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## Three Essays on the Determinants and Effects of Public Sector Bargaining Laws.

Melissa S. Waters

*Louisiana State University and Agricultural & Mechanical College*

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**Waters, Melissa S., Ph.D.**

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THREE ESSAYS ON THE DETERMINANTS AND EFFECTS OF  
PUBLIC SECTOR BARGAINING LAWS

A Dissertation

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy

in

The Department of Economics

by

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August 1987

## TABLE OF CONTENTS

|                |    |
|----------------|----|
| LIST OF TABLES | v  |
| ABSTRACT       | vi |
| INTRODUCTION   | 1  |

### TOPIC ONE

#### THE DETERMINATION OF A GENERAL MODEL OF PUBLIC SECTOR BARGAINING LAWS

##### Chapter

|   |    |
|---|----|
| 1. INTRODUCTION TO TOPIC ONE                                    | 5  |
| 2. REVIEW OF THE LITERATURE                                     | 9  |
| The Economic Theory of Regulation                               |    |
| The Economics Literature on the Determination<br>of Legislation |    |
| 3. EMPIRICAL ANALYSIS   | 71 |
| Estimation Technique  |    |
| The Model   |    |
| Ordinal Probit Estimation Results                               |    |
| Summary   |    |

### TOPIC TWO

#### SIMULTANEOUS ESTIMATION OF A GENERAL MODEL OF PUBLIC SECTOR BARGAINING LAWS

##### Chapter

|                              |    |
|------------------------------|----|
| 1. INTRODUCTION TO TOPIC TWO | 88 |
| 2. REVIEW OF THE LITERATURE  | 91 |

The Private Sector: The Effects of Right-to-Work Laws on Unionization

The Public Sector: The Effects of Union Regulations on Union Outcomes

3. THEORETICAL DERIVATION OF A MODEL OF UNIONIZATION 140

The Demand for Union Services

The Supply of Union Services

4. EMPIRICAL ANALYSIS 155

Estimation Technique

The Model

The Determinants of Bargaining Laws: Equation Two

The Determinants of Public Sector Union Membership: Equation One

Estimation Results

Comparison of Simultaneous and Single-Equation Estimation

Summary

TOPIC THREE

SIMULTANEOUS ESTIMATION OF INDIVIDUAL PUBLIC EMPLOYEE GROUPS:  
TEACHERS, FIREFIGHTERS, POLICE

Chapter

1. INTRODUCTION TO TOPIC THREE 174

2. REVIEW OF THE LITERATURE 176

Teachers

Firefighters

Police

Other Groups

Police and Firefighter Bargaining Spillover  
Evidence

3. EMPIRICAL ANALYSIS

194

Estimation Technique

Estimation Results: Application of the  
General Model to Sub-Groups

Teacher Results

Firefighter Results

Police Results

Modifications of the Sub-Group Models

Teachers: Refinements on the General Model-  
Simultaneous Estimation

Firefighters: Refinements on the General  
Model-Simultaneous Estimation

Summary

CONCLUSION

227

BIBLIOGRAPHY

236

## LIST OF TABLES

| <u>Table</u>  | <u>Page</u> |
|---|-------------|
| 1 Ordinal Probit Estimation: The Determinants of Bargaining Laws. . . . .                       | 84          |
| 2 Simultaneous versus Single-Equation Estimation: The General Model of Bargaining Laws. . . . . | 170         |
| 3.3 TEACHERS--Simultaneous Versus Single-Equation Estimation. . . . .                           | 198         |
| 3.4 FIREFIGHTERS--Simultaneous Versus Single-Equation Estimation. . . . .                       | 206         |
| 3.5 POLICE--Simultaneous Versus Single-Equation Estimation. . . . .                             | 212         |
| 3.7 TEACHERS--Modification of the General Model. . . . .  | 220         |
| 3.8 FIREFIGHTERS--Modifications of the General Model. . . . .                                   | 222         |



Dissertation Abstract

THREE ESSAYS ON

THE DETERMINANTS AND EFFECTS OF PUBLIC SECTOR BARGAINING LAWS

The theoretical foundation of this model is the economic theory of regulation as developed by Stigler; in addition, modifications of the economic or special interest theory implied by the Public Choice school of thought are employed. A synthesis of these two theories of regulation, then, provides the framework upon which to develop a general model of the causes and consequences of laws regulating the bargaining rights of state employees.

Topic One is devoted exclusively to the determinants of state-wide bargaining rights laws. The data are pooled over two years, and state laws are classified into one of three possible categories: bargaining prohibition (or nonexistence of a law), mandatory meet and confer, and mandatory bargaining. The dependent variable, then, is ordinal. Each observation is a discrete realization of the underlying, unobservable variable, sentiment toward public unionism. Estimation proceeds by the technique of McKelvey and Zavonia (1976). The independent variables are divided into two categories: economic/demographic, and political. Inclusion of variables in the former category is motivated by the Chicago School's interest group theory, while the Public Choice School and Economics of Legislatures School suggest variables proxying characteristics of the political process.

Topic Two, employing the basic model developed in Topic One, estimates the determinants and effects of bargaining laws simultaneously.

The dependent variable in the "effects" equation is union density. Single equation estimation of either process is assumed to suffer from simultaneous equations bias, the consequences of which are biased and inconsistent parameter estimates. An econometric technique developed by Heckman (1978) is employed in order to account for the estimation of an ordinaly measured endogenous variable within a simultaneous equations system.

Topic Three applies the simultaneously estimated general model developed in Topic Two to three separate employee groups: teachers, firefighters, and police officers. By doing this, comparisons may be made among individual sub-groups, and the applicability of the general model tested.

## INTRODUCTION

This dissertation consists of three Topics on public sector unionism and bargaining laws. Its purpose is to determine whether bargaining law determinants and the extent of unionization are joint outcomes which are properly specified within a simultaneous system. In addition, the process surrounding the enactment of legislation is modelled according to the economic theory of regulation; therefore, the validity of this theoretical framework is also tested.

Almost all of the literature on public sector unionism consists of single equation models of either union outcomes or union regulations. According to the economic theory of regulation, legislation is endogenous, modelled within a demand and supply framework. The price theoretic foundation also underlies the determination of union density (or bargaining coverage): the proportion of the public sector unionized is an outcome of the demand for and supply of union services. Thus, micro foundations explicitly underlie this union model, which is not always the case in traditional industrial relations research in labor economics.

In addition, a large proportion of the published

research in this area deals with just one public employee group: teachers. This dissertation improves on previous work in this regard in two ways. First, a general model of state-wide public employee unionization and bargaining laws is estimated in order to make inferences about the most general case; few studies have attempted this. Second, the general model is disaggregated into three separate employee groups (teachers, firefighters, police) in order to make comparisons among the individual groups, and between them and the general model. This could shed light on the validity of a general model representing disparate groups. That is, it could lead to the identification of a core group of explanatory factors common to all employee groups, and thus fundamental to the process determining laws and unionism in the public sector; it could also highlight systematic differences between groups, providing future research topics.

Finally, this dissertation improves on previous estimation techniques above and beyond the employment of a simultaneous system. One of the reasons simultaneous estimation is rarely employed in this type of analysis is because of the econometric difficulties associated with simultaneous systems containing a limited endogenous variable. In this model, the two jointly dependent variables are union density, which is continuous, and bargaining law status, which is discrete. Heckman (1978)

developed a simultaneous estimation procedure designed to handle both discrete and continuous endogenous variables; he derived the case for a dichotomous endogenous variable. This procedure is extended here to account for an ordinal or n-chotomous dependent variable, which characterizes the general model described above.

Topic One develops a single-equation model of the determinants of bargaining laws across states and over time. Its purpose is to test the validity of the model of legislation put forth by the economic theory of regulation. Topic Two then adds to this general model of bargaining law determinants a model of public employee unionization; this equation, then, represents the effects of legislation. By treating these two variables as endogenous, their true effects within this legislative process can be inferred. That is, the direction(s) of causality are estimated without the possibility of bias which may arise from improperly specified single-equation models. Topic Three then estimates the simultaneous equation model for three individual employee groups, providing interesting and useful comparisons among these workers.

The other comparison of interest is between single-equation estimates of all the equations of Topics Two and Three and their simultaneously estimated counterparts. When the process surrounding public sector unionization and the statutes regulating its activities are correctly specified

as simultaneous, the inferences derived from estimation provide clear evidence of the gain to be had from treating laws and unionization as jointly endogenous.

CHAPTER 1  
INTRODUCTION TO TOPIC ONE

Examining the determinants of public sector collective bargaining laws is an exercise in the application of the economic theory of regulation: it provides the basis for the specification of a model of the demand for and supply of labor legislation. This literature can be divided into three partitions, and at its base is the Chicago School or special interest theory. The special interest theory was advanced as it became increasingly clear that the traditional public interest theory of regulation did not fit the data; that is, the orthodox rationale of regulation as a means of correcting market failures was not supported by actual regulatory behavior, structure, and outcomes. The focus of this theory is on income redistribution: competing interest groups demand regulation as a means of eliciting a wealth transfer from the state, and support-maximizing politicians supply regulation based on characteristics of the political process. The Chicago School focus is on interest group demand; it comprises the demand side of the economic theory.

An extension of the Chicago School framework is

provided by the supply side emphasis of the remaining two components of the economic theory of regulation: the Public Choice School, and the Economics of Legislatures School. The primary contribution of the former in this context is to emphasize the active role and influence of legislators and constituents in the determination of legislative output. Essentially, this results in supply constraints which are consequences of the political costs of producing regulation. The latter school, the Economics of Legislatures, introduces additional supply constraints. This school analyzes legislatures as firms which produce legislative output. It accounts for the political and institutional factors which affect the costs of reaching collective decisions: in other words, the economic costs of legislation.

Modelling the determinants of legislation occurs within this economic framework. In the determination of state-wide bargaining laws, then, demand is specified by identifying interest groups which expect to be directly or indirectly benefited or harmed by the regulation. Benefitted groups provide support, while the pressure exerted by taxed groups is in opposition. The supply of special interest regulation is specified using the same cost-benefit calculus, this time applied to legislators. Those factors expected to affect the political and economic costs of supplying regulation are weighed against the expected support from special interests. In short, those factors which affect the economic self-



interest of rational, maximizing politicians, pressure groups and constituents determine the outcome of the regulatory process.

Chapter 2 contains a review of the literature. The first section deals specifically with the economic theory of regulation literature. This review establishes the theoretical framework within which economists model the determinants of economic legislation. The second section contains a review of the literature on these determinants. First, a summary of the theoretical derivation of the general economic model of the political process is presented; it is within this general model that the economic theory of regulation is derived. Second, the empirical literature is surveyed. This covers the actual model specifications and empirical proxies used, the econometric techniques employed and the consequences associated with their use, and last, the implications and results of this research.

Finally, chapter 3 develops a general model attempting to explain the determinants of public sector bargaining laws across states, and describes the econometric technique. The dependent variable is ordinal, taking one of three possible values representing the strength of the existing bargaining laws. The bargaining law index is aggregated over employee groups in order to identify the common factors surrounding this particular type of regulation. Estimation of the model

is by ordered probit analysis.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### 2.1 The Economic Theory of Regulation

The seminal article in the theory of regulation and the cornerstone of the Chicago School is Stigler's The Theory of Economic Regulation (1971). This article provided the foundation for the revisionist positive economic theories, and focused on the demand for and supply of regulation. The coercive power of the state, with its ability to tax or subsidize different groups, creates incentives for these groups to compete for a positive wealth transfer. This wealth transfer may come in the form of any of four basic government policies: direct subsidy, entry controls, controls over substitutes and complements, and price fixing. Although Stigler assumes that most regulation is demanded by the regulated industry itself, his analysis clearly accounts for the cases of onerous legislation upon industries. This of course refers to the demand for controls over substitutes and complements.

The differences between political versus economic markets constrain industry cartel policies, implying that where private cartelization is possible, its benefits to

members exceed those obtainable from regulated cartelization. The limitations of the political process impose the implementation of costly procedural safeguards, change the distribution of power among firms in the industry, and finally, allow the admission of "powerful outsiders" to membership in industry councils.

The analysis of the costs of obtaining regulation is particularly significant within a political framework. It explains why rational voters in a democracy permit wealth transfers to special interests to whom the benefits fall short of society's deadweight losses. The issue is coercion: the democratic political decision making process compels everyone to abide by the majority outcome, whether he or she had voted yes, no, or abstained. In contrast, a voter in the product market places individual votes the consequences of which follow directly from his or her decision (i.e., to consume or not and in what quantity). Stigler notes the two fundamental differences between political and economic decision making processes which arise from the element of coercion in political markets. It is the costs implied by these two differences which are significant in the special interest theory's analysis.

First, simultaneity by voters (or their representatives) is required. As a result, direct voting by individuals on a large number of issues is too costly; therefore, elected representatives must be given wide

discretion, and changes in marginal preferences by voters will be unaccounted for by the representatives.

Second, the political process does not allow participation in direct proportion to interest and knowledge. The democratic process cannot exclude uninterested parties, and does not allow extremely interested parties more than one vote. As a result, incentives to acquire costly information about political goods are attenuated relative to those existing in the economic marketplace.

The primary means by which these two elements of the democratic political marketplace are handled is by the election of representatives; that is, representative democracy. The cost to voters of acquiring information and of voting itself, the low probability of any single voter affecting outcomes, and the measurement error in the precision of preference expression introduced by uninformed voters all add noise to the channels of the political process. It is this noise or grossness in a representative system which causes the strong preferences of the majority and many strong preferences of minorities to be effectively transmitted and thus implemented by the representative. Marginal preferences of either the majority or minorities are not effectively transmitted.

Turning to the sellers of legislation, i.e., the political parties in which politicians are organized, the

supply price is measured in units of political support. Votes and resources provided by special interests seeking regulation constitute this support.

Stigler hypothesizes that the costs of obtaining legislation increase with industry size, but at a rate less than the increase in size. The reasons underlying the former hypothesis are increases in industry organizing and maintenance costs, increases in the size of the transfer demanded which increases opposition, and increases in free rider problems. The latter hypothesis is explained by the "fixed" size of the political market within which these industry cost increases are set.

Stigler's article provided the general theoretical framework for the revisionist economic theory of regulation, allowing a broad range of empirical testing of the special interest theory's validity in explaining legislative outcomes. On its own, however, it provides few specific testable hypotheses of optimal industry size or of effects on optimal size and support of changes in the level of costs, transfers, welfare losses and opposition. The following articles analytically derive these and other hypotheses through extensions and modifications of Stigler's theory.

The major analytical extension of the Chicago School foundation is provided by Peltzman (1976). This article emphasizes the positive nature of Stigler's economic

analysis in specifying the demand for and supply of regulation; in contrast, the traditional public interest theory specifies no mechanism by which demand for regulation is made effective, and in addition virtually ignores supply costs.

The important role of Peltzman in generalizing Stigler is in his analysis of the relationship between group size and the role of costs in determining efficiency within political markets. That is, by generalizing and formalizing Stigler's framework, Peltzman analytically derives results on optimal group size. Peltzman formalizes the model by assuming the regulator maximizes net votes or a majority (M). In this simplified model, the regulators choose the size of the winning group (and thus the size of the taxed group). The regulator's objective function is specified as

$$M = n*f - (N-n)*h,$$

where  $n$  is the number of potential voters in the beneficiary group,  $N-n$  is the number of potential voters in the taxed group (i.e.,  $N$  = number of potential voters), and  $f$  and  $h$  are net probabilities of a beneficiary granting support and of a taxed individual opposing, respectively. The function  $f$  is determined by per capita net benefit, and is not simply zero or one owing to information and voting costs. Thus,  $f = f(g)$ , where  $g = (T - K - C(n))/n$ , and  $T$  is the total wealth transfer to the beneficiary group,  $K$  the dollars

spent by the group to obtain the transfer, and  $C(n)$  the organizing cost of the group,  $C'(n) > 0$ . Peltzman assumes for simplification that the regulator chooses both  $K$  and  $T$ ; in reality,  $K$  and  $T$  are simultaneously determined by the interaction of demand and supply.

Since the transfer is the product of a tax, it may be written as

$$T = t \cdot B \cdot (N - n), \text{ or } t = T / (B \cdot (N - n)),$$

where  $t$  = tax rate, and  $B$  = wealth of the non-benefitted group.

Turning to the net probability of opposition from the taxed group,  $h$ , it is a positive function of  $t$  and a negative function of per capita voter education expenditures ( $z$ ), where

$$z = K / (N - n).$$

The assumptions about  $f$  and  $h$  are as follows:

$f_g > 0$ ,  $f_{gg} < 0$ , i.e., diminishing returns to benefits;  $h_z < 0$ ,  $h_{zz} > 0$ , i.e., diminishing returns to per capita education expenditures; and

$h_t > 0$ ,  $h_{tt} > 0$ , i.e., increasing costs of taxation.

The first order conditions are then derived with respect to the three choice variables  $M$ ,  $T$ , and  $K$ . Combining these expressions and solving for  $n$  yields

$$n/N = 1 - (f_g \cdot (g + a)) / (f + h - f_g \cdot (m - a)),$$

where  $a = C/n$  and  $m = C'(n)$ , the average and marginal costs of group organization, respectively.



The first result Peltzman derives is obtained from the first order condition taken with respect to  $T$ ,

$$M_t = f_Q - h_t \cdot (1/(B + t \cdot b_t)) = 0.$$

This condition states that the marginal political return from a transfer must equal the marginal political cost of its tax. It can be seen that  $(B + t \cdot b_t)$  must be positive for an interior maximum (since  $f_Q$  and  $h_t$  are positive). Since this term is the marginal product of the tax rate  $t$  in raising revenue, that it must be positive implies that a vote maximizing politician will impose an amount of tax less than the revenue maximizing tax level. This first result, then, is simply that the revenue generated from a regulated cartel must be less than the revenue possible from a privately organized cartel.

A related result follows after dropping Peltzman's initial assumption of a uniform tax. Relaxing this assumption allows more than one single economic interest group to win. Thus, the rational regulator may exploit differences within the losing (i.e., taxed) and the winning groups so that some losers win and some winners lose. Peltzman derives this result analytically, and it is seen that the tax on any individual member of the losing group (a function of demand, elasticity of demand, and tax responsiveness) may be positive or negative.

