has a law in any other category would equal zero. While there is no chance that the model will do this well, the interesting question that can be answered by this analysis is whether the estimated probabilities for a state with a given category law are skewed toward the type of law that the state, in fact, has.

Table 5.10 contains estimated transition probabilities and standard errors for the three employee groups. The calculations are presented for the three selected years 1964, 1974, and 1984 (corresponding to $n = 9, 19, 29$). Three subsets of states in each year are used: 1) states with no law, 2) states with category 1 laws, and 3) states with category 4 laws. The estimated probabilities sum to one by now.

The estimates in tables 5.10A for laws governing state employees are not very encouraging. For states with no law, the estimated probability that the state, in fact, has no law is substantially different from one even in 1964 and declines dramatically by 1984. Even worse, the estimated probabilities are virtually indistinguishable from those contained in table 5.9A computed using all fifty states. For states with type 1 laws, the model does a bit better. The estimated probabilities are still dramatically smaller than one, but they are substantially larger than those contained in table 5.9A computed using all fifty states. For states with type 4 laws, the estimated probabilities are again dramatically smaller than one, and they are again larger than those contained in table 5.9A computed using all fifty states.

The results contained in table 5.10B for laws governing police are qualitatively identical to those for laws governing state employees. The model does a poor job distinguishing states that have no law, but it does a somewhat better job identifying states that have anti-bargaining or pro-bargaining laws. The estimates contained in table 5.10C suggest that the model performs even more poorly for laws governing teachers. The model can neither distinguish states that have no law, nor distinguish states that have anti-bargaining or pro-bargaining laws. Basically, the probabilities presented in table 5.10C computed using only the states with specific categories of laws are not very different at all from the probabilities presented in table 5.9C computed using all fifty states.

Table 5.10 **Predicted Distribution of Laws by Category,[a] Sets of States with Selected Category Law**

A. State Employees

Year	No. of States	No Law	Category 1	Category 2	Category 3	Category 4
		States with No Law (category 0):				
1964	37	0.704	0.0736	0.0711	0.0573	0.0939
		(0.0573)	(0.0314)	(0.0225)	(0.0200)	(0.0439)
1974	14	0.417	0.0994	0.102	0.101	0.280
		(0.0531)	(0.0414)	(0.0306)	(0.0311)	(0.0498)
1984	8	0.246	0.0751	0.108	0.118	0.454
		(0.0594)	(0.0374)	(0.035)	(0.0400)	(0.0679)
		States with Law Prohibiting Bargaining (category 1):				
1964	4	0.810	0.166	0.0128	0.00507	0.00652
		(0.0884)	(0.0933)	(0.0101)	(0.00490)	(0.00580)
1974	8	0.623	0.194	0.0515	0.0371	0.0951
		(0.0867)	(0.0901)	(0.0199)	(0.0151)	(0.0284)
1984	8	0.474	0.182	0.0826	0.0599	0.201
		(0.0956)	(0.0830)	(0.0303)	(0.0314)	(0.0640)
		States with Law Requiring Bargaining (category 4):				
1964	0	—	—	—	—	—
1974	19	0.256	0.0344	0.112	0.132	0.465
		(0.0524)	(0.0279)	(0.0383)	(0.0423)	(0.0662)
1984	24	0.105	0.0244	0.0781	0.114	0.678
		(0.0356)	(0.0173)	(0.0334)	(0.0406)	(0.0655)

