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1 Public Sector Union Growth and Bargaining Laws: A Proportional Hazards Approach with Time-Varying Treatments

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1.1 Introduction

Entering the 1960s, few public sector employees were organized. By 1984, approximately 36 percent of all government employees in the United States were members of unions (Freeman 1986, 41). For certain occupational groups, particularly the protective services, collective bargaining establishes salaries and working conditions for the vast majority of departments in the United States (Freeman 1986, 46). This explosion in public sector unionism has occurred while private sector unionization has declined dramatically. It also coincides with the passage of state laws that provide various degrees of protection of public employees' rights to organize and to bargain collectively. The role that these laws play in the growth of public sector unionism is the central focus of this study.

1.2 Previous Research and Current Methodology

Largely because the coverage of the National Labor Relations Act (NLRA) extends across most areas of private sector employment, econometric investigations of the relationship between policy variables and union growth using private sector data are necessarily very limited. The most convincing studies are perhaps case studies of groups that were at various times covered by the NLRA; for example, supervisors

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in the Foremen's Association of America in the late 1930s and early 1940s (see Ross 1965, 260–62), or agricultural workers in the United Farm Workers in California in the late 1960s (see Kushner 1975). In contrast, the public sector provides a better laboratory for examining the linkages between public policies and union growth because of the extreme variation in public sector collective bargaining laws across states and occupational groups. Despite this, there have been few investigations of the relationship between bargaining laws and union growth in the public sector, and those studies tend to focus on unionization among teachers.[1]

The studies also rely on aggregate state-level data and therefore suffer from three limitations. The state-level percent-organized or percent-covered measures used as dependent variables are affected not only by the formation of new units, but also by subsequent employment effects of collective bargaining. If, as has been recently suggested, public sector unions increase employment as well as compensation levels through their influence on the budget-setting process (Freeman 1986, 52), then percent-organized statistics may increase from relative increases in manning after departments unionize as well as from the formation of new bargaining units. The limited evidence on this point in fact supports the proposition concerning positive employment effects of public unions (Zax 1985). A second difficulty associated with using state-level percent-organized variables as the dependent variable is that these state-level percent-organized variables give equal weight to a given percentage increase in unionization in different states, even though the same percent increase represents very different numbers of bargaining units and covered employees from state to state. For example, a given percentage increase in New Hampshire's percent organized may correspond to the formation of only a very small number of bargaining units covering relatively few employees, while in California the same percentage increase may mean a very large number of new units were formed. Third, state-level analyses cannot provide any information on the kinds of municipalities that are more or less likely to enter bargaining relationships with unions in their departments.

In contrast to this earlier work, in this study I focus on collective bargaining at the municipal level, which is normally the level at which bargaining units are formed for most public sector occupations. I use the data to follow the unionization history of approximately 1,000 municipal police departments with differing characteristics under various state laws. Unlike with most state-level studies, which use cross-sectional data and can only document whether unionization tends to be higher in states that have laws,[2] here I take a longitudinal perspective and ask whether or not the legislation is necessary to permit growth of collective bargaining.

1.2.1 Model Specification: Proportional Hazards Framework

With municipal-level data, more appropriate specifications than have been previously employed can be developed. Specifically, I model the process of bargaining unit formation as a duration study that asks "what determines the length of time that will pass before a department unionizes?" and I use the Cox proportional hazard (PH) model to analyze the data. Let Y_1 measure the number of years municipality i remains nonunion; $f(Y)$ is the probability density function of this duration variable; $F(Y)$ is the cumulative probability function; and $H(Y) = f(Y)/(1 - F(Y))$, the hazard function that describes the rate of transition from nonunion to union status. The PH model assumes multiplicative effects of the independent variables according to:

$$H(Y) = H(Y)\exp(XB) \tag{1}$$

where X is a vector of municipal and state-level characteristics that affect the decision to unionize. The PH model assumes no specific form for the underlying hazard rate function $H(Y)$. The X variables cause parallel shifts in $H(Y)$.[3]

1.3 Data and Variable Definitions

1.3.1 Dependent Variables: Post-Law Duration and Nonunion Duration

The likelihood function that describes transitions into unionization for each city and town is generated from a duration variable, Y_i. To calculate Y_i, I use responses to two questions to a 1979 survey conducted by Freeman, Ichniowski and Lauer (1985): (1) Does your city have a written labor contract covering wages, hours and conditions of employment for police personnel?; and (2) What year was the first written labor contract signed?. I assume that cities with contracts have been party to a contract since the year given in the response to the second question. This information covers approximately 1,000 municipalities with populations above 10,000 that report municipal police employment in the *Municipal Yearbook* in 1978 (International City Management Association 1978). Police associations that do not bargain for written agreements are considered nonunion. From these survey questions, I construct two different measures of the duration of nonunion status.