Peltzman then turns to factors affecting the size of the winning group: support, opposition, and organization

costs. In the first of three simple cases, he shows  $dn/df > 0$ , i.e., an increase in the probability of support (holding benefits constant) increases the size of the winning coalition. The second case is a parametric shift in opposition,  $h$ :  $dn/dh > 0$  for the same reason that  $dn/df > 0$ . As opposition technology improves, the regulator allows some members of the taxed group to avoid the tax, and thus become winners. The third case, a parametric shift in organizing costs  $C$ , is ambiguous. Stigler argued that the free rider dilemma would limit the size of the group, but the sign of  $dn/dC$  is determined by the sum of offsetting components. The first component describes Stigler's effect of concentrating benefits (i.e., a smaller  $n$ ) in response to an increase in  $C$ . The second component is a decrease in  $K$  (essentially payment to the politician or party) resulting from the increase in  $C$ , which produces the third component. This is the effect the fall in  $K$  has on increasing  $n$ ; that is, with a lower  $K$ , lobbying efforts are more efficiently employed on a smaller taxed group, so that  $n$  rises. Stigler's hypothesis holds, then, if this latter effect is small relative to the initial "free rider" response, which seems reasonable.

Peltzman then generalizes the model further and derives several more results from a specific analysis of price-entry regulation. The results include effects on prices and profits, and on demand for new regulation.

The politician is assumed to maximize a majority generating function the arguments of which are the wealth of various interest groups, subject to a constraint on total wealth. Groups are assumed independent of one another, and the game is zero sum in transfers. Applying this formulation to the case of two groups, producers and consumers, and to regulation in the form of price setting and entry controls, the constrained objective function may be written

$$L = M(P, \pi) + \phi(\pi - f(P, C)),$$

where

$P$  = output price,  $C$  = production cost,

$\pi$  = producer wealth,  $\phi$  = a Lagrangian multiplier,

$M_P < 0$ ,  $M_\pi > 0$ ,  $M_{PP} < 0$ ,  $M_{\pi\pi} < 0$ ,  $M_{\pi P} = 0$ .

Maximizing this Lagrangian with respect to  $P$ ,  $\pi$ , and  $\phi$  yields

$$-(M_P / f_P) = M_\pi = -\phi.$$

This condition specifies that the marginal political product of one dollar's worth of profits ( $M_\pi$ ) must equal the marginal political product of a price cut ( $-M_P$ ) relative to a one dollar profit loss resulting from the price reduction ( $f_P$ ).

In deriving the comparative static results of changes in cost or demand on price, Peltzman defines a "political wealth effect". That is, a change in the cost function has a positive effect on price (as in the unregulated case).

However, this effect is composed of two elements: the typical economic response facing both unregulated and regulated firms, and a political response or political wealth effect. In general terms, the political wealth effect indicates that a regulator's purchases of the "good" political support are positively affected by the regulator's wealth or income, assuming normality of the good. For this specific example, this effect arises because the surplus to be distributed by the regulator has decreased, inducing him or her to purchase less support. However, an important implication is that a rational regulator will not decrease political support purchases from a single group only, or increase purchases from a single group in the case of cost reductions. It follows that consumers will be forced to share producer's losses from cost increases; conversely, when costs fall, regulators purchase more political support from both groups so that producers share some of consumer's gains.

For the effects of a change in demand on price, the same two components comprise the comparative statics expression: a typical positive economic component, and a political wealth effect which in this case is negative. As the regulator's wealth increases due to an increase in consumer demand, the political wealth effect induces the regulator to buy more support from both groups; thus, producers buffer consumer losses resulting from the increase

in demand.

Peltzman summarizes the implications for regulatory behavior from this price-entry regulation application of a very general special interest model. First, the analysis immediately preceding implies that regulation tends to be favorable to producers during recessions and to consumers during expansions. Second, regulation is in general a normal good and therefore entry into regulation is endogenous. Third, regulatory lag will tend to be more pronounced during demand rather than cost changes. This is due to the opposing effects of the economic and the political components on price in the case of a demand change. Fourth, studies indicating that regulation on an industry has had no effect may be measuring the net effect over time. For instance, initial producer protection should over time shift to consumer protection in a growing and technologically innovative industry. Thus, distinct and opposing regulatory effects exist, and their measured net effect is zero. Fifth, regulated firms with the highest profits should also have the lowest prices. This negative price-profit correlation exists because as the surplus to be disposed of increases, the regulator has the incentive to purchase more support from both groups, i.e., to increase profits and to lower prices. Sixth, conditions of elastic demand and scale economies favor consumers. That is, a more elastic demand increases the consumer surplus of a price

decrease, while decreasing the profitability of a price increase. Taking the case of scale economies, and assuming that marginal cost is falling but total costs are essentially unchanged due to diseconomies of smaller outputs, a price increase will be less profitable; a given price decrease, then, is associated with enhanced voter productivity. Thus, both these conditions imply consumer protection. Finally, a seventh implication is that regulation should reduce risk associated with financial assets since profits and stock prices are to some degree insulated from demand and cost changes.

In the final section, which examines the structure of regulated prices, Peltzman derives results for the regulated sector reflecting its substitution of political for economic criteria. Specifically, the phenomenon of cross-subsidization emerges as a consequence of the distribution of transfers and tax burdens such that marginal opposition among competing groups is equal. Summarizing the results, cross-subsidization can be explained by the regulator's incentive to spread benefits or costs among all groups, even though they were generated by the cost or demand characteristics peculiar to a single group. Therefore, profit-maximizing forces leading to pure price discrimination are suppressed; at the same time, political wealth effects create a regulated price structure in which low cost customer groups subsidize high cost groups.

Finally, Peltzman makes two additional points. First, the model's implications for control of entry follow from this discussion of cross-subsidization. From the regulator's point of view, the existence of cost differences among consumer groups always implies that the politically motivated price structure will be discriminatory. Profit-maximizing price discrimination is not politically optimal, but the cross-subsidizing variant is. Therefore, the regulator will seek the power to control entry in order to prevent cream skimming. Second, entry of regulation is more profitable for the regulator the more disparate is the industry's price structure. As long as cost-based price differences exist the regulator can increase his or her support by spreading the low costs of some customer groups to other high cost groups.

In sum, Peltzman's contribution in generalizing Stigler's model is to provide additional testable hypotheses regarding regulatory outcomes. Another article extending this basic Chicago School framework of regulation as a means of wealth redistribution is Becker (1983). This model is capable of explaining both special and public interest legislation, and it does so within a framework strongly emphasizing the deadweight costs resulting from benefits and taxes.

Becker's model assumes competing pressure groups expend resources in order to win political favors, or to

redistribute wealth. The political budget equation is balanced: the amount raised in taxes must equal the amount spent on subsidies; influence, then, is a zero-sum game. The equations determining the amounts of taxes paid and subsidies received incorporate their respective deadweight costs. Thus, the revenue generated from a tax of  $x$  dollars, and further, the deadweight cost of the tax, increases as the tax increases. The subsidy received by a winning member is a function of the deadweight cost of providing the subsidy, so that the actual transfer is less than the dollar amount of the subsidy raised; further, the cost of providing the subsidy increases as the amount of the subsidy increases. Therefore, the model is negative-sum in taxes and subsidies.

Becker develops influence functions relating subsidies and taxes to the amount of pressure generated by two homogeneous pressure groups, and to other variables as well. A pressure function is then derived for each group, where pressure is a function of the number of members in the group, and resources spent by the group, e.g. lobbying activities, information campaigns, and political contributions.

Then, expressions for the full income of each member of both the taxed and the subsidized groups are developed:

$$Z_s = Z_s^0 + R_s - a_s, \text{ and } Z_t = Z_t^0 - R_t - a_t,$$

where



$Z_s^0$  and  $Z_t^0$  are the full incomes of a member of the subsidized group (s) and the taxed group (t) respectively;

$Z$  measures the income of each s and t after redistribution;

$R$  measures the redistributions to each s and away from each t;

'a' measures the total resource expenditure per member of each group (where total expenditure = direct outlay on political activity plus cost of controlling free-riding).

Income is maximized when

$$dR_s/da_s = 1, \text{ and } dR_t/da_t = -1.$$

Using this condition, the expressions for each group's influence function, and assuming Cournot expectations by each group, equilibrium conditions may be derived from which optimal values of expenditures and pressure are solved. From the comparative static properties of the political equilibrium, which defines the optimal amounts of pressure by each group, Becker derives his first proposition. Proposition One states that an increase in the efficiency of producing pressure by a group causes its subsidy to rise or its tax to fall. A corollary to this result is that a group's influence is determined by its relative efficiency, not by its absolute efficiency.

One of the most important results to be determined is the effect on a group's influence of an increase in the

group's size. The total effect depends on the manner in which an increase in size affects efficiency, subsidies, and deadweight costs. In order to determine these effects, however, it is necessary to determine the effects of deadweight costs on each of the following: pressure, taxes, and subsidies.

First note that an increase in the marginal deadweight cost of taxes increases pressure by the taxed group, while an increase in the marginal deadweight cost of subsidies reduces pressure by the subsidized group. This means that taxpayers have the intrinsic advantage in translating pressure into influence. Following these results, Proposition Two states that an increase in deadweight costs reduces the subsidy. This implies that a transfer benefiting a special interest and producing very large deadweight costs to society is nonetheless less expensive (that is, more efficient) in terms of deadweight costs than other potential transfers which were not implemented.

Analysing the effects of deadweight costs on efficiency illustrates Becker's contention that his model incorporates both special interest and public interest (e.g., environmental and health and safety laws) regulation. (It is the contention of the public interest school that governments correct market failures, thereby raising efficiency). First, any program benefiting all groups faces no opposition. Of greater relevance is the situation in

which some program increases aggregate efficiency, but imposes deadweight costs on some groups. Becker shows that these programs may be instituted if efficiency is increased at the margin, because in this case the subsidized group has the intrinsic advantage in translating pressure into influence. This is stated in a corollary to Proposition Two: programs increasing efficiency are more likely to be implemented than those reducing efficiency. Therefore, the case of so called "public interest" regulation which corrects market failures is accounted for within this special interest model.

Finally, Proposition Three states that successful groups are small relative to the groups taxed to pay the subsidy. The larger the taxed group, the lower are marginal and total deadweight costs of taxation and therefore the less pressure is exerted by taxed groups.

Becker then turns to the question of whether pressure group competition has a bearing on efficiency in terms of the methods of taxation and subsidization chosen. It is clear that both taxed and subsidized groups should favor the most efficient methods of taxation. If a given tax becomes more efficient, the taxed group exerts less pressure as deadweight costs decline; therefore, the subsidy as well as the net income of the taxed group increases.

Proposition Four, then, states that competition among groups tends to elicit efficient taxation methods.

For the case of subsidization methods, however, the results are less clear cut. First of all, a more efficient method of subsidization yields a higher subsidy, so that the subsidized group always supports the most efficient method. Furthermore, if the optimal pressure exerted by  $s$  falls, which would occur if the marginal deadweight cost at the initial equilibrium was greater under the more efficient method, both  $t$  and  $s$  would favor the efficient subsidy. On the other hand, it is also possible that the marginal deadweight cost at the initial equilibrium is lower under the more efficient tax; in this case, increased pressure by  $s$  results in members of the taxed group opposing the more efficient method.

Pressure group competition, then, may produce efficient subsidies, but not necessarily. This implies that seemingly inefficient means of regulation need to be examined more closely to judge whether conventional conclusions of gross inefficiency are warranted.

Looking at the political equilibrium of this model (i.e., the equilibrium levels of pressure from taxed and subsidized groups), Becker notes that it is not Pareto optimal. The influence indifference curves are positively sloped since influence is a zero sum game: as pressure and the influence of one group increases, the other group's influence must fall, thus causing its production of pressure to rise. This implies that both groups would be better off

if both reduced their pressure. Their influence levels would remain unchanged, and their net incomes would increase as expenditures fell.

Finally, Becker notes some possible problems with his model. First, his influence functions depend only on pressure and other characteristics of the group. Influence, however, may be a function of taxes and subsidies due to voter ignorance. An example is assigning social welfare attributes to private wealth redistribution transfers in the form of the minimum wage. If this is the case, then the conclusions that efficient taxes tend to predominate, and that policies raising efficiency tend to receive more support than those lowering efficiency, are certainly not valid as general propositions. This situation may very well be the case, since voter ignorance is after all rational in the political goods market.

Another possible problem occurs by omitting an explicit treatment of voting. Becker assumes that voting has no significant independent effect, but that special interest information campaigns shape voter preferences. If votes are not so easily bought, and evidence of significant differences in voting patterns by various demographic characteristics suggests they may not be, then the model would have to be modified to account for constituent voting.

Finally, in common with all previous special interest models, Becker's analysis does not account for public

interest regulation which does not raise efficiency. In the 1970's, some legislation began to be enacted for the benefit of no identifiable group, in the presence of no obvious market failures, leaving behind deadweight losses and lower efficiency. Such regulation is not mentioned in Becker's 1983 article. This omission is accounted for in the following article which provides a clear and concise theoretical justification for a Public Choice-type extension of the Chicago School framework.

McChesney (1987) highlights two deficiencies of the private interest theory literature. The first is its treatment of the politician as a "passive broker" redistributing wealth according to the demands of private pressure groups. In fact, the politician does not simply supply regulation; he or she also imposes demands on the interest groups. This acknowledgment allows the politician to derive political gain from activities other than political rent creation.

The second deficiency, related to the first, is the inability of the economic theory to account for the consumer oriented regulation just discussed. In general, the economic theory does not explain regulation which creates no rents for some pressure group(s).

This article develops a theory of a politician playing an active role in the market for regulation. This reevaluation of the politician's role accounts for

regulation which does not create rents. Specifically, politicians use their property rights as public officeholders to threaten private producers with rent extraction. These existing rents may have been created privately, for example through entrepreneurial ability or firm-specific capital investments. On the other hand, the rents may have been originally created by political cartelization. (One way in which the threatened extraction may be accomplished is by industry deregulation.) The producer will then "pay" the politician, through political contributions, to refrain from enacting the threatened legislation if this payment is less than the loss of the rents.

For the case of expropriation of privately created rents, the allocative cost is measured in terms of distortions in investment decisions. Less investment in firm specific capital is undertaken when the possibility of legislative expropriation exists. The expected value of these investments falls if protection must be purchased from politicians in order to deter harmful legislation. There is a shift toward less firm specific investment, and this allocative distortion is often overlooked in the measure of the social costs of regulation. McChesney notes Tullock's point that the consequences of this type of regulatory power are the same as those arising from theft. If theft were legal, people would minimize expected losses by decreasing

their productive activity: they would have less to lose.

Two methods are effective in eliciting payments from producers in order to forestall extraction of producer surplus: the threat of reducing prices, and the threat of increasing costs. A good example characterizing the former method is the threatened extraction of privately created producer's surplus, the result of previous period investments in brand name capital, for instance. Regulation may be threatened which would "substitute" for the private provision of product quality control in the industry. As a result, firms whose customers currently pay a premium in exchange for the quality assurances created by earlier investments will pay politicians to drop this legislation. Otherwise, these firms will lose the return on their capital investment since the regulation's effect will be to lower price and increase the elasticity of industry supply.

For the latter method of eliciting payments, a threat to increase costs by imposing a per unit tax is an obvious example. Another is instituting regulations requiring firms to gather information and report it to the government, thereby increasing paperwork and red tape. Again, firms which would suffer a net loss in producer surplus as a result of these mandated cost increases have an incentive to pay politicians to refrain from action.

Indeed, McChesney points out that examples of both these methods of political blackmail exist. His



contribution to the economic theory of regulation, an active politician who supplies legislation and threatens and imposes demands on special interest groups, rectifies two important deficiencies of the original model. It allows for both the creation and the extraction of rents in the pursuit of private political gain.

## 2.2 The Economics Literature on the Determination of Legislation

### 2.2.1 Theoretical Development of a General Economic Model of the Political Process

The theoretical foundation of the economics literature on the determinants of public sector bargaining laws is derived from the application of economic analysis to the theory of democracy (Downs, 1957). Using economic principles to analyze the behavior of political parties yields the conclusion that politicians' incentives are basically the same as those of entrepreneurs. Politicians will produce that combination of legislative outcomes which maximizes their votes, or in the more general sense, their wealth. Within the political market, then, economically powerful individuals and groups may buy political influence from politicians in exchange for political support. The demand for influence or favorable legislation and its supply by politicians simultaneously determine the equilibrium transfer and its price.

The first two articles reviewed are primarily theoretical, deriving models of specific aspects of the political process. Among these are the determinants and effects of political support, and of representative and constituent voting. Following these, several empirical articles are reviewed to establish those issues on which a consensus of opinion has been reached, and those on which substantial controversy remains.

One of the most general of the theoretical articles is by Ben-Zion and Eytan (1974). The first section evaluates the role of campaign contributions in the traditional (and simple) model of the democratic process. A political candidate is assumed to maximize  $P$ , his expected percentage of the votes in an election, by choosing a vector of optimal positions on various issues,  $(S)$ , given personal characteristics,  $(\alpha)$ . The optimal positions are chosen such that the candidate minimizes the distance between his and the voters' positions. This simple production function  $P$  is then extended by including campaign contributions,  $(M)$ . The simple model can then be written

$$P = f(S, M, \alpha).$$

The candidate will have an incentive to solicit contributions in exchange for advocating a particular policy as long as the votes gained from using the contribution exceed the votes lost from changing the policy. Totally differentiating the objective function yields  $dP$ , the

(positive or negative) sum of these two opposing effects on votes due to a contribution; if  $dP > 0$ , the candidate accepts the contribution, and if  $dP < 0$ , he or she rejects it. Further, the candidate's price for changing policy can be found by solving out for  $dM$  in the totally differentiated equation. The price can be seen to be higher the greater is the required change in policy, and the heavier is the weight attached to the policy by the voters.

This model distinguishes between campaign expenditures made by pressure groups, to which the analysis applies, and money contributed by a single individual. The former are risky investment expenditures on which a future return is expected, while the latter are typically regarded as consumption expenditures. These are assumed to enter the individual's utility function as an argument providing psychic utility. This is the contributor's analogue to the public interest theory of regulation.