B. Police

Year	No. of States	No Law	Category 1	Category 2	Category 3	Category 4
		States with No Law (category 0):				
1964	37	0.697	0.0574	0.100	0.0274	0.117
		(0.0525)	(0.0268)	(0.0252)	(0.0131)	(0.0453)
1974	13	0.459	0.0921	0.145	0.0419	0.262
		(0.0520)	(0.0403)	(0.0347)	(0.0194)	(0.0435)
1984	8	0.175	0.0462	0.150	0.0533	0.575
		(0.0482)	(0.0244)	(0.0458)	(0.0266)	(0.0741)
		States with Law Prohibiting Bargaining (category 1):				
1964	3	0.826	0.118	0.0351	0.00528	0.0157
		(0.0545)	(0.0623)	(0.0199)	(0.00456)	(0.0212)
1974	2	0.667	0.186	0.0750	0.0126	0.0591
		(0.0842)	(0.0844)	(0.0304)	(0.00831)	(0.0297)
1984	4	0.464	0.128	0.158	0.0351	0.215
		(0.101)	(0.0597)	(0.0421)	(0.0197)	(0.0857)
		States with Law Requiring Bargaining (category 4):				
1964	1	0.482	0.0159	0.159	0.0558	0.287
		(0.114)	(0.0140)	(0.0420)	(0.0260)	(0.115)
1974	25	0.260	0.0267	0.152	0.0547	0.507
		(0.0417)	(0.0135)	(0.0421)	(0.0260)	(0.0589)
1984	27	0.113	0.0175	0.125	0.0468	0.698
		(0.0341)	(0.105)	(0.0412)	(0.0242)	(0.0625)

Table 5.10 (continued)

		C. Teachers				
Year	No. of States	No Law	Category 1	Category 2	Category 3	Category 4
		States with No Law (category 0):				
1964	37	0.685	0.0473	0.131	0.0230	0.114
		(0.0542)	(0.0233)	(0.0347)	(0.102)	(0.0385)
1974	8	0.311	0.109	0.214	0.043	0.323
		(0.0508)	(0.0360)	(0.0476)	(0.0210)	(0.0493)
1984	3	0.0597	0.124	0.176	0.0374	0.603
		(0.0386)	(0.0684)	(0.0568)	(0.0219)	(0.0857)
		States with Law Prohibiting Bargaining (category 1):				
1964	3	0.783	0.114	0.0796	0.00724	0.0160
		(0.0495)	(0.0523)	(0.0367)	(0.00594)	(0.0152)
1974	2	0.482	0.203	0.213	0.0248	0.0774
		(0.0851)	(0.0686)	(0.0580)	(0.0155)	(0.0421)
1984	4	0.0842	0.288	0.360	0.0482	0.220
		(0.0620)	(0.129)	(0.0735)	(0.0281)	(0.115)
		States with Law Requiring Bargaining (category 4):				
1964	1	0.677	0.0170	0.157	0.0273	0.122
		(0.0797)	(0.0162)	(0.0466)	(0.0138)	(0.0502)
1974	25	0.153	0.0173	0.193	0.0509	0.586
		(0.0375)	(0.0101)	(0.0546)	(0.0247)	(0.0670)
1984	30	0.0173	0.0346	0.151	0.0380	0.759
		(0.0143)	(0.0210)	(0.0480)	(0.0226)	(0.0713)

[a]Predicted probabilities based on estimates of specification 7 for state employees and police and specification 5 for teachers contained in table 5.8. The numbers in parentheses are estimated asymptotic standard errors.

5.9 Conclusions

The character of both the parameter estimates presented in section 5.7 and the estimated transition probabilities presented in section 5.8 lead to the inescapable conclusion that the model, as estimated, does not adequately explain the evolution of public sector bargaining laws. However, the model was successful in some dimensions. A number of variables (COPE, South, Inc/Pop, Govexp/Inc) were found to be systematically related to the intensity of preference for public sector collective bargaining. In addition, the model seems to perform adequately in explaining the aggregate distribution of bargaining laws at a point in time. It did particularly well explaining the 1984 cross section.

On the negative side, virtually nothing was found that was systematically related to the cost of policy change. Whether this is due to having chosen the wrong set of variables to explain these costs or to the concept itself being misguided is difficult to know. However, one piece of evidence in support of the concept is that when the cost of policy change is estimated as a constant alone plus a stochastic term,

the constant term is estimated to be significantly different from zero. Were there no rigidity in policy determination, the estimate of this constant would be insignificantly different from zero.

Another important negative for the model is its failure to be able to predict *which* states (as opposed to how many) had laws of a given category in a given year. This is clearly a difficult test, but it is something of a litmus test of our ability to explain and predict policy change.