The first variable, post-law nonunion duration (PLDUR), is defined as the number of years a city remains nonunion in different legal environments. If laws affect union status, PLDUR will be smaller in the presence than in the absence of a law, and smaller the stronger the law. Because many states do not have laws and because the duration variable

is censored for cities that do not unionize, there are some complications in measuring PLDUR. For cities in states *with* laws, there are two components to the PLDUR measure—the value of PLDUR after a law is passed, and the value for PLDUR before the law is passed. For the period *after* passage of the law, PLDUR is either: (1) "year unionized–year of law" for cities that unionize; or (2) "1979–year of law" for cities that do not unionize. For the period *prior* to the passage of the laws, PLDUR is either: (1) "year of law–1958" for cities that do not unionize in the pre-law environment, where 1958 is the year that the first state bargaining law for police was enacted; or (2) "year unionized–1958" for cities that unionize before the law was enacted. For cities in states *without* laws, PLDUR is: "year unionized–1958" for cities that unionize, or, for cities that never unionize, "1979–1958." By defining the duration variable this way, I can contrast unionization in three different environments: in states with a law before and after passage of the law, and in states that never passed a law. Table 1.1 summarizes how PLDUR is defined.

There are two elements of arbitrariness in this definition. First, I chose 1958 as a starting year for calculating nonunion durations, even though I could have chosen earlier years. Second, for cities that do not unionize by 1979, I censor PLDUR at 1979. These two decisions should result in an understatement of the number of years a city is nonunion in an environment without a law and thus bias the estimated effects of the laws downward. That is, had I chosen a year earlier than 1958 as a starting point, the values of PLDUR for cities in environments without laws would be even larger. Moreover, with no particular spurt in police unionization in states without laws since 1979, the number of years that cities remain nonunion in these environments has increased

Table 1.1 Constructing Estimates of Post-law Nonunion Duration (PLDUR)

Law and Unionization Situation	Definition of PLDUR
In states that pass laws:	
After law is passed for cities that unionize after law	year unionized – year of law
After law is passed for cities that never unionize	1979 – year of law (censored)
Before law is passed for cities that do not unionize in the pre-law environment	year of law – 1958 (censored)
Before law is passed for cities that unionize before the law	year unionized – 1958
In states that never passed a law:	
Cities that unionize	year unionized – 1958
Cities that never unionize	1979 – 1958 (censored)

since 1979. One reason why this definition could cause an overstatement of the effects of the laws on unionization is that PLDUR is measured from a starting year of 1958 for cities in states that never enacted a law, while in states that did pass a law, the component of PLDUR for the period after the law is passed is measured from a starting year that is later than 1958. This would result in an upward bias on the estimated effects of the laws, if, as seems likely, the climate for public sector unionization improved over time. However, adding a control variable that measures the year that a law is enacted (YRLAW) will adjust for this bias. By defining PLDUR as beginning in 1958 and including the LAWYR control variable, the analysis should understate the effects of laws on unionization rates.

While analysis of the PLDUR duration variable is designed to give understated point estimates of the effect of the law variables on unionization rates, there is an important limitation on this analysis. The LAWYR control variable is undefined for all no-law observations, and is set to zero for these observations. When the definition of one covariate control variable (LAWYR) directly depends on another covariate (the dummy law variables), the significance of the law dummy variables cannot be determined. Because methods for testing the significance of the parameters on the law variables have not been developed, I estimate several other specifications. First, I analyze a sample with all no-law observations deleted. This addresses a more limited question: within the set of cities that have a law, how do different laws affect unionization rates from the date the law is enacted? Since all no-law observations are deleted from the sample (including the set of censored pre-law observations corresponding to the no-law experience of cities that are eventually covered by a law), LAWYR is defined for all observations in the restricted sample. One can therefore test whether the effect of one kind of law on unionization is significantly different from that of a different law.

To extend formal significance testing in a limited fashion to the analyses of the entire sample of municipal observations, I also estimate models of duration of nonunion status using a second duration variable: nonunion duration (NUDUR), which equals the number of years a city remains nonunion after 1955. Again, if a municipality remains nonunion through 1979, the last year of the period being analyzed, the NUDUR variable is censored.

There are several limitations on interpreting parameters on bargaining law variables when NUDUR is the dependent variable. This analysis compares municipalities that were never covered by a bargaining law *and* those that unionized prior to the enactment of a law, with municipalities that did not unionize prior to the law's enactment in states with laws. It tests whether municipalities in the latter group unionized

more or less rapidly after the 1955 baseline year, even though the relevant statutes were generally enacted well after 1955. Estimated parameters on the law variables will therefore underestimate the effect of bargaining laws on police unionization. Still, one can test the significance of these underestimates because the definition of NUDUR is the same for cities with and without laws, and because there is no other covariate whose definition directly depends on the law dummy variables. Note, however, that when LAWYR is added to the NUDUR models, it is not possible to perform formal significance testing of the law parameters. Also, including LAWYR in NUDUR models serves a conceptually different purpose than it does in PLDUR models. That is, for observations with laws, NUDUR includes the pre-law years in the dependent duration variable. Thus, where LAWYR is greater, cities have been exposed to the law for less time, implying that the probability of unionization will be lower if laws increase unionization. In NUDUR models, the parameters on LAWYR should therefore be negative, whereas if the climate for police unionization improved during the period under consideration, its coefficient in the PLDUR models should be positive.