In examining the conditions for market equilibrium the analysis is simplified by looking at one pressure group contributor, call it a firm, and one candidate. The firm wants specific changes in the candidate's previously optimal policy positions, for which the firm offers a contribution,  $(M)$ , and from which it derives an expected gain,  $(G)$ . Now, specify  $S_0$  as the "classical" optimal policy which minimizes the distance between the candidate and the voters in the absence of contributions; therefore,

any change in policy due to contributions can be written  $S = S_0 + \tau$ . The market equilibrium is then determined by maximizing  $P = f(S, M, \alpha)$  subject to  $M$ , the contribution constraint. The system must be solved simultaneously since  $P$  and  $M$  are jointly determined endogenous variables. Substituting expressions for  $M$  and  $S$  into  $P$ , the optimal policy vector is  $dP/dZ_i$ , where  $Z_i$  denotes the changes in the previous equilibrium positions,  $i = 1, \dots, n$ . The optimal change in a policy  $S_i$  in the classical case of zero contributions is  $dS/dZ_i = 0$ . For the general case of positive contributions, the expression for the optimal policy change indicates that in equilibrium a candidate will change policy up to the point at which the marginal gain in votes (due to the contribution) just equals the marginal loss in votes (due to the change in policy).

Positing a specific distance function and assuming a Cobb-Douglas functional form for  $P$  yield a simple expression for the optimal policy change from which several conclusions may be derived. First, the change in policy is greater, the greater is the gain to contributors. Second, noted earlier, the change in policy is greater, the lower is the weight assigned to that specific policy by voters. Third, the size of the contribution is greater the higher is the initial probability that the candidate is elected, holding constant the change in policy. Fourth and finally, if both candidates have approximately equal initial probabilities of

winning, the risk-averse firm may spread the risk of its investment by contributing to both.

This type of constrained maximization problem is limited by the fact that the candidates' positions are not explicitly modelled. The percentage of votes won is modelled as a function of contributions, characteristics, and policy positions. In addition, the determinants of contributions are specified as a function of policy positions and percentage of votes won. Only constituent voting and contributions are thus explicitly modelled. A complete model must also specify the determinants of candidates' policy positions. The model put forth by Kau, Keenan, and Rubin does this by specifying an equation determining congressional voting.

Kau, Keenan, and Rubin (1982) postulate a simultaneous equation system with three jointly determined endogenous variables: constituent voting for Congressmen, Congressmen's voting on specific issues, and campaign contributions from special interest groups. This model reflects the simultaneous relationship between the economic and political sectors of society, a relationship both political scientists and economists have long studied. Beginning with the pioneering work of Downs (1957), economists such as Buchanan and Tullock (1962), Olson (1965), Stigler (1971), Posner (1974), Peltzman (1976), and Becker (1983) have applied economic theory to political

processes. Many earlier articles have estimated single equation models of the influence of constituents on Congressmen's voting; others have looked at the relationship between campaign contributions and Congressmen's characteristics. These models assume one-way causation and as such are subject to possible simultaneity biases. Other previous articles (e.g. Kau and Rubin, 1979, Chappell, 1980), have estimated two equation simultaneous relationships between either Congressmen and constituents or Congressmen and contributors. These models, too, suffer from a possible simultaneity bias according to Kau, Keenan, and Rubin; therefore, summarizing their theory will specify the causes of the biases affecting previous studies, and allow a test of Stigler's economic theory as well.

Beginning with Congressmen, it is assumed that their goal is to be elected; thus, the inputs for this objective function are campaign expenditures and voting on Congressional bills. Voting fulfills two functions for the optimizing Congressman: one, a vote which pleases his constituents will increase his probability of being elected; and two, a vote which pleases potential donors will increase the probability of receiving a contribution, which also increases his probability of being elected (by increasing campaign expenditures). Furthermore, both of these relationships involve two-way causality. First, constituents may vote for a Congressman who votes as they

wish; on the other hand, a Congressman may change his votes according to constituents' preferences. Second, pressure groups may contribute to a Congressman who votes as they wish; or, a Congressman may change his votes according to contributions reflecting pressure groups' preferences. This, then, is the source of the simultaneity within the system: constituent votes, Congressmen's votes, and campaign contributions are all jointly determined endogenous variables.

In addition, there are several other components of this theoretical framework. First, the question of exactly what it is the Congressman maximizes is left unanswered. Downs (1957) assumed votes are maximized, while Riker (1962) assumed the goal is a winning majority. Others prefer a more general function which maximizes a Congressman's wealth. In this analysis, votes are included in the objective function without employing a specific assumption about what is maximized.

Another component of the theory is the recognition of the influence of seniority on Congressional voting, constituent voting and contributions. Seniority implies the attainment of influential committee positions and therefore power; it is expected to exert a separate influence on Congressional voting behavior. By similar reasoning, seniority should have a positive effect on both contributions and constituent voting (i.e., the probability

of election).

Another issue within the political process, one not successfully explained by application of economic analysis, is why people vote. Kau, Keenan, and Rubin take the fact that people vote as a datum, and hypothesize that constituents vote for those who further their interests. Within the economic theory of regulation, interests are defined solely in economic terms. This article employs a more general definition of interest, encompassing noneconomic elements as well. Specifically, constituent ideology is included as a determinant of both constituent and Congressional voting. This allows a test of the validity of the more narrow Stigler-Peltzman-Becker model.

Finally, a note on the empirical specification is worthwhile. Interest groups may have one of two motives in making candidate contributions: one, to change the position of likely winners, which implies that congressional voting is a function of contributions; and two, to elect candidates favorable to their positions, implying that contributions are a function of Congressional voting. To allow for both of these motivations empirically, the total amount of interest group contributions received by the loser is included as an explanatory variable in the constituent voting equation and in the contributions equation. Regarding the former equation, the winner's margin of victory should be a negative function of the loser's



contributions; regarding the latter, contributions received by the winner should be a positive function of the loser's contributions.

The model can thus be written as follows:

$$V = f(M, F, I, S)$$

$$F = g(V, S, TL)$$

$$M = h(V, I, S, TF, TL),$$

where

$V$  = Congressional voting,

$F$  = a vector of contributions received by the Congressman,

$M$  = electoral margin received by the Congressman,

$TF$  = total contributions received by the Congressman,

$TL$  = total contributions received by the Congressman's last opponent,

$I$  = a vector of economic and noneconomic constituent characteristics,

$S$  = seniority.

The following is a brief summary of the data and estimation technique employed, and the empirical results from this model.

The dependent variables are: Congressional voting on eight bills, chosen on the basis of broad economic impact; contribution data gathered by the Federal Election Commission; and electoral margin of each Congressman from the Almanac of American Politics.

The econometric technique employed is the mixed logit model (see Schmidt and Strauss (1975, 1976) and Nerlove and Press (1973)), and it is seen that the empirical results largely support the theory. From an economists' perspective, the most important results are those indicating which interest groups favor which laws, and it is these results which are summarized here.

First, among the eight bills are votes on OSHA and the Consumer Protection Agency. These were included as examples of consumer oriented regulation with no obvious beneficiaries; in contrast, bills with clear special interest beneficiaries were also included. In the Congressional voting equation, the authors included constituent ideology as measured by the percentage of each Congressional district which voted for Ford in the 1976 Presidential election. If its coefficient in the "special interest" legislation is not significant, one could not reject the hypothesis that only economic interests are important in explaining Congressional voting, assuming the model used is the "true" one. In fact, the strongest result of this paper is the consistently significant ideology parameter; in addition, this result is consistent with previous work (Kau and Rubin, 1979). However, to what extent this and similar measures may be accurately interpreted as reflections of ideology is debatable. Another view is that these measures serve as proxies for

omitted or unobservable economic variables (Peltzman, 1984). A review of this latter opinion is included subsequently.

The second important result identifies trade unions as a special interest group generally supporting more government intervention for the eight consumer oriented bills. That is, both union contributions and union membership are associated with Congressional voting in favor of increased government intervention; as is expected, this result holds for bills in which unions have a clear interest.

A third, though weaker, result concerns the special interest contributions of firms. The signs of these parameter coefficients are always opposite to those of the union coefficients, and in the same direction as the Ford ideology measure. They are significant only twice, however.

The theoretical significance of this article is in its development of the three equation simultaneous system. Empirically, an important issue is the strong significance of ideology. In fact, the role and measurement of ideology is emphasized by Kau and Rubin in an earlier publication. Their theoretical development of ideology, and its empirical computation and interpretation, are of interest here since the common finding that ideology is highly significant contradicts the special interest theory of regulation.

## 2.2.2 Empirical Research on the Determinants of General

### Economic Legislation

The purpose of Kau and Rubin (1979) is to distinguish between the factors which determine Congressional voting patterns: self-interest or economic factors, ideology, and logrolling. Since roll call voting is analyzed here as a single equation logit problem, neither the model nor the estimation procedure and results are of great interest now. Consequently, the primary focus of this review is on the paper's development of ideology; in addition, logrolling will be briefly discussed since it is frequently mentioned in the literature.

To begin, the authors note that a well-developed positive theory of the role of ideology is lacking. Economists in general are less familiar and presumably less comfortable with ideology as an analytical tool than are political scientists, who have long analysed roll call voting as one part of the political process. (The focus of political scientists, however, tends to be on the mechanism by which constituent preferences are translated into pressure, and then acted upon by Congressmen. The aim of economists in this political process is the discovery of the groups supporting or opposing the legislation.) The authors also note that Schumpeter is most often cited as having the best developed economic theory of ideology (Capitalism, Socialism, and Democracy, third ed., 1950). He argues that the demise of capitalism will occur largely through an

ideological mechanism itself originating within capitalism. That is, capitalism creates a body of intellectuals, inimical to capitalism, which over time grows in size and in influence over the masses. Though incomplete, Schumpeter's is the major positive ideological theory existing.

From this unconvincing theoretical foundation underlying the hypothesis that ideology is important in determining legislative outcomes, empirical proxies for ideology are presented. Two of the most common proxies are the ADA and the COPE ratings. Both are compiled by liberal pressure groups (Americans for Democratic Action and the AFL-CIO Committee on Political Education), in the same general manner. They represent the number of times a Congressman votes "correctly" on a chosen set of votes. In addition, ADA's set of votes is chosen in such a way that all Congressmen earn a mean ranking.

Several other pressure groups, liberal and conservative, construct their own ratings, with correlations between them quite high. As their first measure of ideology, Kau and Rubin use ADA ratings. The purpose of these ratings is, of course, to obtain as pure a measure of ideology as possible; that is, the proxy for ideology should not reflect the influence of any underlying economic (or self-interest) variables. Most empirical work simply includes economic variables in the estimating equation under the assumption that these proxies accurately measure and

fully account for self-interest; thus, the ideology measure is interpreted as solely capturing non-self-interested motives.

Kau and Rubin go further in attempting to eliminate the influence of any underlying economic variables which the ideology measure may be picking up due to measurement errors in the independent variables. Since the ADA rating is based on votes, many of which are economic in nature, Kau and Rubin use a residualization procedure<sup>1</sup> to purge from ADA these economic influences. The first step of the procedure is to regress ADA on several economic explanatory variables, such as per capita income, central city residence, union membership, age, and proportion black. The second step is to compute the residuals from these ADA equations and substitute this variable, denoted RADA, for the explanatory ADA variable in the regression explaining roll call voting. RADA is thus orthogonal to the economic variables in this equation. Finally, to eliminate any influence obtaining from both the dependent variable and an independent variable being based on voting (roll call votes and RADA, respectively), the dependent variable votes took place in a different year than the votes used to construct the ADA rating. In addition, many of the twenty-six dependent variable roll call votes were chosen because they were not directly relevant to ADA ratings.

Turning to the results of concern here, RADA was

significant twenty-four of twenty-six times. Evidence which may be interpreted as indicating the presence of a liberal logrolling coalition is the consistent sign agreement, where significant, of central city residents, union members, and individuals with an interest in consumer affairs, with RADA. (Along with other economic variables, these three were found to be significant and positive in explaining the ADA rating; that is, these economic variables are associated with liberalism.) This is only an indirect test of logrolling, however, and the possibility exists that RADA proxies liberalism only in the sense of reflecting a liberal logrolling coalition.

One final issue of interest, then, is to directly test this alternative interpretation of ADA: it measures not ideology but logrolling. If correct, no role for ideology in voting exists; instead, all voting is determined by either direct or indirect self-interest. Being a liberal or conservative would simply mean one was associated with a particular coalition of economic interests. To test the hypothesis that RADA measures logrolling, twelve roll call votes were chosen such that each bill appealed to a single, unique economic interest in the set. Then, the conditional logit model was employed to estimate individually each of the twelve jointly determined endogenous variables as functions of the economic variables, RADA, and the remaining eleven bills. (This procedure produces biased and

inconsistent estimates.) If the votes are significantly associated with one another, then this suggests the existence of logrolling coalitions. However, if RADA is also consistently significant in these twelve equations, then one may not reject the hypothesis that RADA is measuring ideology, and conclude that ideology is important in influencing legislation.

A critique of the common interpretation of ADA and similar ratings as measures of ideology is motivated by a basic criticism of the specification of Kau/Rubin-type models. Peltzman (1984) sets up a Public Choice-type principal-agent model explaining roll call voting which employs a different empirical characterization of economic interest. This change in the basic methodology used yields very different conclusions about the importance of ideology; specifically, its significance is lessened greatly.

Peltzman begins with the observation that the use of the typical empirical proxies for the principals' demand for legislation, that is, the average economic characteristics of the Congressman's district, is inappropriate in the context of explaining the principal-agent relationship. Instead, Peltzman accounts for the differences in economic variables between a candidate's supporters and opponents. Thus, Peltzman derives a model conventionally assuming the legislator maximizes votes (or the probability of reelection), but distinguishing between supporters and



opponents; in addition, it contains the percentage of votes won in the last election and campaign contributions as explanatory variables. The first order condition for a maximum is found by taking the partial derivative of the objective function,  $M$ , with respect to the number of votes the legislator cast in the previous session in favor of his or her supporters,  $V$ . Now, this objective function  $M$  summarizes the legislator's expected votes in the upcoming election, from both previous supporters and previous opponents. Some of the implications of this principal-agent model can be conveniently summarized by imposing the simplifying assumption that the only constituent economic variable that matters is income; in addition, assume higher income individuals supported the legislator in the previous election, while lower income voters did not. As a result, the elected legislator voted on bills which either helped or hurt individuals based on their income group, which affects their probability of supporting the legislator during the next election.

The implications from this simplified model are derived from several assumptions: first, as the income of segments of either voter group (previous supporters or opponents) increases, the higher is the probability that members will support the legislator in the next election. Peltzman assumes that increases in contributions cause increases in the probability of support from both groups, and shows that

it is more likely that increases in  $V$  cause increases in contributions, although theoretically this sign could be positive or negative. Based on these assumptions, some implications are derived from changes in the income of either group. First, if either group's income increases,  $V$  increases. Second, if the variance between the two groups increases, holding constant the mean, the effect on  $V$  is ambiguous. However, applying the median voter model to assist in intuitively predicting its sign leads to Peltzman's primary methodological modification: distinguishing between supporters' and opponents' characteristics for use as explanatory variables. To see this, note that the income of the marginal voter in the last election must be closer to the opposition group's average than the supporting group's average. The income level evaluated at the competitive margin, then, is lower than that of the legislator's supporters. This implies that the legislator may vote less often for policies favoring his supporters, the greater is their wealth relative to that of the marginal voter. Thus, this application of the median voter theory to a simple principal-agent model yields Peltzman's innovation: the inclusion of characteristics of both supporters and opponents in the objective function. Finally, Peltzman cites the lack of a theory specifying the direction of effects of several economic characteristics on voting preferences for simply allowing the data to indicate

that information.

Turning to the implications for the significance of ideology as an independent determinant, its relative importance can be inferred from the magnitude by which its explanatory power changes when the matrix of economic variables is measured more precisely. Additionally, if ideology is in fact a proxy for omitted economic variables (and not some other unknown factor), then adding these economic variables to the equation will substantially improve its overall fit. So, if the influence of ideology declines greatly when additional or simply more precise empirical proxies for economic variables are employed, then the conclusion that ideology has little independent effect may not be rejected. Thus, the common conclusion of previous research that ideology is strongly significant, indeed sometimes the most significant variable, is spurious; that is, the ideology proxy is picking up the effects of omitted economic variables due to model misspecification or measurement error.

Peltzman's empirical strategy is the following: to the model including the conventional measures of ideology and average constituent characteristics he adds two elements. The first is the difference between average characteristics and supporter characteristics; the second, characteristics of campaign contributors.

Proxies for supporter characteristics must obviously be

constructed, since there is no way of knowing who did or didn't vote for a candidate. Supporter characteristics are generated by running a least squares regression of a senator's share of the vote in a county on a vector of economic and demographic characteristics of residents of that county. The explanatory variables used were: median family income, median education, percent aged over 65 years, percent black, percent urbanized, and percent of the labor force in the manufacturing sector. Then, to impute differences between the average voter and the senator's supporters, a dummy variable was assigned to each of the characteristics in the senator's share regression according to its significance: +1 for significant positive coefficients, -1 for significant negative coefficients, and 0 for insignificant coefficients. Finally, it is assumed that the true difference for each characteristic is a transformation of the corresponding dummy variable.

Before estimating the roll call voting equations, Peltzman previews one of the conclusions by first running regressions of a senator's ADA rating on economic characteristics. The explanatory variables are statewide averages of those used in the voting regressions plus the proportion unionized; differences between these average characteristic and supporter characteristics statewide, constructed as described above; characteristics of contributors, measured simply as labor's share of total

interest group contributions; and last, the senator's party affiliation.

Peltzman's procedure is to run the ADA regressions first with only average characteristics as explanatory variables, which produces an  $R^2$  of 0.36; second, to this model political party is added, increasing the  $R^2$  to 0.65. Past research has done exactly this, and concluded that ideology as measured by party has a significant effect on a senator's voting. However, Peltzman continues by deleting party and adding supporter characteristics, thereby producing an  $R^2$  of 0.59. To this model he adds contributor characteristics, which increases the  $R^2$  to 0.76. Finally, to this last model which takes account only of economic variables, he once again adds party to infer its independent effect. The  $R^2$  remains the same, which implies a negligible independent effect.

Two final points noted by Peltzman should be mentioned before summarizing the roll call voting regressions. The first is that from these results one cannot confidently draw the conclusion that "political kinship" as proxied by party has no effect on voting. The high correlation between party and the economic variables employed does not allow such an unambiguous statement. And second, one possible conclusion which is suggested is that party affiliation serves the function of all brand names, that of a cheap source of information. Therefore, party could be interpreted as

signalling a constituent about which candidate is most likely to vote in a manner consistent with the constituent's economic interests.