Overall, the problem of modeling the evolution of public policy is a difficult one. The basic model developed here is a potentially fruitful approach toward modeling the evolution of public sector bargaining laws specifically and public policy more generally. At the same time, the results are disappointing with regard to the costs of legislative change and the ability of the model to predict the dynamics of public policy in a particular state. More work needs to be done in defining appropriate explanatory variables as well as in refining and testing the econometric structure.

Appendix
Specification of Transition Probabilities

In this appendix, the twenty-five elements of the Markov transition matrix are defined. The four elements associated with movement from an existing policy to no policy are assumed to equal zero by definition. These are

$$\text{(A1)} \quad P_{m0} = Pr(J_t = 0 | J_{t-1} = m) = 0 \qquad \forall m = 1, 2, 3, 4.$$

The remaining twenty-one elements are described in the remainder of this appendix as functions of the latent variables defined in section 5.4.

Row 1: No Preexisting Policy ($J_{t-1} = 0$)

In this case a state will remain without a policy if the absolute value of the deviation of the intensity of preference from the value of no policy is less than the cost of change. In terms of the latent variables, the probability of this event is

$$\begin{aligned}\text{(A2)} \quad Pr(J_t = 0 | J_{t-1} = 0) &= Pr(-Y_1 < Y_2 - Y_3 < Y_1) \\ &= Pr(Y_1 + Y_2 - Y_3 > 0,\ Y_2 - Y_3 - Y_1 < 0) \\ &= Pr(-\epsilon_1 - \epsilon_2 < X_1\beta_1 + X_2\beta_2 - X_3\beta_3, \\ &\quad \epsilon_2 - \epsilon_1 < X_1\beta_1 - X_3\beta_3 - X_2\beta_2)\end{aligned}$$

$$= Pr(-\epsilon_1 - \epsilon_2 < X_1\beta_1 - X_3\beta_3 + X_2\beta_2)$$
$$\cdot Pr(\epsilon_2 - \epsilon_1 < X_1\beta_1 - X_3\beta_3 - X_2\beta_2).$$

This bivariate normal probability reduces to the product of two univariate normal CDF's because the correlation of $\epsilon_1 + \epsilon_2$ and $\epsilon_2 - \epsilon_1$ is zero under the assumption of equal variances for ϵ_1 and ϵ_2.

The detail of presentation of $Pr(J_t = 0|J_{t-1} = 0)$ is to illustrate how the elements of the specification are tied together. This level of detail will not be continued for all of the probabilities in this section.

When a state with no policy enacts a law in the most unfavorable category (1), it is known that the absolute value of the deviation of the intensity of preference from the value of no policy is greater than the cost of change *and* that intensity of preference is lower than the bottom threshold (K_1). The probability of this event is:

$$\text{(A3)} \quad Pr(J_t = 1|J_{t-1} = 0) = Pr[(Y_2 - Y_3 < -Y_1 \text{ or } Y_2 - Y_3 > Y_1),\ Y_2 < K_1],$$

which can be expressed as sums of bivariate normal CDFs that are easily approximated numerically.

When a state with no policy enacts a law in an intermediate category m (2 or 3), it is known that the absolute value of the deviation of the intensity of preference from the value of no policy is greater than the cost of change *and* that intensity of preference is bounded by the thresholds K_{m-1} and K_m. The probability of this event is:

$$\text{(A4)} \quad Pr(J_t = m|J_{t-1} = 0) = Pr[(Y_2 - Y_3 < -Y_1 \text{ or } Y_2 - Y_3 > Y_1),\ K_{m-1} < Y_2 < K_m],$$

for $m = 2, 3$. Once again, this can be expressed in terms of sums of bivariate normal CDFs.

Finally, when a state with no policy enacts a law in the highest category (4), it is known that the absolute value of the deviation of the intensity of preference from the value of no policy is greater than the cost of change *and* that intensity of preference is greater than the threshold K_3. The probability of this event is:

$$\text{(A5)} \quad Pr(J_t = 4|J_{t-1} = 0) = Pr[(Y_2 - Y_3 < -Y_1 \text{ or } Y_2 - Y_3 > Y_1),\ Y_2 > K_3],$$

which again can be expressed in terms of bivariate normal CDFs.