In summary, the PLDUR models yield point estimates of the effects of different laws, but to formally test the significance of estimated effects of laws the models must be reestimated with samples restricted to municipalities in states that passed laws. By contrast, the NUDUR models are estimated for the entire sample of municipal observations.

1.3.2 Bargaining Laws: The Timing and Substance of Time-Varying Treatments

In this paper I consider two aspects of state collective bargaining laws as potential determinants of union status: the extent to which the law encourages collective bargaining, and the extent to which the law contains impasse procedures that ensure closure of the bargaining process. My control group consists of states with no collective bargaining laws.[4]

In the case of bargaining laws I distinguish between bargaining permitted (BP) laws that permit but do not obligate employers to bargain with employees, and duty-to-bargain (DTB) laws that require employers to bargain with employees. Bargaining permitted laws often state that employees have some weak form of rights "to meet and confer with" or "to present proposals to" their employers. Duty-to-bargain laws place affirmative obligation on employers to bargain with representatives and thus are more likely to induce unionization.

A DTB provision does not, however, ensure closure to the bargaining process. In the private sector, the strike threat forces negotiators to evaluate impasses and ultimately moves the parties to some resolution

of differences in their positions. But, except in very rare circumstances, police strikes are illegal in the United States. One can imagine an employer in a DTB environment bargaining but not conceding to any union demands since the strike threat may be significantly dampened for these public employees. By 1978, fourteen states had enacted some form of compulsory interest arbitration statutes for police negotiations. These environments form another law category (ARB). Under such statutes, police labor organizations need not rely on the final consent of the public employer to determine the terms and conditions of their employment, but rather a neutral third party has power to arbitrate contract terms. If employees believe that interest arbitration produces higher wage settlements, employees would be more likely to organize in these environments. The limited empirical evidence that exists on the impact of arbitration on salaries provides some evidence for such an effect (Olson 1980; Feuille and Delaney 1986). In any case, as long as employees perceive the potential for such an impact of arbitration, it would encourage unionization.

1.3.3 Other Covariates

While there is no comprehensive theory of union growth that clearly identifies other variables that might also influence unionization propensities, previous empirical studies on union growth and representation elections can be used to identify characteristics of police departments and municipalities that might also affect unionization. First, since bargaining laws and policies are defined along state boundaries, it is important to incorporate other state characteristics as controls. State-level controls include four geographic region dummy variables (northeast, north central, south and west), the percentage of state's nonagricultural work force who are public employees, and the percentage of a state's private sector nonagricultural work force that is unionized. The region controls and the percent-union variable will indicate how favorable the climate is toward unionization. If patterns of public sector unionization parallel those in the private sector, one would expect greater public sector unionization for northeastern and north central cities and lower unionization for southern cities. Similarly, the percent-union variable should also have a positive effect on unionization. By contrast, the effect of the proportion of a state's workforce that is in public employment is ambiguous. More public employees constitute a greater voting block likely to pressure states for favorable laws. But, the taxpaying public may find it more important to be represented by public managers who will oppose unionism (and keep labor costs down) where there are relatively more public employees.

Several municipal-level control variables are available for a large proportion of the municipalities in the sample: population, number of

departmental employees, per capita income, per capita municipal revenue, central city dummy variable, and three government-type dummy variables (council-manager, mayor-council, and commission).[5] The first two variables acknowledge the importance of unit size in the unionization process. In the private sector, the most common finding is that unit size is negatively related to union support in certification elections (Rose 1972; Chaison 1973; Cooke 1983). The sign of the correlation in this public sector sample may be different for several reasons. First, the private sector samples are generally certification elections from the 1970s or early 1980s. They do not include the earliest unionization campaigns of the 1930s and 1940s, many of which may have had relatively large units. In contrast, this study is designed to consider the process of unionization among all municipalities with populations over 10,000 from the time when virtually no municipal police department was organized. Also, since bureaucratization is likely to increase with city size, employees may need to unionize to obtain a voice in larger municipalities. Since population is available for a slightly larger sample of municipalities than is the department size variable, and since these two variables are highly correlated, I report results for models incorporating only the population control.

Ability-to-pay variables (revenue and income) might indicate an increase in the public employer's ability to satisfy more of the diverse interest groups, including the police department, vying for a share of the municipal budget. In this way, managers in wealthier cities and towns might be better able to avoid unionization. Conversely, the incentive to unionize may be greater where municipal revenues are larger. Thus, these controls play a role similar to firm profitability in private sector unionization studies. The impact of profitability on unionization rates in bargaining-unit-level studies has received little attention in the existing private sector studies.[6]

Central cities may be associated with relatively high area wages, a greater degree of private sector unionization, and perhaps more hazardous duties for the police. If these forces make police more likely to consider unionization, this variable will cause an upward shift in the union hazard function. Finally, different governmental structures might affect the responsiveness of an employer to employee desires, so that certain governmental structures might be more highly correlated with the probability of municipal unionism.