Now, turning to the roll call regressions, approximately the same procedure as above is followed to ascertain the importance of ideology in a nonrandom sample of senate roll call votes. The estimation procedure is logit, and the goodness-of-fit measure is the logit analogue, two times the log likelihood function (2LL), to the OLS mean-squared error. Starting with a naive model containing intercept only, the addition of average characteristics results in an improvement in 2LL equal to 21.8. Adding supporter characteristics to this model yields an improvement equal to 18.2, and finally adding contributor characteristics yields an additional 6.3. The sum of all interest or economic variables, then, improves the naive model by 46.3. Now, to this interest model the addition of party adds 3.0, ADA adds 8.3, and so the sum of the ideology proxies improves the model by 11.3. The major point here is that 80-90% of the explanatory power of the model derives from the three economic variables, leaving a much more limited role for ideology than that attributed to it by previous research.

Peltzman concludes that these results are not sufficient to deny the relevancy of applying traditional economic analysis to the political process. With a more

refined economic methodology, he believes that the conventional principal-agent model is an appropriate framework, and that serious exploration of ideology may be left to political scientists and sociologists.

### 2.2.3 Empirical Research on the Determination of Public Sector Labor Legislation

Another area of research in this literature describes the determination of public sector bargaining laws using cross-sectional data on states. The next six articles reviewed focus on, first, the theoretical framework, and second, the explanatory variables most successful in empirical applications. One of the earlier quantitative attempts to explain state bargaining laws is by Kochan (1973). This paper is one of the first to explicitly recognize that the determinants and effects of public policy are intertwined. Although not putting this relationship into a simultaneous equations framework, Kochan views state "environmental" characteristics as determinants prior, in an analytical sense, to the effects of bargaining laws. In other words, state characteristics are described as intervening variables, influencing and modifying the effects of public policy on the dependent variables under study.

Looking at various concepts of public policy is useful. First, policy may be explicit, as with comprehensive regulations on specific issues. On the other

hand, policy may be passive, through its interpretation from common or civil law in the absence of explicit regulation. The comprehensiveness of public sector bargaining laws is evaluated in terms of its degree of formalization of the bargaining process, since the trend has been toward greater formalization.

The empirical analysis involves the development of an index of public bargaining laws. Its categories include, among others, bargaining rights, strike and impasse procedures, scope of bargaining, and unfair labor practices. Each state is then assigned an ordinal value reflecting its degree of comprehensiveness within each category.

At the time this article was written, little empirical research had been done on the determinants of public policy. Then, as now, theoretical considerations go only so far in model specification; in particular, the direction of some independent variables in this model is left to the data. The environmental characteristics considered are first subdivided into three categories: one, economic and social characteristics; two, political characteristics; and three, public sector industrial relations characteristics (e.g. wage and employment levels, unionization, strike activity, and right-to-work laws). The results of zero-order correlations between the index of public policy and the state characteristics by category are as follows: for category one, states with the most



comprehensive policies tend to be more urbanized and industrialized, with higher (and rising) per capita income levels, and tend to have higher levels of per capita state expenditures and greater increases in per capita revenue from the federal government. For category two, the most comprehensive laws are associated with a decentralized decision-making process in state legislatures, the degree of partisan conflict, the length of time in existence of a merit system, the strength of the governor, the innovativeness of the state's legislature (measured by comparing the years in which states adopted selected policies since about 1900), and the amount of competition among political parties. For category three, all the following are associated with more comprehensive laws: unionization in the private sector, the number of high wage public employees, a rising public employee income level, and the absence of a right-to-work law.

The significance of Kochan's article today is in its comprehensive coverage of possible explanatory variables; in particular, its inclusion of political variables in an economic framework is a potentially useful synthesis. Another early study is by Moore and Newman (1976). Discriminant analysis is used to evaluate the determinants of teacher bargaining laws across states.

The explanatory variables include, first, the percentage of a state's employment in the government sector;

if this proxies the ability of employees to exert pressure, then it would have a positive impact on a state's probability of enacting bargaining laws. On the other hand, its effect could be negative if a larger group of employees induces greater resistance to enacting costly laws. Second, the percentage of employment in agriculture should have a negative influence on passage due to the traditional difficulties in organizing this sector. Third, a right-to-work dummy variable may represent policies unfavorable to unions, thus exerting a negative influence on passage. Fourth, a regional dummy variable equal to one for Southern states, zero otherwise, proxies the South's historical anti-union bias. Fifth, urbanization is hypothesized to have a positive effect; either way, urban residents are expected to have preferences systematically differing from other state residents. Sixth, population density is hypothesized to be positive; this variable is included to counteract the effect previous rural overrepresentation may have in obscuring the relationship between urbanization and public bargaining laws. Seventh, the share of government employees unionized, and finally, the share of total state nonagricultural employment unionized should both be positive.

Step-wise discriminant analysis was used to classify states into one of three groups describing the structure of public teacher bargaining laws from most to least comprehensive (or nonexistent). Among the results: the

percent of government employment is negatively related to the passage of mandatory bargaining laws (the most comprehensive category); the percent of agricultural employment is, surprisingly, largest not for the least comprehensive group as would be expected, but for the middle group. As predicted, the South dummy is largest for the least comprehensive group, and results on the percent urbanized imply that an increase in urbanization leads to the passage of more comprehensive laws. Population density is positively associated with passage, and the percentage of government unionization is largest for the most comprehensive laws, both as predicted. Contrary to expectations, the right-to-work dummy and the percent of total employment unionized (which includes members of employee associations) are not significant. Overall, the discriminant model classified 68 percent of the states correctly.

A comparison of these last two articles with a more recent one illustrates the progress made through the availability of improved econometric software. Hunt and White (1983) also examine the determinants of public teacher bargaining laws, with estimation by the N-chotomous probit technique.

This article explicitly employs the special interest theory of the demand for and supply of legislation as well as traditional industrial relations analysis. The latter

typically studies the effects of a collective bargaining structure on the terms of employment, taking the legal structure itself as given. Special interest theory, of course, assumes a simultaneously determined demand and supply framework. Specifically, this article explicitly attempts to identify those groups which are expected to be helped or hurt by teacher bargaining laws, as well as the latent groups for which the wealth redistribution process yields stakes too small to generate opposition. The industrial relations literature specifies determinants of the conditions of employment, or the work environment; assuming that collective bargaining changes this environment, these determinants should influence the structure of bargaining legislation. The authors conclude that the special interest theory is far superior to the industrial relations methodology in predicting legislative outcomes.

The dependent variable is an ordinal scale index with units zero through four reflecting increasingly favorable public teacher collective bargaining legislation. Two of the industrial relations employment condition variables which are presumed to affect the demand for legislation are the number of school districts relative to the school-age population, and the average teacher pay relative to median male income. Both are predicted to be negative: the former because the fewer the school districts, the greater their

monopsony power and thus the greater the demand by teachers for more comprehensive laws; the latter because the lower is teachers' relative pay, the greater are the benefits to be derived from bargaining legislation.

Another variable used is a measure of state and local education expenditures; the industrial relations literature hypothesizes a negative sign to reflect the reduction in expected benefits from legislation at higher levels of funding. If, however, funding decisions are viewed as determined simultaneously with bargaining outcomes, as is consistent with the special interest theory, this sign should be positive. Again consistent with the special interest theory is the identification of groups which benefit from or are harmed by the legislation. The percent of total public sector employment and the percent of private sector unionization indicate groups expected to gain from spillovers from teacher bargaining laws. Another group expected to benefit due to similarities in employment conditions is composed of health professionals who are not self-employed.

A variable capturing anti-union sentiment of private management, a group expected to oppose the legislation, is the number of unfair labor practice charges per representation election. A special interest group which may work to pass bargaining laws is parents of school-age children; therefore, the percentage of school-age population

is included and is hypothesized to be positive. Taxpayers as a group, of course, bear the burden of the wealth redistribution process engendered by the bargaining laws. Thus, the proportion of temporary residents as proxied by the estimated labor force separation rate is included and expected to have a positive influence on passage.

Income should be included in the model, since demand for bargaining laws will increase as income increases (assuming education is a normal good). Income is proxied by median male education.

Finally, the last two variables reflect a major thesis of this article regarding an aspect of the wealth redistribution process from teacher bargaining regulation. The authors propose that unionization and bargaining rights lead to a redistribution of wealth toward career teachers, i.e., long tenure in the profession is rewarded. This is consistent with what appear to be basic union goals in general: promoting the rewarding of seniority, and opposing subjective merit-based reward structures. Two variables included as a test of this hypothesis are the proportion of teachers in the labor force. If this variable is positive, the authors interpret it to mean that, contrary to their hypothesis, all teachers gain from bargaining. If negative, they presume it confirms their hypothesis that stayers gain at movers' expense, since some proportion of all teachers measured are employed in that district on a short-term basis

only. In addition, career workers are proxied by the percentage of male teachers, and this variable will be positive if stayers are in fact the net beneficiaries of bargaining legislation.

The estimation procedure employed is N-chotomous probit. The ordinal scale, measured from 1 to 4, reflects the underlying intensity of preferences for bargaining as latent variables which cross thresholds; as thresholds are crossed, these continuous preferences are measured discretely by the content of existing state bargaining laws. The range moves from no bargaining to prescribed bargaining. The statistical methodology employed is the McKelvey and Zavonia model (1975).

The empirical results suggest that, first, the industrial relations variables are of little importance in determining legislative outcomes. Second, the thesis that stayers are subsidized at movers' expense, or of wealth redistribution among teachers, appears to be supported. Third, other groups benefitting from teacher bargaining laws appear to support the legislation, while groups expecting to be harmed oppose it, providing additional support for the special interest theory of regulation. Fourth, labor force turnover carries a positive coefficient, which could indicate that taxpayer incentives to oppose the legislation are diminished if many taxpayers do not expect to be permanent residents.

Although this article provides some important insights into the determination of legislative outcomes from an explicit special interest perspective, ignoring the simultaneous determination of many of the explanatory variables raises, as always, questions about the reliability of conclusions based on possibly biased parameter estimates.

An article attempting to address the problem of cause and effect in bargaining legislation and growth in unionism is Saltzman (1985). He finds that primary causality runs from the enactment of bargaining legislation to the extent of unionism. On the other hand, in a model explaining the determinants of bargaining laws, the effect of teacher unionism is positive but weak; the most important explanatory variables are the extent of political patronage and the bargaining laws in neighboring states.

This paper expands on the few previous econometric analyses of bargaining law enactment and teacher union growth by expanding the set of explanatory variables and using a more appropriate measure of teacher unionization. The variables determining the extent of teacher unionization (referred to as the extent of teacher bargaining) are derived inductively, from observation; in this case, from interviews and previous studies. This approach is taken because the upsurge in public sector union membership during the 1960's and 1970's was neither predicted *ex ante* nor adequately rationalized *ex post*.



Briefly, the explanatory variables explaining unionization are broadly categorized under the following headings: teacher and school characteristics, labor market conditions, membership in other unions, attitudes toward unions, previous extent of bargaining, and public policy changes.

On the other hand, the regression explaining changes in the enactment or nature of bargaining laws (as well as in case law) contains the following explanatory variables: current extent of bargaining coverage, attitudes toward unions, changes in Democratic party strength, extent of political patronage, regional patterns, and previous bargaining laws. As noted, the dependent variable in this regression is the change in bargaining law status, not the level. The justification for this usage lies in the fact that the status of such laws is, of course, subject to change over time; in some cases, currently existing bargaining laws were passed years earlier. Therefore, current year independent variables better explain changes in, rather than levels of, laws. The author contends that the most appropriate specification is to lag the dependent variable (change in status), and match it with current year explanatory variables.

Data for both regressions were obtained by state for 10 years, biennially. The rationalization for estimating these two equations separately, when a simultaneous equations

framework is intuitively expected, rests on the use of the lagged dependent variables. That is, changes in bargaining laws are assumed to affect bargaining coverage only after a lag of months or years, and vice versa. Therefore, since the equation explaining changes in the nature of such laws employs lagged values of the extent of bargaining, and the equation explaining changes in the extent of bargaining employs lagged values of bargaining law changes, there are no jointly determined dependent variables. In other words, the lagged endogenous variables are predetermined, assuming the absence of autocorrelation. Therefore, the bargaining coverage model is estimated consistently by least squares, and the model measuring changes in the nature of bargaining laws is estimated by logit analysis; for the latter model, the dependent variable takes the value one if a state's bargaining law changed from less to more pro-union in a biennium, zero otherwise.

The major results for the two models will be very briefly summarized. For the LS bargaining coverage regression, the primary result is the dominance of the effect of changes in bargaining laws on bargaining coverage relative to all other explanatory variables. That is, the proportion of teachers covered by collective bargaining agreements is strongly and positively influenced by the enactment of laws mandating bargaining. Results pertaining to the remainder of the explanatory variables are generally

as predicted based on previous research; one contrary result, however, and difficult to rationalize, is the insignificance of labor movement strength as measured by membership in other unions.

In contrast, the logistic probability model determining changes in a state's bargaining law status produced the result that the extent of bargaining (as measured by bargaining coverage and union membership) is of only minor importance. The most significant explanatory variables are contained in the "political characteristics" and the "law pattern of contiguous states" categories. In fact, the most accurate predictor of more pro-union laws is the proportion of contiguous states mandating bargaining. However, two closely related measures of legal patterns in contiguous states have anomalous signs, which casts some doubt on the reliability of parameter coefficients in this general category. Finally, another unexpected result (unexpected in terms of previous research results) common to both equations is the insignificance of COPE ratings as indicators of attitudes towards unions.

The major conclusion of this article is that, although causality is in fact two-way, by far the most significant causal relationship runs in just one direction: from the enactment of teacher bargaining laws to the extent of teacher bargaining. The latter variable exerts only a small impact on the former.

Contradicting this conclusion is evidence on bargaining law status from two states, Ohio and Illinois. Saltzman (1988) examines these states which violate the general pattern of the evolution of legislation in public sector labor relations. Despite being industrialized, highly unionized northern states, neither enacted a public sector bargaining statute until 1983. An equally anomalous event is that despite the absence of legislation, both states had many public sector collective bargaining contracts. If laws are the major impetus behind union coverage, how are the cases of Ohio and Illinois explained?

Saltzman answers this question by examining in detail the public sector bargaining and legislative histories of these two states, and by conducting personal interviews with numerous individuals involved in organized labor and state government over this time period. He concludes, first, that the long delay in enacting legislation resulted from exceptional political factors peculiar to each state, and second, that after pro-bargaining laws were finally enacted in 1983, a causal increase in bargaining coverage ensued.

In both states, Saltzman finds that political patronage was a major obstacle to the legislation. However, the weakening of the Chicago Democratic machine after Mayor Daley's death (which had opposed bargaining law enactment as it represented a transferral of authority from Chicago to the state government), and the Democratic control of the

Ohio state government ensuing from the 1982 elections removed these obstacles.

Finally, using quantitative methods of analysis Saltzman finds that passage of the 1983 laws positively influenced bargaining coverage in both states. For instance, descriptive statistics and logistic regression results for Illinois teachers imply that the probability of bargaining coverage increased significantly after the 1983 law went into effect. (The conclusion that the enactment of the law increased Ohio's unionization was also reached; however, due to data limitations on union membership prior to the law's passage, this conclusion is based on very limited existing survey data and information from the extensive personal interviews conducted by the author.) Saltzman asserts that a causal relationship between legislation and union density is likely. He believes that in the 1960's and early 1970's, public sector bargaining laws and unionism were probably outcomes of the same social forces or sentiment. By the 1980's, however, the examples of Ohio and Illinois indicate that changes in the political climate and not sentiment will influence the future enactment of favorable legislation. This implies that laws matter; that is, the increases in bargaining coverage in Ohio and Illinois were caused by the legislation per se.

Finally, Chapter 2 concludes with an article by Farber (1988). He notes that the estimation of a full structural

model of the determination of bargaining laws and union membership is optimal in the sense that the direction of causality could be inferred. Due to data and econometric limitations he estimates a reduced form model explaining legislation, so that unionization is not allowed to directly affect the legal environment. The econometric framework consists of a Markov model of transitions. Transition probabilities are derived to explain the likelihood of a state enacting legislation conditional on the initial bargaining law category. The two categories of explanatory variables capture, first, the intensity of preferences toward public sector unionism, and second, the costs of enacting legislation. Legislation is enacted (i.e., it changes from one category to another) if preferences are strong enough to outweigh the legislative costs. The empirical proxies representing preferences toward unionism include congressional voting on labor issues (the COPE rating), private sector unionization, per capita income, size of the government sector, regional dummies, and a time trend. To measure the costs of enacting legislation, the number of days a state legislature meets, a measure of legislative activity, single party control of state government, and a time trend are included.

The transition model is set up in the following manner. Using the NBER data set described earlier, Farber uses observations on bargaining rights for states from 1955 to

1984. He specifies an ordinal measure of bargaining rights representing increasing permissiveness for each of three employee groups: state employees, police, and teachers. Maximum likelihood estimation is then applied to this extension of an ordinal probit model. The first set of results presents the parameter estimates for the extended ordinal probit model describing bargaining law strength. The second set uses these estimates to compute a predicted Markov transition matrix.

It is evident from the first set of results, that only the variables capturing intensity of preferences toward unionization are significant determinants of bargaining law status. Proxies for factors affecting the costs of producing legislation have no explanatory power. Some specific results are the positive and significant influence of COPE and non-southern regional dummies on bargaining laws. Further, weaker evidence implies that per capita income and per capita government expenditures have positive influences on bargaining law strength, and in addition private sector unionization appears to have no influence. Farber concludes at this point that the model is not successful in capturing the evolution of bargaining laws, and continues to the second set of results as a goodness-of-fit test. Using the parameter estimates from the first analysis, Farber estimates a Markov process to predict changes over time in the aggregate distribution of laws, and

the cross-sectional distribution of laws (or the predicted probability that in a given year an individual state has the bargaining law that is actually observed). Comparing these predictions to the observed distributions he finds that relative to the first test the model seriously underpredicts the sharp decrease in states with no law which actually occurred between 1964 and 1979. However, the model performs better in explaining the aggregate distribution of laws outside of this period.