Taken together these probabilities completely specify the likelihood of all possible events for the cases where no policy had existed. It is straightforward to demonstrate that these probabilities sum to one. The parameters of this specification include β_1, β_2, β_3, and the three thresholds K_1, K_2, and K_3.

Row 2: A Preexisting Policy in the Lowest Category ($J_{t-1} = 1$)

The first possibility is that no change in the law was made. In this case it is known that the intensity of preference is not high enough to warrant a change. Specifically, it is known that the intensity of preference is less than the bottom threshold plus the cost of making a change. The probability of this event is:

$$\text{(A6)} \qquad \begin{aligned} Pr(J_t = 1 | J_{t-1} = 1) &= Pr(Y_2 < K_1 + Y_1) \\ &= Pr(\epsilon_2 - \epsilon_1 < K_1 - X_2\beta_2 + X_1\beta_1), \end{aligned}$$

which is simply a univariate normal CDF.

While it was relatively rare (see table 5.4) for a state to change its policy from one that prohibited bargaining to a more favorable category, it did happen. If a state were to change its policy from one of prohibiting bargaining to an intermediate category, m, it would be known that the intensity of preference exceeds the lower threshold (K_1) by more than the cost of change and that the intensity of preference lies in the appropriate interval (between K_{m-1} and K_m). The probability of this event is:

$$\text{(A7)} \qquad \begin{aligned} Pr(J_t = m | J_{t-1} = 1) &= Pr(Y_2 > K_1 + Y_1, K_{m-1} < Y_2 < K_m) \\ &= Pr(Y_1 - Y_2 < -K_1, K_{m-1} < Y_2 < K_m), \end{aligned}$$

which can be expressed in terms of bivariate normal CDFs.

The final possibility for a state with a policy of prohibiting bargaining is to enact a policy in the most favorable category (4, requiring bargaining). In this case, it would be known that the intensity of preference exceeds the lower threshold (K_1) by more than the cost of change and that the intensity of preference also exceeds the highest threshold (K_3). The probability of this event is:

$$\text{(A8)} \qquad \begin{aligned} Pr(J_t = 4 | J_{t-1} = 1) &= Pr(Y_2 > K_1 + Y_1, Y_2 > K_3) \\ &= Pr(Y_1 - Y_2 < -K_1, Y_2 > K_3), \end{aligned}$$

which can be expressed in terms of bivariate normal CDFs.

Equations (A6)–(A8) define the probabilities of all possible events for the case where there existed a policy in the lowest category. It is straightforward to demonstrate that these probabilities sum to one. The parameters of these probabilities include β_1, β_2, and the three thresholds K_1, K_2, and K_3. Note that these probabilities are *not* a function of β_3, which determines the value of no policy.

Row 3: Preexisting Policy in Category 2 ($J_{t-1} = 2$)

The first possibility is that no change in the law was made. In this case it is known that the intensity of preference is not high enough or low enough to warrant a change. More specifically, it is known that

the intensity of preference is both greater than the lower threshold (K_1) minus the cost of making a change and less than K_2 plus the cost of making a change. The probability of this event is:

$$\text{(A9)} \quad Pr(J_t = 2|J_{t-1} = 2) = Pr(K_1 - Y_1 < Y_2 < K_2 + Y_1),$$

which can be expressed as sums of bivariate normal CDFs.

If a state were to change its policy from category 2 to the lowest category it would be known that the intensity of preference is less than the lower threshold by an amount at least as large as the cost of change. The probability of this event is:

$$\text{(A10)} \quad Pr(J_t = 1|J_{t-1} = 2) = Pr(Y_2 < K_1 - Y_1),$$

which is simply a univariate normal CDF.

Movement from category 2 to category 3 occurs when the intensity of preference exceeds K_2 by more than the cost of a policy change and the intensity of preference is in the interval from K_2 to K_3. The probability of this event is:

$$\text{(A11)} \quad Pr(J_t = 3|J_{t-1} = 2) = Pr(Y_2 > K_2 + Y_1, K_2 < Y_2 < K_3),$$

which again can be computed from sums of bivariate normal CDFs.