While a number of these controls vary over the period considered, it is necessary to assume that the rankings of municipalities along the dimensions of the controls are reasonably stable over the period (Lawless 1980, 383–94). For example, one must assume that relatively populous cities at the start of the period still rank high in population by the end of the period examined. It is also necessary to assume that

unionization of a municipality's police department does not affect that city's relative ranking along the dimensions of the control variables (e.g., if a relatively wealthy suburban town organizes in the early 1960s, it is still relatively wealthy by the end of the period). While these assumptions may be more problematic for some controls (particularly the revenue variables) than for others (such as central city status or government type), these state and municipal characteristics may be correlated with the locus and rate of police unionization and with state bargaining laws. Therefore, they are potentially important controls that help guard against overestimating the impact of bargaining laws on union transition probabilities.

1.4 Empirical Results

Table 1.2 summarizes the basic data that underlie the analysis and reports the percentages of municipalities that unionized before and after enactment of various laws. For each of the law categories, columns 1 and 2 record the number of states that enacted each type of law as its first bargaining law and the number of municipalities in those states with data on their police departments' collective bargaining contract status. Column 3 shows that states that enacted a BP, DTB and an ARB law as their first bargaining law had 65.0 percent, 87.8 percent and 96.2 percent of their police departments organized by 1978. In column 4, one observes that very little of this unionization occurred prior to the enactment of these laws. Only 12.7 percent of the 622 municipalities that unionized did so prior to the enactment of the law. (Any such municipalities are categorized as no-law municipalities in the PH analysis, since they did not remain nonunion past the time of the enactment of the law.) Columns 5 and 6 show that a considerable proportion of the police unionization in states with laws occurred within the first few years of the enactment of a law. This is particularly true for states that had a DTB or an ARB law as their first statute. In those states 52.7 percent and 58.4 percent of all unionization occurred within the first six years of the law, where the year in which the law was enacted is counted as one of these six years (column 6). Of those municipalities that remained nonunion until after a law was passed (column 2 – column 4), 9.7 percent were unionized in BP states, 53.0 percent were unionized in DTB states, and 69.3 percent were unionized in ARB states over the first six years of the initial bargaining law. In sharp contrast, throughout the entire period under consideration, only 9.7 percent of the 237 municipalities in states that never enacted a law had unionized.

This simple analysis, while highlighting sharp differences between police unionization rates in the presence and absence of laws, may be misleading for several reasons. States with laws may have municipalities

Table 1.2 **Timing of Unionization Relative to Passage of Bargaining Laws**

(1) Type of First Bargaining Law (# of states)	(2) Number of Municipalities	(3) Number Organized by 1978 (as % of col. 2)	(4) Number Organized Pre-Law (as % of col. 3)	(5) Number Organized in First Three Years of Law (as % of col. 3)	(6) Number Organized in First Six Years of Law (as % of col. 3)
For states with a law (34)					
BP (10)	374	243 (65.0%)	15 (6.2%)	12 (4.9%)	35 (14.4%)
DTB (16)	229	201 (87.8%)	29 (14.4%)	50 (24.9%)	106 (52.7%)
ARB (8)	185	178 (96.2%)	35 (19.7%)	74 (41.6%)	104 (58.4%)
Subtotal	788	622 (78.9%)	79 (12.7%)	136 (21.9%)	245 (39.4%)
For states that never enacted a law (14)	237	23 (9.7%)	23 (100.0%)	—	—

that are more prone to unionization. Post-law unionization occurs later in the period under consideration, so that the effects of an improving climate for police unionization must be sorted out before attributing the patterns in table 1.2 to an effect of the laws.

To formalize the analysis, I estimate the principal PLDUR PH model. Of the 1,025 municipalities that have police contract data, 793 have a full set of data on all covariates. Since more than one observation per municipality is included in the sample for any municipality that remains nonunion past the time of the enactment of a law, the total number of observations in the sample for the analysis, N = 1,359, is greater than 793.

Column 1 of table 1.3 presents the complete set of parameters from the PLDUR PH model. Since the magnitudes of the β parameters are affected by the units of measurement for the independent variables, the relative magnitudes of the various β's do not gauge the relative importance of the covariates. Column 2 of Table 1.3 presents the means and standard deviations of the covariates for the N = 793 sample. (The N = 793 sample is used to calculate sample characteristics instead of the N = 1,359 sample since the latter includes more than one observation for certain municipalities and, therefore, would not give an accurate picture of the average municipality.) Column 3 calculates for the dummy variables in the model the quantity $\exp[\beta]$. This calculation yields the ratio of the union hazard rate for a municipality with the given characteristic and one without it (all other covariates the same). Column 4 presents the relative increase in the union hazard rate that would result from a one standard deviation increase in a given covariate. This is given by $\exp[\beta(\bar{x} + \sigma_x)]/\exp[\beta\bar{x}]$. These calculations indicate that the *nature of the bargaining law is the most important factor in influencing unionization rates.*

Specifically, lines 1a, 1b, and 1c of column 3 show that the relative unionization propensity of a municipality is raised dramatically by any of the bargaining laws. Compared to no-law environments, relative unionization propensities are: 15.0 times greater in ARB environments, 13.3 times greater in DTB environments, and 4.2 times greater in BP environments. The magnitude of the effects of laws calculated in this way shows an even more dramatic effect of laws than the simple analysis of table 1.2. Moreover, the calculations in column 4 which compare the magnitude of the effects of the bargaining laws to the effects of other covariates, underscore the conclusion drawn by Saltzman (1985, 345) in his state-level analysis of teacher unionism—that bargaining laws are the single most important deterimant of public sector unionization.