Turning to the second goodness-of-fit test, the estimated probability that a particular state has the law that is actually observed is generally very inaccurate. The Markov model's unreliable performance in correctly identifying the legal status of individual states again points up the inadequacy of the original model in explaining the process of bargaining law evolution. Clearly this failure lies primarily with the legislative cost variables. Farber concludes that either the rationale for the inclusion of this category in a model of bargaining law determination should be examined more thoroughly, or more appropriate proxies for legislative costs are required.



CHAPTER 3  
EMPIRICAL ANALYSIS

3.1 Estimation Technique

The model of public sector bargaining laws in this thesis employs pooled data on forty-eight states (Alaska and Hawaii are excluded) for the years 1970 and 1980. An n-chotomous ordered response model (McKelvey and Zavonia (1975)) is employed to explain the three public sector bargaining law categories representing an escalating intensity of preferences towards unionization. If a state has either no bargaining provision or it specifically prohibits bargaining, then the dummy variable is set to zero; if a state has a mandatory meet and confer law (MMC), the dummy variable is set to one; and if the state has instituted the strongest possible provision, a mandatory bargaining law (MBL), the dummy variable equals two. This representation of the dummy variable model is that of an indicator of latent variables crossing thresholds. That is, if the model is written as

$$Y_j = X'_j * B + u_j, u_j \sim NID(0, \sigma^2),$$

then  $Y_j$  is the underlying continuous variable (i.e., sentiment toward unionization), and is unobservable. The

latent variable  $Y_j$  is denoted by SENTIMENT. What is actually observed is an ordinal (or categorical) variable,  $Z_j$ , representing the observable category into which the unobservable  $Y_j$  falls. Thus, with  $M$  response categories there are  $M+1$  thresholds. Define these unknown parameters as

$$u_0, u_1, \dots, u_m,$$

where

$$u_0 = -\infty, u_m = +\infty, \text{ and}$$

$$u_0 \leq u_1 \leq u_2 \leq \dots \leq u_m,$$

and  $u_1 = 0$  due to normalization, with  $\sigma^2 = 1$ .

For example, in this model the dummy variable  $Z_j$  falls into the first category, taking the value zero, if

$$u_0 \leq Y_j \leq u_1.$$

The unknown parameters are estimated by maximum likelihood procedures as described in McKelvey and Zavonia. The actual estimation was implemented using the LIMDEP software package (Greene).

### 3.2 The Model

The explanatory variables are divided into two categories: economic and demographic variables, and political variables. The economic variables are motivated by the Chicago School or private interest theory of regulation, and the political variables by the Public Choice School and the Economics of Legislatures School.

Beginning with the first category, the private interest

theory motivates inclusion of all variables representing groups expected to benefit from the legislation. The first three variables, then, represent a demand for public sector bargaining laws. The first variable is the percentage of the public sector organized, (PUBLIC UNION), which includes membership in unions as well as employee associations. The second is the percentage of all employment organized, (PRIVATE UNION). This variable could proxy one of two conflicting effects in the context of the private interest theory. The first represents the interest group demand of organized labor. Private sector unions have an interest in promoting the bargaining position of organized labor, and thus PRIVATE UNION may proxy the strength of the labor movement. On the other hand, the possibility of divergence between the stated goals, beliefs, values and preferences of union leadership and rank-and-file membership is frequently hypothesized. Although private sector union leadership expresses support for and contributes resources to public unionism, it is possible that the private sector rank-and-file are more influenced by their position as a taxed group than their common membership in the labor movement. That is, opposition may be generated by the rank-and-file's taxpayer costs of implementing strong public sector bargaining rights. Whether the costs exceed the expected spillover benefits accruing to organized labor is an empirical question.

Third, the percent employed in the public sector, (EGS), is included, but its sign cannot be predicted from the theory. If passage of legislation is specific to one occupation (or one group of occupations), spillovers to other public sector occupations may cause overall demand to increase and so to produce a positive sign. In addition, if the size of the public sector also proxies its strength and thus its ability to influence legislation, its effect is reinforced. On the other hand, a large public sector may also motivate significant opposition as increasing size causes costs associated with the legislation to rise. This could generate opposition from the suppliers of regulation as well as intensify the existing opposition of other groups.

One of the special interests expected to be hostile to organized labor and thus to commit resources opposing bargaining laws is management. Its opposition is proxied by the fourth variable, the number of unfair labor practice cases filed, (UNFAIR). Since gains accruing to public sector unionism signal benefits to unionism in general, management in the private sector will seek to discourage legislation providing these gains. The greater the number of unfair labor practice charges filed against employers, the greater will be management's opposition to union gains in general. Thus, the coefficient on UNFAIR should be negative.

Several additional variables are included as proxies for tastes or preferences toward bargaining rights and unionism in general; therefore, they represent demand shift variables. They are percent urbanized (URB), population density (POPD), the proportion of the labor force between ages 55 and 64 (SLF), and two dummy variables representing Southern states (SOU) and states with a right-to-work law (RTW). Let us consider the expected effects of these taste variables.

The fifth variable is the percentage of a state which is urbanized (URB). It is an environmental characteristic expected to exert a positive influence on the passage of bargaining legislation by influencing tastes toward unionism. Previous research has confirmed that this sign if in fact typically positive. In addition to this is the sixth variable, population density (POPD). This measure of the population per square mile within a state is added because the true relationship between urbanization and bargaining legislation may be obscured by the disproportionately large representation of rural residents in state legislatures prior to reapportionment (Moore and Newman, 1976).

The seventh variable, SLF or senior labor force, represents a personal characteristic affecting preferences toward union membership, and thus sentiment toward bargaining laws. Experience, or age, appears to be

systematically related to the probability of being a union member or of voting yes or no in NLRB representation elections. Studies relating age to union membership or to votes in union representation elections have yielded conflicting results. Some indicate union membership increases with age, others show membership decreases with age, and some find age insignificant (Hirsch and Addison, 1986:p.58). One possible explanation is that a concave relationship exists between union membership and experience (Duncan and Stafford, 1980). Because of multicollinearity problems, only the senior labor force is entered as an explanatory variable as opposed to entering several categories representing young workers and prime-aged workers as well. If there is in fact a concave relationship between union membership and experience, it may show up as a positive sign on SLF and a negative sign on SLF squared.

The eighth variable, RTW, is a dummy set equal to one if a state has an RTW law, zero otherwise. Recent research on the effects of RTW laws tends to conclude that they have no significant independent effect on the extent of unionism; rather, they mirror existing attitudes toward unionism (Moore and Newman, 1985). The ninth variable (SOUTH), a dummy equaling one for Southern states, has essentially the same motivation. Historically, the South has been more hostile to unions than other regions, and this factor has inhibited union growth. One explanation advanced for this

systematic difference in preferences by region is related to the level of economic development. The South, traditionally a less developed region in the U.S., may resist unionism more strongly on the argument that it creates a less attractive environment in which to attract industry (Marshall, 1967). The tenth and eleventh variables are the proportion of the labor force which is female (WLF), and the proportion which is non-white (NWLF). Past research indicates that women are less likely and non-whites more likely to be union members.

Two additional demand factors are included in our legislation model. The twelfth variable is the average monthly salary of state employees (GOVWAGE). Two opposing effects are possible from this variable. The first is the interest group demand effect; that is, assuming that union services are normal goods, an increase in income results in greater demand for these services as well as legislation which supports them. On the other hand, some studies have found that workers who support unions tend to be relatively low wage employees. That is, in studies determining the probability that a worker will vote for or against a union in a representation election, workers with salaries at the lower end of the interfirm wage distribution are the most likely to vote yes (Farber and Saks (1980)). Evidence indicates that one of the effects of unions is to flatten the earnings distribution, thereby benefitting low wage

employees relatively more than high wage employees. In calculating the benefits and costs of union membership, one of the most important variables is the expected effect on the wage; thus, relatively high wage workers perceive lower benefits to unionization. Which of these hypotheses dominates is an empirical question.

The last and thirteenth demand variable is the unemployment rate (UNE), which accounts for labor market conditions affecting the strength or militancy of organized labor and thus its probability of success in demanding legislative gains (or of attempting to secure such gains in the first place). The widespread conclusion of U.S. research is that variables assumed to measure union militancy (e.g., strike activity) move procyclically (Hirsch and Addison, 1986:pp.99-100). That is, the rank and file union membership is more militant in terms of organized demands and the probability of concession when greater alternative employment opportunities exist and when past real wage increases are lower, as when the price level is rising faster than the nominal wage rate (Ashenfelter and Johnson, 1969). Therefore, the unemployment rate is expected to have a negative effect on the demand for bargaining laws.

Turning to the supply side, the second category of explanatory variables used in modelling the determinants of bargaining laws is composed of characteristics of the



political process. The Public Choice School represents an extension of the Stigler-Peltzman-Becker economic model by explicitly accounting for the limitations on the wealth transfer process inherent in the production of political goods (Smith, 1982). That is, the Chicago School assumptions of rationally ignorant voters and passive legislators are relaxed. Thus, the wealth transfer process is constrained on the supply side by the political costs to a legislator (or a political party) of supporting special interest legislation. In addition, the Economics of Legislatures School accounts for the economics costs of agreement, or of collective decision-making.

One measure of political cost is provided by calculating state-wide averages of congressional COPE ratings (COPE). As noted, this variable is typically included in empirical studies as an ideology proxy. Here it is assumed that it measures the political cost to the politician of supporting labor legislation. If legislators tend to vote with rather than against their constituents' interests, then high average COPE ratings imply greater pro-labor sentiment within a state. Therefore, the political cost to a state legislator of voting in favor of laws upholding public sector bargaining rights is lower in a state with higher average COPE ratings. The sign of COPE is expected to be positive.

A second variable proxying the political costs of

legislation is PRIOR-LEG, the proportion of contiguous states which had passed a manatory bargaining law prior to the observation years. According to Saltzman (1985), political scientists have shown that state governments tend to adopt policies similar to those in neighboring states because public officials are more likely to consult their counterparts in nearby states, and because neighboring states often have many socioeconomic characteristics in common. In addition, this variable may also proxy demand for bargaining through the demonstration effect of public employee bargaining in a neighboring state. Either way this variable is expected to have a positive sign.

Finally, several variables were tested as additional supply constraints representing the economic costs implied by the Economics of Legislature's School. One of the major indicators of the economic cost of agreement is the degree of interparty competition within a legislature. Variables measuring political dominance are thus expected to affect special interest legislative output.

The first variable is TURN, the number of times the majority party changed hands in the last ten years. At least two opposing effects from this variable are possible. The first is a fixed-cost effect and implies a negative relationship between a change in majority party and legislative output. This is a result of the start-up costs a new regime incurs in organizing and rearranging the means

of production; as a result, output productivity falls. A countervailing effect in this model, however, owes its existence to the unique nature of the type of legislation under study. Special interest legislation as a component of total legislative output may increase with a change in the majority party if such legislation were promised in exchange for political support during the campaign. If this relationship is positive, it supports the contention that a higher degree of inter-party competition leads to a greater amount of special interest legislation.

Second, control of the legislature by the Democratic party is expected to affect the costs (both political and economic) of supplying labor legislation. Typically, the Democratic party represents and supports labor; therefore, a legislature controlled by Democrats may be assumed to face less opposition within the legislature (a lower economic cost), and less opposition from constituents (a lower political cost) to the passage of pro-labor bargaining laws. A dummy variable, (UPPER), set equal to one indicates that the Democrats control the upper legislative house, zero otherwise. An analogous dummy, (LOWER), refers to the lower house.

Another variable tested was Log MAJ-PARTY, the natural log of the percentage of seats held by the majority party. Clearly this variable is highly correlated with TURN, and its sign cannot be predicted a priori. Crain argues that

legislative output as controlled by the majority party is subject to strong economies of scale. In addition, diminishing returns to party dominance are predicted by Stigler (1972). An opposing view is that large majority proportions represent effective entry barriers to legislative seats; therefore, the application of monopoly theory yields the prediction that less competition (as measured by large majorities) results in restricted legislative output at a higher price (Anderson and Tollison (1988)). Either way, however, diminishing returns to dominance are expected.

Other economic cost variables tested were the length of the legislative session, the session's frequency (annually or biannually), the length of the legislator's term in office, the size of the legislature, and a bicameralism indicator (the ratio of the size of the upper house to that of the lower house). These variables were all insignificant, and thus were omitted from further testing.

Preliminary results of the ordered probit analysis indicated that the demographic variables URBAN and DENSITY play no significant role in explaining variation in public sector bargaining laws across states and over time. These two variables are highly collinear, not just with each other, but potentially with all the other economic/demographic variables. The consequences of multicollinearity are imprecise parameter estimates. This is

expected to be a problem in any model which contains as right hand side variables both unionization and other economic variables which are determinants of unionization, and highly correlated among themselves as well. Both URBAN and DENSITY were subsequently deleted from the model. The final specification is therefore the product of, first, a theoretical model the implications of which provide testable hypotheses in the form of suggested explanatory variables. The second contribution, indispensable in empirical research due to data limitations as well as limitations in available econometric estimation techniques, is specification by hypothesis testing. Pre-testing produces parameter estimates with unknown properties; that is, their distribution is conditional on the "correctness" of the model.

### 3.3 Ordinal Probit Estimation Results

The empirical results are contained in Table 1. Discussing some notable omissions first, EGS (the percent employed in the public sector), and TURN (the number of times the majority party changes hands in the preceding ten years), were both omitted in preliminary testing due to insignificance. Both these variables are subject to opposing influences on sign, as was discussed. It is not surprising, therefore, that these effects might wash out. The effect of EGS, for example, is confounded due to its

TABLE 1  
ORDINAL PROBIT ESTIMATION:  
THE DETERMINANTS OF BARGAINING LAWS  
(asymptotic t-statistics in parentheses)

84

| Explanatory Variables | Dependent Variable = Bargaining Legislation |
|-----------------------|---|
| INTERCEPT             | 16.94<br>(2.62)                             |
| PUBLIC UNION          | 0.06<br>(2.60)                              |
| GOVWAGE               | 0.001<br>(1.69)                             |
| UNFAIR                | -0.0009<br>(-2.40)                          |
| PRIVATE UNION         | -0.04<br>(-1.27)                            |
| NWLF                  | 0.06<br>(1.64)                              |
| COPE                  | 0.01<br>(1.59)                              |
| PRIOR-LEG             | 0.01<br>(1.96)                              |
| Log MAJ-PARTY         | -5.09<br>(-3.25)                            |

simultaneous determination by both demand and supply.

In addition, the political variables UPPER and LOWER were omitted in preliminary models, as was RTW. RTW laws cover public sector employees in sixteen of the twenty RTW states; if the RTW variable proxies sentiment towards unionization as is suggested by recent research, it is incorrectly specified as an independent variable in a single equation model explaining bargaining law strength, a proxy for the same unobservable, latent variable sentiment. In this case, bargaining law strength and RTW provisions are jointly determined endogenous variables. On the other hand, if the existence of a RTW law does in fact independently influence the passage of bargaining laws (and thus also the level of unionization for example), presumably it would show up as a significant and negative variable in a single equation model.

Of the reported demand variables, only PRIVATE UNION is not significant. Since this variable is expected to influence bargaining law passage in opposing directions, it is possible that its influence is washed out. PUBLIC UNION, UNFAIR, and NWLF are all significant, and have the signs predicted. GOVWAGE is significant and positive, supporting the hypothesis that union services are normal goods.

In terms of the supply variables, COPE and PRIOR-LEG are both significant and positive, supporting the lower

political cost hypotheses attached to them. Again, however, PRIOR-LEG may actually (or additionally) be picking up a positive demand-side demonstration effect; this is one of the consequences of estimating a reduced form equation. Finally, the only economic cost variable attaining significance is Log MAJ-PARTY. Its coefficient is negative, which supports the monopoly theory prediction that greater competition among political parties results in greater special interest legislative output. On the other hand, this variable could be a rough proxy for the South, since this region is dominated by a single party to a much greater degree than any other region. (Although the single party referred to is the Democratic party, the conservatism of traditional southern Democrats is well known; this variable, then, may simply be picking up unmeasurable anti-union preferences in the South.)

### 3.4 Summary

In sum, this n-chotomous dependent variable model estimating the determinants of public sector bargaining laws across states and over time is consistent with current research. In common with this research, one-way causality is assumed, ruling out the possibility of the joint determination of levels of unionization and the passage of bargaining laws. It appears that single equation models such as this have extended knowledge of the causes of



variation in bargaining laws as far as they are able. Further extensions in this area are expected from the expansion of this basic model to a simultaneous equations system.

## CHAPTER 1

### INTRODUCTION TO TOPIC TWO

Any study attempting to account for differences in union density or changes in the level of unionization must account for the relevant legal structure. Studies of private sector unionism have focused on the effects of right-to-work (RTW) laws, since this is the only major variable affecting private sector employee unionization determined on the state, rather than the federal, level. In contrast, laws governing public sector unionism originate at the state level, thus providing a wide variety of regulations which may be analyzed to explain differences in unionization across states and over time.

In Topic One, the determinants of public sector bargaining laws were modelled. The purpose of Topic Two is to analyze the effects of such laws on differences in public sector union density across states. As was discussed in the first topic, one of the determinants of the legal structure defining the status of public unionism is the extent of bargaining or the proportion of the public sector unionized. Therefore, the major contribution of the current topic is the analysis of the effects of these laws within the context

of a simultaneous equations system in which bargaining laws and unionization are treated as jointly determined endogenous variables.

Again, the economic theory of regulation provides the theoretical foundation upon which to build a model of the simultaneous determination of unionization and bargaining law status. Extending the Chicago School framework, political variables implied by both the Public Choice and the Economics of Legislatures schools are employed.

Chapter 2 is a survey of the empirical literature on the effects of bargaining laws. Since the earliest body of work examining the effects on unionization of laws governing union status pertains to the private sector, a brief review of the RTW literature begins the chapter. Next, the more recent attempts to measure the public sector effects of differing legal structures are included.