Finally, if a state were to change its policy from category 2 to the highest category (4, requiring bargaining), it would be known that the intensity of preference exceeds K_2 by more than the cost of a policy change and that the intensity of preference is greater than the highest threshold (K_3). The probability of this event is:

$$\text{(A12)} \quad Pr(J_t = 4|J_{t-1} = 2) = Pr(Y_2 > K_2 + Y_1, Y_2 > K_3),$$

which can be computed from sums of bivariate normal CDFs.

Equations (A9)–(A12) define the probabilities of all possible events for the case where there existed a category 2 policy. It is straightforward to demonstrate that these probabilities sum to one. The parameters of these probabilities include β_1, β_2, and the three thresholds K_1, K_2, and K_3.

Row 4: Preexisting Policy in Category 3 ($J_{t-1} = 3$)

The first possibility is that no change in the law was made. In this case it is known that the intensity of preference is not high enough or low enough to warrant a change. More specifically, it is known that the intensity of preference is both greater than K_2 minus the cost of making a change and less than the upper threshold (K_3) plus the cost of making a change. The probability of this event is:

$$\text{(A13)} \quad Pr(J_t = 3|J_{t-1} = 3) = Pr(K_2 - Y_1 < Y_2 < K_3 + Y_1),$$

which can be expressed as sums of bivariate normal CDFs.

If a state were to change its policy from category 3 to the lowest category, it would be known that the intensity of preference is less than K_2 by an amount at least as large as the cost of change and that the intensity of preference is less than the lowest threshold. The probability of this event is:

$$\text{(A14)} \quad Pr(J_t = 1 | J_{t-1} = 3) = Pr(Y_2 < K_2 - Y_1,\ Y_2 < K_1),$$

which can be expressed as sums of bivariate normal CDFs.

Movement from category 3 to category 2 occurs when the intensity of preference is less than K_2 by an amount at least as large as the cost of change, and the intensity of preference is greater than the lowest threshold. The probability of this event is:

$$\text{(A15)} \quad Pr(J_t = 2 | J_{t-1} = 3) = Pr(Y_2 < K_2 - Y_1,\ Y_2 > K_1),$$

which again can be computed from sums of bivariate normal CDFs.

Finally, if a state were to change its policy from category 3 to the highest category (4, requiring bargaining), it would be known that the intensity of preference exceeds K_3 by more than the cost of a policy change. The probability of this event is:

$$\text{(A16)} \quad Pr(J_t = 4 | J_{t-1} = 3) = Pr(Y_2 > K_3 + Y_1),$$

which is a univariate normal CDF.

Equations (A13)–(A16) define the probabilities of all possible events for the case where there existed a category 3 policy. It is straightforward to demonstrate that these probabilities sum to one. The parameters of these probabilities include β_1, β_2, and the three thresholds K_1, K_2, and K_3.

Row 5: Preexisting Policy in the Highest Category ($J_{t-1} = 4$)

Finally, consider the case where the state had a law requiring bargaining (category 4). While it is conceptually possible for a state to move to a less favorable policy (if intensity of preference becomes less than the highest threshold, K_3, by more than the cost of change), this was never observed for the three employee groups over the thirty-year period covered (see table 5.4). Nonetheless, the probabilities of these events will be required when the parameter estimates are used to compute predicted legal status at various points in time.

In the case where there is no change in policy (all of the observed cases), it is known that the intensity of preference exceeds the highest threshold minus the cost of a policy change. This probability is:

$$\text{(A17)} \quad Pr(J_t = 4 | J_{t-1} = 4) = Pr(Y_2 > K_3 - Y_1),$$

which is a univariate normal CDF.

If the policy were to change to the lowest category, it would be known that the intensity of preference is less than the highest threshold minus the cost of a policy change and that the intensity of preference is less than the lowest threshold. The probability of this event is:

$$\text{(A18)} \quad Pr(J_t = 1|J_{t-1} = 4) = Pr(Y_2 < K_3 - Y_1,\ Y_2 < K_1),$$

which can be evaluated as a bivariate normal CDF.