Among other covariates, there are significant effects associated with the degree of private sector unionization in the state, the region

Table 1.3 **The Impact of Bargaining Laws, State Characteristics, and Municipal Characteristics on Police Unionization**

Covariates	(1) β-parameters and (standard errors)	(2) Means and (standard deviations) of Covariates	(3)[a] Relative Increase in Unionization Probability from 0 to 1 increase (dummy variables)	(4)[b] Relative Increase in Unionization Probability from a one standard deviation increase (all variables)
1. Bargaining laws				
a. ARB	2.711[s]	0.172	15.044	2.779
	(.287)	(.377)		
b. DTB	2.590[s]	0.175	13.330	2.676
	(.262)	(.380)		
c. BP	1.442[s]	0.332	4.229	1.972
	(.218)	(.471)		
2. LAWYR	0.092***	6.166	—	1.688
	(.019)	(5.639)		
3. Region				
a. northeast	0.286	0.170	1.331	1.111
	(.217)	(.376)		
b. central	0.472***	0.328	0.624	0.801
	(.147)	(.470)		
c. south	0.459*	0.281	0.632	0.813
	(.251)	(.450)		

4. Percent union	3.692***	0.249	—	1.404
	(.913)	(.092)		
5. Percent public	2.525	0.159	—	1.059
	(3.203)	(.020)		
6. Central city	0.513***	0.230	—	1.241
	(.124)	(.421)		
7. Population	0.050 E-6	67881	—	1.009
	(.210 E-6)	(188229)		
8. Per capita income	0.043 E-4	4887	—	1.005
	(.370 E-4)	(1271)		
9. Per capita city revenue	0.357 E-3	289	—	1.071
	(.222 E-3)	(193)		
10. Government-type				
a. mayor-council	−0.068	0.298	0.934	0.969
	(.200)	(.458)		
b. council-manager	0.181	0.641	1.198	1.091
	(.196)	(.480)		

Notes: [s]significance tests not performed on parameters for law dummy variables

[a]calculated by $\exp[\beta]$

[b]calculated by $\exp[\beta(\bar{x} + \sigma_x)]/\exp(\beta\bar{x})$

***two-tailed p-value $< .01^{x}$

**two-tailed p-value $< .05$

*two-tailed p-value $< .10$

variables,[7] and central city status. The insignificant impact of the population variable does not necessarily contradict the observation that the largest cities in the United States are more likely to have unionized police departments. Central city status and population are highly correlated so that with a central city variable in the equation, population has no effect on the propensity to unionize. While the city income and revenue variables both have positive parameters, neither is judged to be significant.

1.4.1 Additional PH Models

While the magnitude of the effects of the bargaining laws is larger than that of all other covariates, formal significance testing of individual parameters on the law variables are not possible for the model in table 1.3. Therefore, several additional PH models are estimated. Parameters on the law variables for these supporting PH models are presented in table 1.4.

As a reference point, column 1 of table 1.4 presents the estimates of the impact of the laws from the model in table 1.2. Column 2 gives estimates of the impact of the laws when NUDUR ("year of unionization–1955" for uncensored observations and "1979–1955" for censored observations) is the dependent variable. In this analysis an observation is classified according to the first legal environment it experiences while it is still nonunion. These estimates show that municipalities with laws unionized earlier in the 1955–78 period than municipalities in the no-law category. Since laws are usually enacted well into the 1955–78 period, the parameters on the law variables are, as expected, noticeably smaller than those obtained in column 1. While these parameters underestimate the effect of bargaining laws, one can test the significance of each parameter relative to the omitted no-law comparison group. Even using these underestimates of the effects of the laws, the estimated parameters on the DTB and ARB variables are significantly different from zero, though the estimated parameter on the BP variable is not.

To illustrate the fact that the column 2 model underestimates the effects of laws because pre-law years are included in the dependent duration variable, I added LAWYR, the number of pre-law years, to the equation. The results in column 3 show that the estimated parameters on the law variables increase dramatically. Again, since LAWYR is undefined for no-law observations, no significance testing of these law parameters is performed.