Chapter 3 develops a reduced form model of union status or unionization, i.e., the 'effects' equation, to add to the previously developed equation explaining the determinants of bargaining law status across states. As mentioned, the econometric technique reflects the simultaneous determination of one continuous endogenous variable (unionization) and one ordinaly measured discrete endogenous variable (bargaining legislation). Bargaining law status, then, must be estimated as an ordinal qualitative endogenous variable within a simultaneous

equations system. Chapter 4 describes the econometric methodology employed to accomplish this: an extension of the econometric procedure developed by Heckman (1978). In addition, Chapter 4 describes the model to be estimated and presents the empirical results.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### 2.1 The Private Sector: The Effects of Right-to-Work Laws on Unionization

The early debate over RTW laws was limited primarily to the economic effects of such a law: did RTW laws exert a significant, negative, and independent influence on union growth, or were they merely proxies for anti-union sentiment? By the mid-1970's, however, the finding that unionization had a negative influence on RTW status made clear the necessity of considering the two to be jointly determined endogenous variables (Moore, Newman, and Thomas (1974)). Therefore, in a single-equation model of the effects of the passage of an RTW law, the RTW estimator is expected to be biased and inconsistent; specifically, its reported effect on unionization should overstate its actual effect if it is picking up two-way causality.

To investigate this possible simultaneous bias, Moore and Newman (1975) used ordinary least squares (OLS) regressions to explain the variation in union density across states, then re-estimated the model by Two Stage Least Squares (2SLS) to allow for simultaneous determination.

They then compared the RTW parameter coefficients from each technique. OLS estimation produced a negative and significant RTW coefficient, while the 2SLS procedure indicated that the RTW variable had no significant impact on unionization.

Using a single-equation model and a crude technique to separate the directions of causality, Lumsden and Petersen (1975) conclude that RTW laws exert no independent influence on unionization. Starting from a typical reduced form equation derived from a model of the demand for and supply of union services, the authors attempt to distinguish between two possible interpretations of the effects of RTW laws on unionization within a single equation context. One interpretation is that RTW laws increase the cost of unionization, thereby decreasing the supply and equilibrium level of union services. A competing hypothesis is that RTW laws merely proxy tastes for or against unionism, and thus exert no independent influence. Data on state-wide union density is employed for years prior (1939) and subsequent (1953, 1968) to the passage in 1947 of the Taft-Hartley Act, which allowed states to ban union shops. In the first regression, the cross-section was estimated for 1939 and 1953. For 1953, a dummy variable was set equal to one for states with RTW laws in existence by that year; in addition, for the 1939 observations a dummy variable was included which was set to one for those states which would enact an

RTW law by 1953, zero otherwise. Therefore, the RTW parameter for the 1939 observations was interpreted as a pure proxy for tastes, since no law was actually in effect. The RTW coefficient in 1953, however, could represent a combination of both possible interpretations of the RTW variable. If, then, the 1953 RTW coefficient is significantly greater than its 1939 counterpart, one may reject the hypothesis that RTW laws reflect tastes only, assuming preferences remained constant over time; in this case one would conclude that RTW laws per se depress growth in unionization levels. In a second test of the hypothesis, the same procedure was carried out with the addition of observations for 1968. Again, a dummy variable was set equal to one for states which would have an RTW law in existence in 1968. The purpose of this addition was to allow a longer time lag during which any independent effects of the law might be manifested.

Regression results from both specifications yielded the same conclusion: the hypothesis of no independent RTW effect on unionization could not be rejected. This implication supports the interpretation of RTW laws as mere proxies for tastes for or against unionism.

This study seems to provide somewhat stronger evidence on the effects of RTW laws than does a simple, conventional single-equation model; nonetheless, the correct specification of the process determining RTW status and

unionization involves simultaneous estimation as was undertaken by Moore and Newman (1975) and by the authors of the following article.

Warren and Strauss (1979) estimate a two-equation model with RTW and unionization specified as jointly determined endogenous variables. The RTW dummy variable is a discrete realization of a latent, continuous, unobservable variable; therefore, an appropriate estimation technique must allow for its qualitative nature. The technique employed here is the mixed logit model (Schmidt and Strauss (1976)). Their results on the effects of RTW laws on unionization are contrary to the two previous studies: they found RTW to have a significant and negative impact on unionization levels. In addition, the effect of unionization on RTW status is significant and negative (consistent with Moore et al. (1974)). In comparing these results to those of single-equation models estimated by others and by themselves, the authors conclude that by incompletely characterizing the true relationship, single-equation techniques may lead to incorrect inferences.

Continuing in the simultaneous equations framework, Wessels (1981) extends the basic model by considering two sources of bias present in most previous studies. The first results from ignoring the simultaneous determination of RTW status with wages as well as with union membership. The second source of bias stems from ignoring the simultaneity



between wages and union membership. The first bias may be corrected by a procedure developed by Heckman (1978), while the second bias is corrected explicitly within this simultaneous equations framework by treating as endogenous the choice to join a union.

Wessels estimates a four equation model, the purpose of which is to analyze the effects of RTW laws on wages, unionization, and strike frequency. Strike frequency was chosen as a proxy for union militancy, and as Wessels notes, the economic literature on RTW effects has concentrated on these three variables.

The following briefly describes the econometric method employed. First, a four equation model is specified, with wages ( $w_i$ ), union membership ( $u_i$ ), strike frequency ( $s_i$ ), and pro-RTW sentiment ( $RTWSENT_i$ ) the jointly determined endogenous variables. The subscript  $i$  indexes states. The last variable,  $RTWSENT_i$ , is an unobservable latent variable; as such, the model specifies (or predicts) that a state will have an RTW law only if  $RTWSENT_i$  is nonnegative. This predicted variable is denoted by  $RTW_i$ :

$$RTW_i = 1, \text{ iff } RTWSENT_i \geq 0,$$

$$RTW_i = 0, \text{ otherwise.}$$

Note that this dummy variable scheme may be described, as in Heckman, by recognizing that dummy variables serve one of two distinct roles. First, in Wessel's model,  $RTW_i$  takes the role of a direct shifter of behavioral equations.

Second, the role of  $RTWSENT_i$  is that of an indicator of latent variables crossing thresholds. Heckman's econometric procedure is based on this statistical model, first proposed by Pearson in 1900, of the generation of discrete endogenous variables by continuous, underlying, unobservable variables crossing thresholds.

With this in mind, Wessels' structural model may be written compactly as follows:

$$(1) \quad w_i = a_{12}(u_i) + a_{13}(s_i) + a_{14}(RTWSENT_i) + b_1(RTW_i) \\ + c_1(X_{1i}) + e_{1i}$$

$$(2) \quad u_i = a_{21}(w_i) + a_{23}(s_i) + a_{24}(RTWSENT_i) + b_2(RTW_i) \\ + c_2(X_{2i}) + e_{2i}$$

$$(3) \quad s_i = a_{31}(w_i) + a_{32}(u_i) + a_{34}(RTWSENT_i) + b_3(RTW_i) \\ + c_3(X_{3i}) + e_{3i}$$

$$(4) \quad RTWSENT_i = a_{41}(w_i) + a_{42}(u_i) + a_{43}(s_i) + b_4(RTW_i) \\ + c_4(X_{4i}) + e_{4i},$$

where  $X_{j,i}$  is a vector of exogenous variables, and  $e_{j,i}$  is the error term for equation  $j$ .

Wessel's derives consistent, although not asymptotically efficient, estimates of the structural parameters by first estimating the reduced form. Following Heckman, the predicted rather than the actual value of  $RTW_i$  is inserted along with the other predicted values of endogenous variables in the second stage of estimation. (A complete discussion of Heckman's technique will be included in Chapter Three.) Calculation of the structural parameters

yields the following results, briefly summarized.

RTW<sub>1</sub>, the dummy variable directly shifting each behavioral equation, has no significant effect on wages, unionization, or strikes. In addition, the estimated value of the unobservable variable representing favorable RTW sentiment, RTWSENT<sub>1</sub>, is insignificant in all three equations. (An unexpected result relating to RTWSENT<sub>1</sub> is that it turned out to be positively, albeit insignificantly, related to another measure of pro-union sentiment included as an additional endogenous variable in the original model.)

Finally, Wessels notes that in accord with Ashenfelter and Johnson (1972), Schmidt and Strauss (1976), and Schmidt (1978), unionization has no significant effect on wages. Wages, however, positively and significantly influence the percent unionized. Finally, strike frequency, the proxy for union militancy, has a significant and positive effect on unionization.

Another possible extension of the conventional model used to measure the impact of RTW laws is contained in Hunt and White (1983). Specifically, they consider the possibility that in the presence of RTW laws, union behavior may differ systematically from that in non-RTW states in ways which union membership levels don't capture. In other words, even if RTW laws have no significant influence on percent organized as most studies conclude, other union

outcomes may be significantly affected. The authors employ, among others, the following indices of union success in an attempt to capture any genuine RTW effects on union outcomes: election voting behavior, the size of newly certified units, and the rate of union decertification. Furthermore, they identify and test three distinct hypotheses regarding RTW laws and union outcomes. The first is the free rider argument predicting a decreased supply of union services in RTW states. The second, the saturationist hypothesis, predicts greater organizing activity in RTW states due to the concentration of unorganized workers. The third hypothesis is that the effects of RTW laws are mitigated by systematically differing organizing behavior in RTW and non-RTW states.

Using SMSA data from 35 states, the authors test their model employing a total of eight different dependent variables measuring union outcomes. Each provides some index of a union's success rate. A wide array of SMSA level variables are available to proxy the perceived costs and benefits of joining a union. Assuming that the endogenous variables are outcomes of the unionization process exerting no influence on the legal structure (i.e., ruling out two-way causality), RTW is treated as a purely exogenous variable. Also assumed exogenous is another law which is assumed to proxy sentiment towards unions: mandatory teacher bargaining.

In the interest of brevity, only those results pertaining to the two legislative status exogenous variables will be reported. First, sample statistics yield the following conclusions. One, the free rider hypothesis is not supported; RTW status does not significantly influence union membership. Two, union election voting turnout is significantly lower in RTW states. Three, the size of newly certified bargaining units tends to be greater in RTW states, and the rate of decertification lower.

Second, turning to the single equation OLS regression results, the legislative climate is significant in determining union outcomes. RTW laws are negatively related to voter turnout, while mandatory teacher bargaining laws also exert a negative influence on the percentage of voters choosing the no-union option. Finally, Chow tests were performed to determine whether union returns to the various characteristics (i.e., independent variables) in the model differed systematically between RTW and non-RTW states. In five of the eight models the slopes were in fact significantly different.

The authors conclude that, contrary to much of the previous work on RTW effects, RTW states experience significantly different union outcomes as measured by union success variables other than percent organized. Their evidence also lends credence to the saturationist hypothesis, and refutes the free rider hypothesis.

The significance of this article involves its use of union outcome variables other than proportion unionized. Subsequent research employing a variety of finely detailed proxies for union success may also find these variables to be significantly influenced by the legislative climate. Furthermore, the use of simultaneous equations models would provide more reliable conclusions by avoiding the possible bias involved in ignoring the joint determination of laws and union outcomes.

Finally, Moore and Newman's (1985) survey of the RTW literature classifies models according to three major specifications, shedding light on the reasons underlying the differing results. First, the extreme sensitivity of estimated RTW effects according to the econometric specification and technique employed is clear. Most of the studies which treat RTW as exogenous find it to have a significant and negative impact on unionization. This result holds true not only for the single equation models, but also for the simultaneous equation models which entered RTW laws as an exogenous variable. On the other hand, when RTW status and unionization are treated as jointly determined endogenous variables, the RTW coefficient tends to lose its significance. (An exception to this tendency is found by Warren and Strauss (1979).)

Second, in the context once again of single equation models, those which appear to adequately account for tastes

by inclusion of relevant control variables reveal that RTW status has little impact on unionization. In contrast, models in which tastes for unionism are not well proxied find that RTW laws play a much more influential role. This provides indirect support for the taste hypothesis against the free rider and bargaining power hypotheses. (The latter hypothesis, as noted by the authors, implies that RTW laws cause less demand for union services since workers' expectations of unionism's benefits are lower due to a perceived loss of bargaining power; in addition, the supply of union services may decrease as unions concomitantly experience lower marginal returns to organizing activity.)

The previous studies focused explicitly on the effects of RTW laws within the context of a model of the determination of union status. Before examining the literature on the legislation regulating public sector unionism, a series of three articles will be reviewed which, using micro data, explicitly derive empirical models from a utility-maximizing choice model explaining individuals' union decisions. Building on this framework, the third article incorporates the effects of an individual's RTW coverage status. Finally, concluding this section on private sector unionism is an article accounting for the effects of RTW laws on flows into, rather than stocks of, unionization.

The first article in the series of three is by Farber

and Saks (1980). This study attempts to isolate the union membership decision from the job decision by using voting and other data on individuals participating in NLRB union representation elections. As the authors point out, a worker can choose to become a union member one of three ways: by joining a union in an open shop situation; by accepting employment in a union shop situation; or by voting in favor of the union in a representation election. Most studies measure the extent of unionization or of covered jobs; therefore, they cannot abstract from the employment decision to address separately the union membership decision. This model, then not only abstracts from the job decision to model the determination of union status, it abstracts from past worker determination to focus solely on an individual's current expectations concerning the benefits and costs of unionization.

The data allow the estimation of a model with the following interpretation: a vote in favor of a union occurs if the expected utility from the job becoming a union job is greater than from it remaining nonunion. The primary issue involved here, then, is the expectation of how unions affect wage and nonwage outcomes, controlling for tastes which may systematically vary across subgroups owing to differing perceptions of unionism's impact.

Looking at wage outcomes, an important hypothesis of this paper is that the effect of unionization on an



individual's wage is negatively related to his or her position in the intrafirm earnings distribution; in other words, the probability of a yes vote is negatively related to the intrafirm earnings distribution position. Previous evidence supporting this hypothesis is reported by Freeman (1978b), (cited on p. 352) who reviewed studies on the effects of unions on wage dispersion. He concludes that earnings dispersion in unionized sectors of the economy has been reduced by intrafirm wage standardization, interfirm standardization of blue-collar wages, and the reduction of the white-collar/blue-collar earnings differential.

The other important feature of unionism affecting workers' cost/benefit expectations is its effects on nonwage outcomes: this article focuses solely on changes in job characteristics. Farber and Saks focus on one particular job characteristic modification: the substitution of bureaucratic for personal rules in terms of hiring and promotion decisions, work schedules, and disciplinary procedures. Therefore, the probability that an individual will vote yes is positively associated with his or her perception of arbitrary or discriminatory treatment of workers by management.

As noted previously, the model is specified such that individual  $i$  votes yes if and only if the expected utility from the job becoming unionized ( $E(V_{ui})$ ) exceeds the expected utility from the job remaining nonunion ( $E(V_{ni})$ ).

In particular,

$$E(V_{ni}) = P_{ni} * V_{ni} + (1 - P_{ni}) V_{mi},$$

$$E(V_{ui}) = P_{ui} * V_{ui} + (1 - P_{ui}) V_{mi},$$

where  $P_{ni}$  = the probability of individual  $i$ 's retaining the job if it remains nonunion,

$P_{ui}$  = the probability of individual  $i$ 's retaining the job if it becomes union,

and  $V_{mi}$  = the utility individual  $i$  attaches to some available, certainty-equivalent alternative job if the current job is not retained.

Therefore, the condition for individual  $i$  to vote yes, or in favor of the union, may be rearranged and written:

$$(1) \quad Z_i = P_{ui} (V_{ui} - V_{ni}) + (P_{ui} - P_{ni}) (V_{ni} - V_{mi}) > 0.$$

Farber and Saks then related the data to each term in equation 1, thereby deriving the empirical model to be estimated by probit analysis. Without replicating the detailed data analysis provided by the authors, a brief discussion of the data employed is presented here.

Beginning with the first term,  $P_{ui}$  is specified to be a positive function of individual  $i$ 's seniority. Next,  $(V_{ui} - V_{ni})$  is determined by individual  $i$ 's expectations concerning the impact of unionization on wage and nonwage outcomes, and also by tastes for unionization. The empirical variables used in this term are, first, individual  $i$ 's adjusted standardized deviation from the within-firm mean earnings ( $DEV_i$ ). Second, three dummy variables are

used to measure nonwage union outcomes.  $RDET_i$  equals one if individual  $i$  expects unionization to cause a deterioration in worker-management relations.  $FIMP_i$  equals one if individual  $i$  expects unions to increase fairness of treatment by management.  $PRO_i$  equals one if individual  $i$  believes he or she is likely to be promoted based on merit. The hypothesized signs are:  $RDET < 0$ ,  $FIMP > 0$ , and  $PRO < 0$ . The last coefficient is expected to be negative since unionization typically results in seniority-based promotion rules; thus, ambitious individuals tend to believe that the imposition of union rules will harm rather than benefit them.

Third, several control variables are included as taste proxies for individual  $i$ . These are age, sex, race, education, and urbanization of the location in which the individual was raised.

The final term in equation (1) is  $(P_{u1} - P_{n1})(V_{n1} - V_{u1})$ , and is expressed empirically as the following:

$$(1a) B_5(DIFF_i) + B_6(DIFF_i * DS_i),$$

where  $DIFF_i$  is a dummy variable equalling one if individual  $i$  expects finding an equivalent job to be difficult, zero otherwise, and

$DS_i$  is a dummy variable equalling one if individual  $i$  is not satisfied with the job security of the nonunion job, zero otherwise, and it is hypothesized that  $B_5 < 0$ ,  $B_6 > 0$ .

This specification has the following implications:

one, equation (1a) is zero for individuals who expect that finding an equivalent job will be easy; therefore, they are indifferent between their current job and an equivalent job; two, for individuals who believe it will be difficult to find an alternative job, and are satisfied with their job security,  $V_{n1} - V_{m1} > 0$  and  $P_{u1} - P_{n1} < 0$ , so that they are less likely to vote yes, i.e.,  $B_5 < 0$ ; three, for individuals who believe it will be difficult to find an alternative job, but who are not satisfied with their job security,  $V_{n1} - V_{m1} > 0$  and  $P_{u1} - P_{n1} > 0$ , so that they are more likely to vote yes than the 'satisfied' group, i.e.,  $B_6 > 0$ ; four, it is possible that this latter group is even more likely to vote yes than those who expect to easily find an alternative job, implying that  $B_5 + B_6 > 0$ .

Substituting the empirical components into equation (1) yields the probit model, the parameters of which are computed by maximum likelihood estimation. The results indicate support for the hypothesis that a yes vote is more likely the lower one is in the intrafirm earnings distribution. Also, the three dummy variables representing the effects of unionization on nonwage outcomes or job characteristics (RDET, FIMP, PRO) all had the hypothesized effects. Turning to the taste variables, only race and age had a significant impact. Blacks are more likely and older workers less likely to vote in favor of a union.