If the policy were to change to category 2, it would be known that the intensity of preference is less than the highest threshold minus the cost of a policy change and that the intensity of preference lies between K_1 and K_2. The probability of this event is:

$$\text{(A19)} \quad Pr(J_t = 2|J_{t-1} = 4) = Pr(Y_2 < K_3 - Y_1,\ K_1 < Y_2 < K_2)\ ,$$

which can be evaluated as sums of bivariate normal CDFs.

Finally, if the policy were to change to category 3, it would be known that the intensity of preference is less than the highest threshold minus the cost of a policy change and the intensity of preference lies between K_2 and K_3. The probability of this event is:

$$\text{(A20)} \quad Pr(J_t = 3|J_{t-1} = 4) = Pr(Y_2 < K_3 - Y_1,\ K_2 < Y_2 < K_3)\ ,$$

which can be evaluated as sums of bivariate normal CDFs.

Equations (A17)–(A20) define the probabilities of all possible events for the case where there existed a category 4 policy. It is straightforward to demonstrate that these probabilities sum to one. The parameters of these probabilities include β_1, β_2, and the three thresholds K_1, K_2, and K_3.

Notes

1. Freeman (1986) makes this argument directly in the context of an interesting survey of the growth of unionism in the public sector. See also the work of Reid and Kurth (1983), Dalton (1982), Moore (1977), Ichniowski (this volume, chap. 1), and Lauer (1979).

2. Kochan (1973), Faber and Martin (1979), and Saltzman (1985) present studies of the determinants of public sector bargaining laws.

3. For example, both police and fire fighters are viewed as critical local government employees, and the public policy issues raised by unionization of these two groups are similar.

4. Incomplete measurement of judicially based policy should be more of a problem in the early years prior to the passage of legislation because, at that time, the courts could exercise discretion without reference to specific legislation.

5. There are not $30 \times 50 = 1{,}500$ observations because Alaska and Hawaii did not become states until 1959 and 1960. Thus, these states do not contribute

observations for the five-year period from 1955 to 1959, resulting in ten fewer observations.

6. For state employees, only Florida first prohibited bargaining (category 1) then moved to a policy requiring bargaining (category 4). For police, only Nevada and Texas had such a reversal of policy. For teachers, only Nevada had such a reversal of policy.

7. It is clear that the empirical analysis of outcomes will not support any other interpretation. For example, anything that makes it more likely that a favorable law is passed cannot be classified unambiguously as more favorable preferences as opposed to lower costs of passing *favorable* legislation. The analogous argument can be made for unfavorable legislation.

8. This is not a terribly realistic assumption, and it is not consistent with the empirical analysis that follows. However, it simplifies the analysis quite a bit without changing its fundamental nature.

9. Such a retreat is never observed.

10. The "*it*" subscripts are suppressed in this presentation, except where necessary for clarity, to keep the notation uncluttered.

11. While the derivations of the probabilities are straightforward, they make rather tedious reading. The reader may find it useful to examine the derivation of a few of the probabilities in the appendix in order to be clear about their nature.

12. The variable $I_{mnit} = 0$ for all values of m and n for Alaska and Hawaii prior to 1960.

13. Data for 1955 and 1957 for New Jersey and for 1955 for New York were missing.

14. There were nonpartisan elections in Nebraska for the entire period and in Minnesota for part of the period. Given the absence of a party structure, the concept of unified control has little meaning, so the dummy variable was assigned a value of zero in these cases.

15. The voting records were available only for congresses (pairs of years) from 1955 through 1958. For these years, the two-year record is used. For example, the 1955–56 COPE score is used for both 1955 and 1956.

16. The numerical optimization was carried out using the algorithm described by Berndt, Hall, Hall, and Hausman (1974).

17. The standard error of an element of the transition matrix is computed as the square root of $g'Vg$, where g is the gradient vector of the particular element of the matrix with respect to the parameter vector, and V is the estimated asymptotic covariance matrix of the estimated parameters. The gradient vectors were computed numerically.

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