To judge the significance of the effects of ARB and DTB laws relative to BP laws, the sample in columns 4 and 5 is analyzed. Here, all no-law observations are deleted from the sample, and the observations in the BP category are the comparison group. Whether or not LAWYR

Table 1.4 **The Effect of Bargaining Laws on Police Unionization: Estimates from Proportional Hazards Models**

	(1)	(2)	(3)	(4)	(5)
Dependent Variables	PLDUR	NUDUR	NUDUR	PLDUR	PLDUR
Observations	1359	793	793	506	506
1. Bargaining laws					
a. ARB	2.711[s]	0.336*	1.856[s]	1.915***	1.819***
	(.287)	(.191)	(.399)	(.162)	(.211)
b. DTB	2.590[s]	0.445**	1.999[s]	1.693***	1.602***
	(.262)	(.211)	(.419)	(.226)	(.259)
c. BP	1.442[s]	0.078	1.069[s]	—	—
	(.218)	(.171)	(.283)		
2. Years before enactment of law (LAWYR)	0.092*** (.109)	—	−0.093*** (.021)	—	−.018 (.025)
3. Other controls	a	a	a	a	a
−2* log-likelihood	6410.55	5523.6	5504.2	3885.4	3885.0

Notes: Asymptotically normal standard errors in parentheses. (a): Other controls are: three region dummies; percent of private sector workforce in the state that is unionized; percent of state workforce in public employment; two government-type dummies; central city dummy; population; per capita income; and per capita city revenue.

[s]Significance tests inappropriate on law dummy parameters in columns marked with s.

***two-tailed p-value $< .01$

**two-tailed p-value $< .05$

*two-tailed p-value $< .10$

is included, significance testing can be performed on the law variables, since LAWYR is defined for all observations in this sample. The analysis does in fact suggest that the DTB and ARB laws increase unionization rates more than do BP laws. Interestingly, once one restricts the sample to observations with some kind of law, the effect of LAWYR is no longer judged to be significantly different from zero. That is, within the range of years that laws were enacted in the United States, post-law durations are not significantly shorter if the post-law duration begins in a later year.

Across all models, it is also interesting to note that the effects of DTB and ARB laws on police unionization are not significantly different from one another. Specifically, in comparing the log-likelihood statistics from any of the models in table 1.4 to a corresponding model in which DTB and ARB categories are collapsed into one variable, there is no significant difference in the performance of the two models.

1.4.2 Survival Plots

A useful way to summarize the data and to underscore the importance of the bargaining laws is to present plots of the survival functions for various representative cities. Figure 1.1 plots the probability that a municipality with average characteristics will be nonunion under the differing legal environments. These probabilities are estimated using the model in table 1.3 with PLDUR as the dependent variable, with any LAWYR effect excluded from estimates. The plots for the BP, DTB and ARB municipalities begin in 1965, 1968 and 1968, respectively. These years represent the average of the years in which these forms of bargaining law were enacted. The results are clear. No-law environments are characterized by very little unionization. In 1979, the probability that the average municipality would still be nonunion if it had not been exposed to a law is approximately .83. Law environments produce unionization. An average municipality exposed to a BP law (for fourteen years), a DTB law (for eleven years), or an ARB law (for eleven years), has .59, .29 and .25 probability of remaining nonunion by 1979.

In figure 1.2, I plot the probability that a municipality having the average characteristics of a no-law, BP, DTB, and ARB municipality will be nonunion at different points in time. Here the municipalities differ in characteristics across law categories as well as in the law itself. That the plots are quite similar to those in figure 1.1 underscores the fact that the legal environment, more than any characteristic, dictates the union hazard probabilities. The differences between the probability of remaining nonunion for a no-law municipality and those of municipalities in other legal environments is slightly larger than the differ-

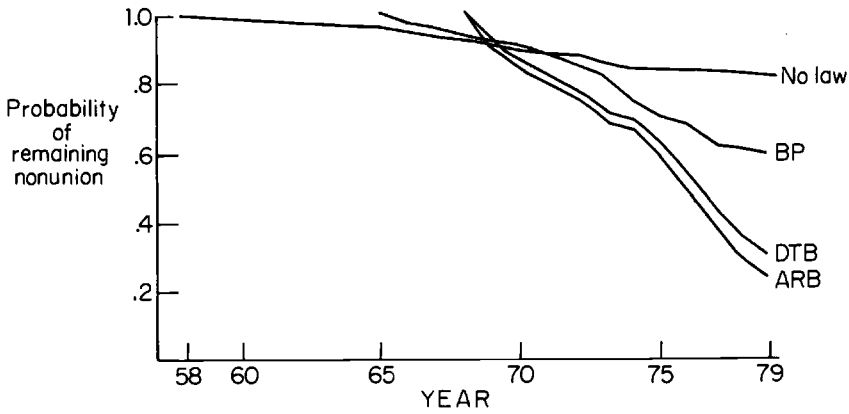

Fig. 1.1 Probability of remaining nonunion for the average municipality under the four different legal environments

ences in figure 1.1. This reflects the fact that no-law cities have lower values of PCTUNION (percent union) and are less likely to be in the northeast region (both of these characteristics are positively associated with the union hazard function). From figure 1.2, one estimates the probability that an average no-law, BP, DTB and ARB municipality will still be nonunion in 1979 as .87, .36, .02 and .01, respectively. These plots depict graphically the central finding of this study: changes in unionization rates among municipal police in the United States occurred after the enactment of bargaining laws.