The effect of seniority on the probability of job

retention in the case of a union win was insignificant. (Recall that this probability was used to weight net expected benefits from unionization.) And finally, the data supported the following hypotheses: compared to the base group of individuals who expect that finding an alternative job will be easy, an individual is significantly less likely to vote yes if he or she expects it to be difficult to find an alternative job and is satisfied with job security (i.e.,  $B_5 < 0$ ); and compared with first, the latter group, and second, the base group, an individual is significantly more likely to vote yes if he or she expects it to be difficult to find an alternative job but is dissatisfied with job security (i.e.,  $B_6 > 0$  and  $B_5 + B_6 > 0$ , respectively).

The second in this sequence of articles is Farber's "The Determination of the Union Status of Workers." This paper extends the framework developed in the previous article for analysing the determination of the union status of workers. Specifically, the model allows the union or nonunion outcome to be determined by decisions made by both the worker and the potential union employer. That is, it is assumed that the union employer has some discretion in hiring due to the existence of a queue for union jobs. A queue exists as long as for some workers, the benefits from union coverage of existing jobs exceed the costs (i.e., initiation fees and dues). Workers differ in characteristics affecting productivity, and productivity is

assumed to be compensated differently in the union and nonunion sectors; therefore, union employers will choose those workers who allow the cheapest production of effective labor. That is, employers choose the workers from the queue who will result in least-cost production. This process, in which the "better" workers are chosen for union jobs, must be accounted for in order to discern the true effects of unionization.

This queueing model improves on previous models of union status determination which cannot distinguish between a nonunion worker who is nonunion by choice, and a nonunion worker who prefers a union job but was not hired by a union employer. Farber's bivariate model employs data on both the union status of workers, and the preferences of those nonunion workers for union representation; the latter data, of course, represent the union queue. Two important points should be noted about this theoretical construction. First, this model, unlike that of the previous article, is conditioned upon the locus of union jobs. Second, this is a censored sample problem. That is, the data representing the size of the union queue are censored; only nonunion workers are asked if they would vote for or against union representation. (The reason that this represents a censored sample is because these data represent current preferences, while the model of union status determination is specified as the product of worker decisions made at the time of

hire.)

Estimation proceeds by first deriving the likelihood function for the probabilistic model of union status determination, then inserting the data describing each term (as in the previous article). Here, three distinct events are possible: the worker is unionized (the probability that the worker desired a union job and was hired by a union employer); the worker is nonunionized and currently prefers union representation (the joint probability that the worker desired a union job but was not hired by a union employer, and that he or she currently desires a union job, plus the joint probability that the worker did not desire a union job (at the time of hire), and that he or she currently desires a union job; the worker is nonunionized and currently does not prefer union representation (the joint probability that the worker desired a union job but was not hired, and that he or she currently does not want to be unionized, plus the joint probability that the worker did not desire a union job (at the time of hire), and that he or she currently does not desire union representation.

In sum, utilizing data on the current preferences of nonunion members yields the above empirical specification: a trivariate censored data model. It allows identification and estimation of a model of union status determination which accounts for both worker and employer decision-making. By estimating this type of model, as opposed to the

conventional utility-maximizing worker choice model alone, a distinction may be made between the level of worker demand for unionization (i.e., worker preferences toward unionization), and the relative supply of unionized jobs (i.e., the number of unionized jobs relative to the size of the queue). Simple univariate worker choice models cannot provide this information.

Briefly, the major results of this model's estimation are the following. The queuing model, like univariate probit models, finds that nonwhites have a significantly higher probability of union coverage; in addition, the queuing model suggests that the reason lies on the demand side: nonwhites have a greater probability of desiring union representation. Conditional on each desiring union jobs, however, the results indicate that whites and nonwhites have roughly similar probabilities of being hired by union employers.

Next, both univariate probit models and the queuing model indicate that workers in the South are significantly less likely to have union jobs than workers in other regions. The queuing model provides additional information: in the South, worker demand for unionization is significantly lower than that in other regions, and also the supply of union jobs relative to the length of the queue is significantly less. In other words, the conditional probability of being hired by a union employer given



presence in the queue is significantly lower for a Southern worker. (This latter result is consistent with the hypothesis discussed earlier in this section.)

A few more interesting results regard clerical, service, and professional and technical workers relative to a base group of blue-collar workers. Clerical workers are less likely to demand union representation than blue-collar workers, a typical result of univariate probit models as well. However, clerical workers who do desire union jobs are significantly less likely to be hired by a union employer than are blue-collar workers. Service workers, on the other hand, exhibit about the same level of demand for union services as do blue-collar workers, but are significantly less likely to be hired by a union employer given the desire for a union job. Finally, the lower probability of union membership exhibited by professional and technical workers (relative to blue-collar workers) is primarily explained by a lower demand for union services.

A final result of the queuing model is that the variables sex, marital status, and education have no significant impact on the union status outcome.

The third and final in this series of articles extends the queuing model of union status determination by introducing the legal environment in the form of RTW laws. Farber's "Right-to-Work Laws and the Extent of Unionization" allows another test of the hypothesis that RTW laws simply

proxy tastes, rather than exert an independent effect on the extent of unionization in a state. Farber notes that this issue has been approached by treating RTW laws and the extent of unionization as jointly endogenous variables. Farber's approach, however, is to test the effects of RTW laws within the context of his queuing model. He then examines the results of these effects on both the demand for unionization and on the relative supply of union jobs. By adding to this analysis the effects of RTW laws on the union-nonunion wage differential, he asserts that the free-rider hypothesis may be distinguished from the taste hypothesis.

First, the empirical implications of the two hypotheses are noted. The free-rider hypothesis implies, first, that RTW laws reduce the supply of union services; thus, the supply of union jobs relative to demand is constrained (i.e., a longer queue exists for union jobs). Second, union members in RTW states receive a greater equilibrium level of benefits from unionization; this implies that the union-nonunion wage differential is greater in RTW states. Third, Farber notes two second order effects on the demand for union services. Demand may be higher in RTW states if workers perceive that they will be able to receive the benefits from unionization without actually supporting the union. On the other hand, if workers perceive a loss of union negotiating strength under RTW laws then demand may

decrease. (One final point: if demand does in fact decrease due to an impaired ability to secure benefits to members, the result is to offset to some degree the predicted greater union-nonunion differential.)

The empirical implications of the taste hypothesis are, first, that demand for unionization in RTW states will be lower. Second, the supply of union jobs relative to demand will be unaffected; or, in other words, the length of the union queue is the same in RTW and non-RTW states. Third, like the free-rider hypothesis, the taste hypothesis implies that the union-nonunion wage differential is greater in RTW than in non-RTW states. This is true because the pecuniary benefits (proxied by the union-nonunion wage differential) must outweigh the nonpecuniary costs (proxied by the existence of a RTW law) to an individual union member in an RTW state. Before turning to the empirical results, Farber comments that these two hypotheses are not necessarily mutually exclusive; therefore, effects of both could be found.

To estimate the effects of RTW laws on the union-nonunion wage differential, Farber specifies a conventional single equation semilog earnings function using micro data from the Current Population Survey, and estimates it by OLS. Based on this equation, the difference between the union-nonunion wage differential in RTW states and non-RTW states is positive and significantly different from zero. That is,

the differential is greater in RTW states. This result is consistent with both the taste hypothesis, which explicitly predicts it, and the free-rider hypothesis, which cannot predict the sign a priori. (To account for differences in the differential across workers possessing unequal characteristics, Farber also estimates separate semilog earnings functions for union and nonunion workers. The results are consistent with those of the single equation model: the union-nonunion wage differential is significantly greater in RTW states than in non-RTW states.)

Completing the analysis, the queuing model is employed to evaluate the effects of RTW laws on the demand for and the relative supply of unionization. Using the same theoretical framework and data as described in the previous article, Farber includes a dummy variable in the worker's union preference equation indicating whether an individual is covered by an RTW law or not. Its coefficient reflects the correlation between the demand for unionization and RTW laws. The RTW dummy variable is also included in the equation measuring the union employer's criteria for hiring workers from the queue. In this context, its coefficient measures the correlation between the supply of union jobs relative to demand and RTW laws.

After constructing and estimating the relevant likelihood function for the trivariate censored model, the mean values of the predicted probabilities are calculated,

using various values for region and RTW. On the demand side, the probability that a worker desires a union job is significantly lower in RTW states. This is an explicit prediction of the taste hypothesis, and is not inconsistent with the free-rider hypothesis, which cannot predict this sign a priori. (No significant differences exist in the demand for unionization by workers across regions.) On the supply side, the probability that a worker will be hired by a union employer given that the worker is in the queue is approximately the same in both RTW and non-RTW states. This is an explicit prediction of the taste hypothesis, and is unambiguously inconsistent with the free-rider hypothesis. (Region, however, does appear to play a significant role in terms of the relative supply of union jobs: southern workers in the queue are significantly less likely to be hired by union employers than are nonsouthern workers.)

In sum, the results of the queuing model are consistent with the taste hypothesis, and not with the free-rider hypothesis: RTW laws appear merely to mirror preexisting tastes toward unionization, and not to exert any independent impact on the extent of unionization. As noted previously, however, the estimates could reflect some combination of the two non-mutually exclusive hypotheses; as a result, any conclusions reached should not be imbued with excessive confidence. On the other hand, this result does conform to the RTW literature which treats laws and unionization as

endogenous.

The final article on the effects of the legal structure on private-sector unionization is Ellwood and Fine's "The Impact of Right-to-Work Laws on Union Organizing." This study represents an important departure from the previous studies in that its focus is on flows into union membership rather than stocks of membership. As concluded by Moore and Newman (1985) in their review of the literature, a consensus seems to have been reached that RTW laws are primarily symbolic; this consensus was reached, however, based almost exclusively on stock models of unionization. Ellwood and Fine argue that flows, as measured by the amount of organizing activity, are a more sensitive response variable. Stock models may not be capable of discerning significant effects on the level of union membership, and thus incorrectly conclude that RTW laws do not independently depress union membership levels. Actual changes in state-wide levels of unionization might instead be picked up by measuring changes in the number of employees in bargaining units before and after passage of a RTW law.

First, a partial adjustment accelerator model of union organizing is specified. It accounts for the stock adjustments which occur when conditions cause the existing level of unionization to differ from the equilibrium level. The adjustment flow may be accounted for by changes in the size of existing union firms, or by new certification or

decertification of bargaining units. Thus, since organization activity is very sensitive and can adjust quickly to changes in the local environment influencing tastes for or against unionism, it could detect any real effects of RTW laws which may exist, and which stock models could not.

The first model uses pooled data on states over the period 1951 to 1977. The dependent variable is the number of employees in bargaining units in which unions won an NLRB election, divided by the state's nonagricultural labor force. The effects of RTW laws are captured by constructing dummy variables in 5-year intervals: that is,  $D_{1-5} = 1$  iff an RTW law were passed from 1 to 5 years ago;  $D_{6-10} = 1$  iff an RTW law were passed from 6 to 10 years ago, etc. The major results with regard to these dummies are the following: union organizing activity is reduced by 46 percent in the first five years following passage of a RTW law; after 6 to 10 years, organizing declines by 30 percent, and after 10 years, the apparent reductions are no longer statistically significant. The implications of these results are potentially very important. During the sample period, the annual flow into union membership is approximately 2 percent. Based on the parameter estimates, union membership will be about 8 percent lower ten years after passage of an RTW law than it would have been were the law not passed. The authors believe that this reduction is

likely to be permanent because the standard errors attached to the RTW coefficients after ten years are very large. However, it is equally possible that the effect does not outlast the short run, so that no long run RTW effect exists.

In order to account for the possibility of omitted variable bias and/or simultaneous equations bias, a model allowing fixed effects and simultaneity tests is estimated. For the former test, a subset of the first model which contains sufficient data on pre- and post-RTW organizing activity is estimated. (This technique was used by Lumsden and Petersen, and is described earlier in this section.) The results of this nonrandom sample are entirely consistent with those of the first model: ten years after passage of an RTW law, organizing is reduced by about 32 percent.

To account for the possibility of two-way causality between organizing activity and the legal structure, the authors construct a leading indicator, called PRE-RTW. It takes the value one in each of the five years preceding passage of an RTW law in the subsample states, zero otherwise. If organizing activity and the legal structure are jointly endogenous, then weakening union strength should be reflected in decreases in organizing activity in the few years prior to enactment of an RTW law. After passage, no significant reduction in organizing is expected. Conversely, if RTW laws do exert an independent negative



influence on unionization, decreases in organizing should not occur before passage. The results, again, are consistent with those of the first model: decreases in organization appear after RTW enactment, with no significant decreases prior to passage.

Finally, the dependent variable (new membership from organizing activity) is decomposed to ascertain the primary avenues through which RTW laws (as well as the other explanatory variables) affect flows into unionization. The number of new members is specified as the product of the number of elections, the percentage of elections won, and the average size of the newly established bargaining units. The results indicate that over half of the decline in membership resulting from the passage of an RTW law is attributable to a reduction in the number of elections, with decreases in new unit size accounting for most of the remainder.

The conclusion of this article is that contrary to the recent consensus, RTW laws are substantive, not just symbolic. This indicates that more research using flow models of union membership is necessary before completely accepting the taste hypothesis regarding RTW laws.

## 2.2 The Public Sector: The Effects of Union Regulations on Union Outcomes

As noted previously, the wide variety of state

determined bargaining laws permits a more detailed investigation into the effects of the legislative climate on public sector union outcomes than is possible in the private sector. Again, consistent with the special interest and the Public Choice theories, the endogeneity of legal variables is emphasized. Regulatory status is not an exogenous event, and is hypothesized to be determined by both economic and political variables.

Referring to Topic One of this dissertation, Saltzman (1985) was reviewed as one of the few articles to explicitly consider both the determinants and the effects of public sector bargaining laws vis-a-vis union membership. His article looks specifically at one public sector employment category, that of teachers. Saltzman specifies two equations to be estimated separately: one examines the effects of changes in lagged values of bargaining law status on the extent of unionization (or bargaining) across states; the other examines the effects of changes in lagged values of the extent of unionization on bargaining law status. The use of lagged variables, motivated by the theoretical specification, makes the simultaneity issue a moot point; simultaneous estimation is not appropriate if the assumption of no autocorrelation holds. Saltzman found that the primary direction of causality runs from the enactment of bargaining legislation to union density. On the other hand, in the equation explaining changes in bargaining laws, union

density exerts only a very weak positive influence.

Saltzman's empirical results of the OLS estimated "effects of bargaining laws" equation will be summarized in greater detail than will be the results in subsequent articles. This is because Saltzman employs an unusually wide variety of explanatory variables from several broad categories expected to influence union density. First, bargaining laws themselves are the dominant influence on union density. Pro-union laws cause increases in unionization; the effect is not immediate, but works through a lag. The other explanatory variables employed can be categorized under the following headings: teacher and school characteristics, labor market conditions, membership in other unions, attitudes toward unions, and previous extent of unionization.

Teacher and school characteristics. The share of male teachers and the number of teachers per school both have a significant and positive impact on changes in the percentage of teachers covered by collective bargaining contracts. Saltzman explains the former result in terms of men's higher propensity to organize relative to women's, a result found in many previous studies. The number of teachers per school may be expected to be positive for many reasons, the most important of which relates to the hypothesized existence of economies of scale in organizing efforts.

Labor Market Conditions. The growth in teacher employment is negative and significant, while the lagged unemployment rate is insignificantly different from zero. The sign of growth in teacher employment could not be predicted a priori. Saltzman argues that decreasing growth levels could reflect a weak market position, thus producing a negative sign. On the other hand, if the decrease in employment growth results in more militancy among teachers and teacher unions, a positive relationship could exist.

Attitudes towards union. The only significant variable in this category is real per capita income. Its positive sign is interpreted as support for the hypothesis that a region's level of economic development provides an indirect measure of its attitudes toward unions. A relatively less developed region of the U.S. such as the South may exhibit more anti-union sentiment if unionization is regarded as a barrier to attracting industry. A second measure of preferences, utilizing the AFL-CIO's Committee on Political Education (COPE) ratings, is not significant.

As a control variable, the lagged extent of bargaining is included to account for demonstration effects among teachers within a state (see Moore and Newman (1975). Additionally, the square of this variable is included to capture, first, the expected initial rise in the dependent variable resulting from the existing stock of bargaining units; and second, the subsequent fall in the dependent

variable (i.e., the change in teacher unionization) as a purely mechanical effect: bargaining coverage cannot exceed one hundred percent. Both of these variables are significant; as expected, the lagged extent of bargaining is positive while its square is negative.

Finally, a result contrary to initial expectations is the insignificance of labor movement strength as measured by "membership in other unions". This variable was predicted to be positive; the labor movement as a whole is expected to provide political support for union organizing efforts, and to proxy an index of attitudes towards collective bargaining activities and outcomes. The author cannot provide an explanation for the insignificance of labor movement strength in his model.

This article is of primary significance for its wide variety of included explanatory variables, and in particular, for its explicit treatment of the interdependence of cause and effect in the study of bargaining laws and union outcomes. An alternative model specification reflecting this interdependence is, of course, the simultaneous equations system.

Within a simultaneous equations framework, Hunt, Terza, White, and Moore (1986) extend an estimation technique developed by Heckman (1976). They jointly estimate teachers' wages and unionization, and condition the estimates on an ordinal qualitative variable representing

bargaining law status. In this manner, the legislative climate may be treated as an exogenous event affecting wages and union membership, but at the same time the econometric procedure accounts for the truncation of the joint distribution of wages, unionization, and legislative environment. In addition, this article explicitly models wage, union membership, and bargaining law outcomes in terms of the interest group theory of regulation.