1.4.3 The Pre-Law Organizers

While the analysis documents the critical role that bargaining laws play in creating an environment that will allow collective bargaining to exist, there are cases where formal collective bargaining contracts are negotiated even though no law exists. To gain further insight into the unionization-bargaining law relationship, I contacted representatives from municipalities that have contracts but are in states that have yet to enact a bargaining law. Of the 793 municipalities included in the PH analysis, 198 are in states that have not enacted a law. Of these 198 municipalities, only 10 have negotiated contracts. However, in several of these cases, the cities enacted a municipal ordinance permitting collective bargaining, emphasizing the importance of protective legislation to allow bargaining. In other cases, municipalities tended to have a strong union influence in private sector employment that made collective bargaining a widely accepted practice in the area. For example, Weirton and Huntington, West Virginia, are communities with strong influences from the steel workers and mine workers, respectively.

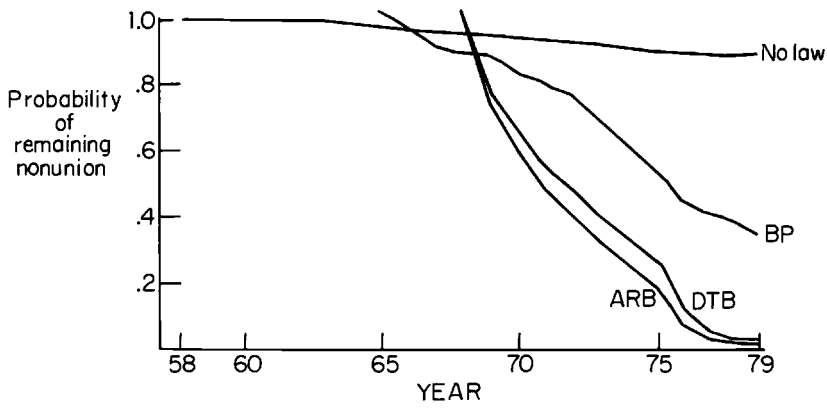

Fig. 1.2 Probability of remaining nonunion for each legal environment's average municipality

Pascagoula, Mississippi (the only municipality with a contract in a state in which police collective bargaining is explicitly illegal by state statute) has a number of craft unions representing workers in its dominant industry, shipbuilding. Management in Pascagoula, because of the state law outlawing police bargaining, has the option of using the courts to void the contract, but has not followed this route because of the strong pro-union sentiment of the citizens in their town. These examples suggest channels through which a variable like PCTUNION influences police unionization rates; however, the examples also suggest that the state-level PCTUNION variable does not adequately capture occasional strongholds of private sector unionization at the municipal level in states with otherwise low levels of private sector unionism.

1.5 Conclusion

Using a PH framework for estimating the rate of unionization among municipal police departments, this study documents the critical role played by the nature of the statutory bargaining environments. The police bargaining laws are clearly not a result of already existing bargaining. The speed with which unionization occurs in the first few years after enactment of laws, particularly laws with some sort of duty-to-bargain provision, does however suggest some form of pent-up demand for unionization. Given the experience in the private sector, where unionism continues to decline in spite of the protections of the NLRA, bargaining statutes are a necessary but insufficient condition for union growth. Other factors specific to the public sector might help to account for the rapid rate of public sector unionization after bargaining laws were enacted. Public sector laws may be more effective safeguards of employees' bargaining rights, since these laws may have stricter enforcement or stiffer penalties for violations than does the NLRA in the private sector.[8] Finally, public employers, as agents of the government, may be less likely than private sector employers to violate the letter or spirit of a bargaining statute.

Notes

1. The most recent study which employs the most rigorous empirical tests to date is Saltzman (1985). Also see Moore (1978).

2. The only analysis on public sector unionism that examines changes in a percent-organized variable is contained in Saltzman (1985, 345). However, the analysis does not correlate this change variable to all categories of bargaining laws.

3. For the original exposition of the proportional hazards framework, see Cox (1972). More recently, see developments in Kalbfleisch and Prentice (1980).

4. A small number of municipal observations in states that eventually enacted a law prohibiting police bargaining are kept in the no-law comparison group.

5. Municipal control variables are available from International City Managers Association, "Master Code" Data Tape (I.C.M.A. 1978). Government type, municipal revenue, per capita income population and department size also appear in the published volume *Municipal Yearbook, 1978* (International City Management Association 1978).

6. In one review of what have generally been industry-level studies, Bain (1981, 3) concludes that profit levels seem to have a positive correlation with union growth and labels this a "prosperity effect".

7. The significance of the set of region controls is judged by comparing the chi-square statistics for the model in table 1.2 with and without the three region variables.

8. For a critical review of the increase in unfair management labor practices and a discussion of the weakness in penalties under the NLRA, see Weiler (1983).

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Comment John M. Abowd

In the private sector the two most important pieces of enabling legislation permitting the formation of collective bargaining units are: (1) the Clayton Act exclusion of coalitions of employees from antitrust regulation and (2) the National Labor Relations Act (NLRA) regulation of the formation of bargaining units and imposition of a duty to bargain on employers. It seems inconceivable that any economist would argue that private sector unionism would have developed its current form or coverage without this protection.[1] The question of which protection is quantitatively more important in explaining the subsequent increase in private sector bargaining units is completely confounded by the uniqueness of the legislative actions. There is simply insufficient statistical variation in the legal environment to permit reliable estimation of the effects of these laws.

Economists presume that private sector bargaining unit formation is a direct result of legal protection not afforded to other forms of collective activity. This presumption is based on a simple before and after comparison of bargaining unit formation around the times of major changes in the legal environment. In the public sector there is also a

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1. This is not to argue that collective action by workers occurs only because of the NLRA. Collective action is the regulated activity. Its incidence and form is governed by the costs and benefits of the activity itself. However, the position of recognized bargaining units as a substantial economic force is a direct result of lowering the costs (protection of organizing activity) and raising the benefits (duty to bargain) that occurred because of the form of the regulation.

presumption that the widespread increase in organizing and negotiating activity was due to the legal protection recently granted those activities. Fortunately, in the public sector this presumption can be systematically investigated because the regulation has, for the most part, occurred at the state and local levels of government. The necessary statistical variation in the legal environment is present because the various states acted at different times and with different types of legal protection. The paper by Ichniowski uses this variation in the legal environment to provide striking evidence that it is precisely the form of the legal protection of police bargaining units that has promoted the formation of these units and the subsequent negotiation of collective agreements.

Since many readers may not be familiar with the statistical techniques Ichniowski uses, let me summarize his simplest, but most convincing, results. The unit of analysis is a municipal police force. The definition of unionization is that a bargaining unit exists from the date of signing the first written collective agreement. Ichniowski is studying the time it takes for a bargaining unit to form in the presence of different legal environments: (1) no protection, (2) collective bargaining permitted, (3) duty to bargain, and (4) compulsory interest arbitration. The statistical method is based on the probability of becoming a unionized police force in the next year, given that the police force is not unionized at the start of the year.[2]

From table 1.2 we can deduce that in the absence of any law there is about a 0.4 percent chance of a police union forming in any given year. This is the base against which all comparisons are made. At this rate of unionization, a police force would expect to remain nonunion for 250 years. We can think of this as forever. Turning now to table 1.3, the effect of passing a bargaining permitted law is to increase the conditional probability of union formation from 0.4 percent to 1.6 percent per year. At this rate a police force would expect to remain nonunion for sixty years. The effect of a duty-to-bargain law is to increase this probability from 0.4 percent to 5 percent per year. At this rate a police force would expect to remain nonunion for nineteen years. Finally, the effect of passing a compulsory interest arbitration law is to increase the conditional probability of unionization from 0.4 percent to 6 percent per year. At this rate a police force would expect to remain nonunion for seventeen years. Since the probability of decertification of police unions is essentially zero, if new bargaining units form at a

2. I have taken certain liberties with the statistical terminology in order to promote clarity. Technically, Ichniowski studies the hazard rate, which measures this conditional probability in the next instant given that the union does not currently exist. The "hazard" here is formation of a union. This terminology has its origins in engineering and the life sciences, where the "hazard" is failure of a critical part or death, and leads to somewhat unfortunate connotations in this study.

rate of 6 percent per year, the extent of public sector unionization would reach 27 percent in just five years.

The statistical analysis attempts to control for the independent effects of location, private sector unionization, and other potential correlates of propensity to unionize. In order to gain some feel for the magnitude of the estimated legal environment effects, suppose that there were no public sector enabling legislation. Then, if the extent of private sector unionization increased from 25 percent (the sample average) to 34 percent (one standard deviation above the sample average), the conditional probability of forming a new police union would increase from 0.4 percent to 0.6 percent per year. The length of time a police force would expect to remain nonunion would fall from 250 to 178 years. The effect of increasing private sector unionization is the largest estimated effect on the police unionization rate apart from the public sector bargaining law effects.

Ichniowski's estimated effects of changes in the legal environment are so large that one is compelled to ask: Are these estimates credible? I think the answer to this question is "yes." Most municipalities use standardized personnel policies for police officers already. The formation of a bargaining unit, therefore, has limited benefits unless the police expect to win substantial improvements in the terms of compensation or operating procedures of the force. Without legal protection, police officers may face nontrivial penalties for collective action—termination or denial of promotion, for example. With legal protection, unionized officers are unlikely to lose the benefits of standardized personnel policies, so they no longer risk substantial costs when attempting collective action that might produce other improvements in compensation or working conditions. Therefore, it is believable that police officers would attempt collective action in this low penalty environment. Of course, this does not mean that they will be successful in achieving gains from unionization. The measurement of the gains to the police officers awaits further study.