In the wage equation  $w_t$ , where  $t$  indexes the cross section of states, the exogenous variables included represent market forces and political considerations. Variables measuring the former factor include: the percentage of teachers who are male (MALE), a proxy for the stock of human capital; the number of hiring units relative to the population (DIST), a proxy for the competitiveness of the labor market; the labor force participation rate of females (FLFPR), also a market structure proxy, which may affect wages positively if it denotes abundant female employment opportunities, or negatively if it denotes an abundant supply of teachers (since two-thirds of teachers are women). Variables measuring the latter factor include: a measure of professionals in the labor force (PROF), a proxy for education level; and last, the percentage of total educational expenditures originating at the state level (FIN). This final variable is interpreted as a test of the interest group theory. Legislators are assumed to maximize

self-interest, providing favorable legislation to competing interest groups in return for contributions. The benefits legislators receive from supplying this regulation must be weighed against the costs incurred: the loss of votes from the taxed group, i.e., the general public. Therefore, it is predicted that indirect methods of creating rents for teachers, who comprise a strong and active pressure group, will be preferred over direct increases in teacher pay (as proxied by FIN). The indirect method at issue is, of course, legislator support for teacher unionism, or public sector bargaining laws for teachers.

In the unionization equation  $u_i$ , the exogenous variables represent the perceived benefits from union membership, and include two variables specifically motivated by the special interest theory. Measuring perceived benefits are MALE and PROF. MALE is expected to be positive, since males' greater lifetime labor force attachment results in higher returns to seniority provisions, and seniority provisions are frequently outcomes of union contracts. PROF is expected to exert a negative influence on union membership, since the individual bargaining power which often attaches to professional status reduces the benefits from unionization. From the perspective of the special interest theory, a group expected to exhibit anti-union behavior is private sector management. If this group opposes the strengthening of the position of both private and public sector organized labor

by assuming the existence of spillovers between the two, then the number of unfair labor practice claims (ULP) proxies opposition to public unionization. Finally, net migration within a state (POP) captures attachment to area wage structures. A transient population derives lower expected lifetime benefits from unionization; therefore, this variable is expected to be negatively related to union membership.

To this point, teacher bargaining laws have not been explicitly included in the wage-union simultaneous equation model. The following is a brief description of the procedure used to model the determination of teacher bargaining laws, and of the inclusion of this ordinaly measured, "exogenous" event in the wage-union system.

The ordinal legislative index  $i_{\lambda}$  covers three teacher bargaining rights categories: category one indicates no law exists, or bargaining is prohibited; category two indicates a stronger pro-union sentiment as measured by meet and confer laws, or employer voluntary bargaining; and category three reflects the strongest pro-union sentiment, as measured by mandatory bargaining. This ordinal dependent variable is modelled as a function of the following exogenous variables: MALE, PROF, FLFPR, DIST, POP, ULP, and VOTE. The new variable, VOTE, is the percentage of a state's eligible voters who voted in the 1976 presidential election. It is included as a measure of active taxpayer



resistance to special interest subsidies, and as such is expected to have a negative sign. It should be noted that POP has a different interpretation in a model of bargaining law determination. A transient population does not expect to bear the same burden of taxation in the wealth redistribution process as does the "permanent" population; as a result, the larger the former group, the smaller the anti-bargaining resource expenditure.

Now, the statistical implication of conditioning both the wage and the unionization equations on legislative category is to truncate the joint distribution of  $w_t$ ,  $u_t$ , and  $i_t$ . To account for the truncation and produce estimates with the properties of consistency and asymptotic normality, the authors extend Heckman (1976) to develop the Three-Stage N-chotomous Probit estimator (3SNP).

In the first stage, the equation determining bargaining law status (with dependent variable  $i_t$ ) is estimated by the N-chotomous probit procedure developed by McKelvey and Zavoina (1975). In this manner, an estimate of both the parameter vector corresponding to the independent variables explaining legislative status, and of the single unknown partitioning threshold are obtained. Only one threshold,  $u_2$ , is unknown; in a model of three ordered categories there must be four partitions of the unobservable continuum. Since the error term attached to the equation determining  $i_t$  is assumed to follow a standard normal distribution, the

endpoint thresholds  $u_0$  and  $u_3$  are negative infinity and positive infinity respectively. In addition,  $u_1$  is normalized to zero as is conventional in N-chotomous and ordinary probit models. Completing the first stage, the estimated values of the explanatory variable parameter vector and the threshold parameter are used to compute the (nonzero) expectations of both the wage and unionization equations' error terms. These conditional mean-valued error terms are generated, of course, by taking the expectation of each equation conditioned on the observed bargaining law category by state,  $i_t$ .

This nonzero expectation is the familiar result from a truncated distribution: the expectation of  $w_t$  (or of  $u_t$ ), given the realization of a particular value of bargaining law status, yields the nonstochastic independent variables and their parameters, plus a nonzero error term which may be consistently estimated in the manner the previous paragraph outlined. This error term, composed of standard normal PDF's and CDF's evaluated at the predicted values of  $i_t$  and  $u_2$  for each cross-section, may be termed the "legislative shift" factor  $\phi_t$ .

After substituting into  $w_t$  and  $u_t$  the computed legislative shift variable  $\phi_t$ , it may be treated as an exogenous variable and estimated in conventional fashion. Stages two and three of the 3SNP technique, then, consist of the simple application of 2SLS to the two equation  $w_t$  and  $u_t$

system.

To provide a comparison to the results from the 3SNP model, the two equation wage and unionization system was estimated by 2SLS, treating the exogenous bargaining law status as a simple dummy variable. First, the 3SNP results will be summarized. Beginning with the first stage N-chotomous probit estimates of bargaining law status, the variables MALE, FLFPR, and POP are all significant. The first two have the anticipated signs; POP, however, does not and the authors cannot reconcile this result with the model. In terms of the 3SNP estimation of the wage and unionization equations, in general the economic variables perform well and in the predicted manner. The political variables, however, are not as successful. In the wage equation, unionization is positive and significant, as is MALE, PROF, and FLFPR. Neither of the two political variables, FIN and the legislative shift factor  $\mu_t$ , exert a significant influence on wages across states. In the unionization equation, wages are positive and significant, as is  $\phi_t$ . Thus, pro-bargaining legislation, as a measure derived from the process determining bargaining law status, positively affects union membership. Other significant variables, all negative as expected, are PROF, POP, and ULP.

In general, the authors conclude that the 3SNP results support the special interest theory. In particular, legislators increase teachers' wages indirectly: pro-

bargaining laws are supplied which increase unionization, which in turn increases wages. (If lawmakers increase wages directly, the coefficient on FIN in the wage equation should be significant, which it is not.)

In comparison, results from a 2SLS estimation of  $w_t$  and  $u_t$ , with a simple dummy variable representing exogenous bargaining law status, indicate that the legal environment has no significant effect on either wages or unionization. In addition, unionization is not found to significantly increase wages.

Next, two articles will be reviewed which utilize cross-sectional data at the municipal level. First, Casey Ichniowski (1988) analyzes bargaining law effects at the municipal level by means of a proportional hazard (PH) model. He studies police departments over time, and models the unionization process as a duration study. That is, he wants to determine the factors affecting the length of time it takes a police department to unionize after the state has passed a law legalizing bargaining. To do this, he analyzes two different aspects of public sector bargaining laws: first, the strength of the law (i.e., does it merely permit bargaining by employees or does it compel employers to bargain with employees); and second, the presence and type of impasse procedures associated with the law. Since police strikes are in most cases illegal, the presence of some type of compulsory interest arbitration is expected to increase

the demand for union membership by ensuring closure of the bargaining process.

The control variables in the model include, at the state level, regional dummies, the percent of a state's workforce in the government sector, and private sector unionization. At the municipal level, population, per capita income, central city status, the number of departmental employees, and per capita municipal revenue are among those variables included. Estimation of several variants of the PH model reveal that the type of bargaining law enacted is by far the most important determinant of the rate of unionization among police departments over time. The stronger the law, the greater the relative propensity to unionize. (In addition, the degree of private sector unionization, region, and central city status all have significant effects on union propensities.) Ichniowski concludes that the legal environment is the most important factor influencing the growth of public sector unionization, the same conclusion Saltzman (1985) reached based on his model of public employee unionism.

The second article examines the influence of laws on labor market outcomes of local government workers (Freeman and Valletta (1988)). Specifically, effects on collective bargaining coverage, wages, and employment are examined. Here only the effects on coverage will be summarized. To measure the effects of an index of bargaining law strength

on an individual's bargaining contract status, linear probability equations are estimated which include various municipal public employee groups. After controlling for state and municipal level variables, the legal index (which represents increasing preferences in favor of bargaining laws) is positively and significantly correlated with a (0,1) index of bargaining coverage. As always, the question of causality must be addressed. Do the laws themselves, or omitted, unmeasurable variables cause the correlation?

To answer this question, Freeman and Valletta include in their regressions a variable measuring the percentage of municipal employees unionized (including members of employee associations). They reason that if the sole effect of legislation is to increase union membership, which then leads to greater contract coverage, then the coefficient on the legal index should become insignificant when municipal union density is included in the equations. Their results indicate that, although the legal index coefficient is reduced somewhat, it remains significantly and substantially positive.

A final test of the question of causality involves the omission of the unmeasurable variable pro-union sentiment. If sentiment determines both laws and contract coverage, then the measured correlation between the two is spurious. To test this possibility, the authors control for city-wide effects proxying sentiment by transforming the variables for

all occupations into deviations from city means. This has the same effect as including city dummy variables. The results indicate that the coefficient on the legal index is virtually unchanged, which implies that the measured correlation between laws and contract coverage is not the result of the omission of sentiment. Based on both test, Freeman and Valletta also believe that a causal relationship between laws per se and bargaining coverage exists.

The articles discussed in this section have focused entirely or primarily on cross-sectional data to evaluate the role of bargaining laws in explaining state or municipal differences in the level of public sector union membership. A comparison of results from these studies to one employing individual data could prove instructive. A recent article by Hundley (1988) uses a micro-data set to evaluate the effects of individual characteristics and bargaining law coverage on union membership probability. Furthermore, he analyses the effects of a range of legislation dealing with public sector unions, permitting a more comprehensive understanding of the influence of the legal environment on union membership decisions. His findings indicate that the implementation at the federal level of proposed pro-bargaining legislation for public unions could elicit large changes in public sector union density.

Using individual data from the 1985 Current Population Survey (CPS) provides the author with three major advantages

relative to previous studies. First, most of the major changes in state-wide bargaining laws were completed by the late seventies to early eighties. Therefore, if most of the adjustments to these changes are reflected in the 1985 data, the results could be considered more reliable than could the conflicting results of earlier studies for which the adjustments were still in progress. Second, by using individual data on union status, the bargaining law variable may be assumed to be given to each individual. As a result, simultaneous estimation of laws and union membership is not required. Third, each individual may be matched with the bargaining law specifically pertaining to his or her category of public employment; thus, information is not lost through aggregation.

In estimating the probability of union membership, Hundley employs explanatory variables representing both demand for and supply of union services. The costs to the union of organizing and providing services to members, the major (non-price) determinant of supply, represent an implicit cost to workers and thus affect their probability of membership<sup>1</sup>.

Representing demand for union services are the familiar individual and occupational characteristics included in various combinations in both private and public sector studies. Included among the individual characteristics are race, sex, education, experience, part-time work status, and



private sector unionization. Occupational characteristics affecting demand include a job's educational requirements, its hazard ranking and repetitiveness, and its supervisory or non-supervisory status.

The costs of supplying union services are measured by the various legal provisions surrounding public sector unionism. An important point of this article is that different types of laws affect the probability of union membership in different ways. Among the legal provisions and their expected effects are the following. Exclusive jurisdiction laws should increase the supply and equilibrium quantity of union services. Union security provisions, such as mandated agency shops, are expected to increase demand. The possible effects of public sector right-to-work laws, on the other hand, may be drawn from the extensive private sector RTW literature; the author predicts that the equilibrium level of union membership falls as a result of a decrease in supply, with demand remaining constant. A final union security procedure, mandatory dues check-off, should increase supply by decreasing a union's costs.

Turning to the most frequently studied category, that of bargaining rights, it is expected that "voluntary" employer bargaining laws (e.g. mandatory meet and confer) will exert only a small positive influence on demand. On the other hand, mandatory bargaining laws should significantly increase the probability of membership.

Finally, the last category is impasse procedures. These are assumed to operate through their effects on the costs of bargaining to both management and labor, and thus, on bargaining outcomes, both of which affect the perceived benefits from unionism. Two types of impasse procedures are discussed: arbitration and the right-to-strike. Compulsory arbitration is expected to increase the demand for union services. The explanation provided is that workers perceive that more favorable bargaining outcomes result under binding arbitration, and that in addition its exercise imposes negligible costs on them. Nonbinding impasse procedures, on the other hand, are not perceived by workers as posing substantial constraints on management's behavior; union membership, therefore, should not be significantly affected by mediation or fact-finding.

The use of the strike weapon as an impasse resolution procedure yields opposing effects in a worker's cost-benefit calculus. The threat effect attaching to the right-to-strike may promote management concessions, thereby increasing perceived benefits from unionism. However, the costs incurred by a worker if a strike is called may be substantial. It must be left to the data, then, to provide the sign of the effect on the probability of union membership of legalized strikes.

Turning now to the model, a conventional reduced form single equation specification is used to determine factors

affecting the probability of union membership. The dependent variable takes the value one if the individual reports membership in a union, zero otherwise. As noted earlier, a great advantage in using individual CPS data is that each individual may be matched with the state laws affecting his or her particular occupational class. Data from the National Bureau of Economic Research (NBER) on public sector collective bargaining laws categorize state-wide statutes by five employee groups: state government, police, fire, teachers, and municipal government.<sup>2</sup>

Another important point concerning the use of micro-data and its implications for model specification is the potential omitted variable bias arising from the predetermined nature of bargaining laws when applied to individual data. Although this is the correct specification, it may be true that more heavily unionized states produce stronger bargaining legislation. In order to account for this effect within a single equation model, variables which proxy tastes for unionism in a state must be included in the equations as control variables. In Hundley's model, private sector unionization across states serves this purpose. In addition, he includes dummy variables for each of the five employment groups to control for within state differences in preferences across groups.

Probit estimation of the reduced form reveals that the majority of the individual and occupational characteristics

are significant and of the expected sign. Summarizing some of these results, private sector union density is strongly significant and positive, and males and nonwhites are more likely to be unionized than females and whites. Additionally, the evidence supports both the concave unionism-experience relationship found elsewhere, and the theory that employers of unionized positions hire more highly educated workers. As expected, part-time status and supervisory status are highly significant and negative, and the variable measuring job hazards is positive and significant. The repetition variable, however, is insignificantly different from zero.

Turning to the effects of legal provisions on the propensity to unionize, mandatory bargaining laws are significant and positive as anticipated, while the weaker "voluntary" statutes, expected to be insignificant or only weakly positive, actually exert a negative influence. These two variables are the typically employed measures of the legal environment affecting public unionism. The results of this model strongly imply that extending the analysis to include other legal provisions regulating union behavior yields additional insight on the process. Union security provisions, for example, strongly affect union membership. The mandatory agency shop has the largest positive effect on membership probability; laws allowing union or agency shops exert a smaller positive effect, and mandatory dues check-

off is also positive.

In the impasse resolution category, non-binding procedures do not, as expected, increase membership; compulsory arbitration, however, does exert a positive influence. In addition, providing the right-to-strike decreases membership probability. This may indicate that the expected costs to workers associated with the exercise of the strike option exceed the potential benefits arising from a change in an employer's concession curve.

Finally, simulations based on these estimates of the effects of proposed federal public sector bargaining legislation are undertaken. Three different proposals representing varying degrees of pro-union sentiment are analysed. The simulations suggest that even the weakest of these proposals would generate a substantial increase in public union density. Furthermore, the major result of this model is that different types of union regulations have different impacts on union density; the consequence, therefore, of focusing exclusively on bargaining rights provisions is a loss of information containing potentially significant policy implications.

### CHAPTER 3

#### THEORETICAL DERIVATION OF A MODEL OF UNIONIZATION

The development of a model explaining the level of unionization or of union density is derived from the standard theory of consumer choice. Following papers by Berkowitz (1954), Ashenfelter and Pencavel (1969), Pencavel (1971), and Ashenfelter and Johnson (1972), an individual's decision to join a union is analyzed within a conventional demand and supply framework: choices are assumed to result from a utility maximizing decision process, so that membership in a union is seen as an alternative way in which to hold wealth (also see: Lumsden and Petersen (1975), and Moore and Newman (1985)). The analysis of the union decision, then, involves the determination of the worker's choice of investment in union membership versus alternative assets, all of which yield services over time.

The theoretical model of an individual's demand for union services is specified as a function of the relative price of union membership ( $P$ ); permanent income ( $Y$ ); its return relative to alternative assets: the union-nonunion wage differential ( $(W_u - W_n)/W_n$ ), denoted by  $\delta$ , and non-pecuniary union benefits ( $B$ ); the price of substitutes for

(T).

On the supply side, the production of union services is expected to be a function of membership price (P), and costs (C), which are composed of two basic elements: factor costs, i.e., the costs of organizing and of providing services; and in addition, all factors affecting supply, positively or negatively, imposed from both outside the union (i.e., government policy and legislation), as well as from inside (i.e., "any real or psychological costs imposed by union leadership or rank-and-file members themselves, such as resistance to working with minority groups" (Lumsden and Petersen (1975), p.1238). This latter cost element can alternatively be viewed as encompassing union goals.

Imposing the standard equilibrium condition yields the following system of structural equations describing the demand for and supply of union services:

$$(1) U_d = f_d(P, Y, \delta, B, S, T)$$

$$(2) U_s = f_s(P, C)$$

$$(3) U = U_d = U_s.$$

The equilibrium level of union services, U, is proxied in empirical models which use aggregate data by either percent unionized (or organized), or percent covered by collective bargaining agreements. In making this transformation from the theoretical model it is assumed that the level of union services is proportional to the percentage of unionized jobs, so that the empirical proxy may be viewed as per

capita consumption of union services.

Extending this topic, it should be noted that collective bargaining coverage is a more appropriate proxy within this utility-maximizing choice model. This results from differences in legal structures across states affecting the status of the union shop. For instance, in the twenty states having RTW laws (and in sixteen of these twenty, court decisions have interpreted the RTW statutes as covering public sector workers) some workers who are not union members will be covered by a collective bargaining agreement; it is conceivable that some of these workers may have chosen union membership if the union shop were legal. The implication is that these nonunion members in RTW states in reality perceive that benefits from unionization exceed costs. On the other hand, in non-RTW states, it is again conceivable that some workers will choose union membership who would not do so were the union shop outlawed. The implication is that these union members actually perceive that the costs of union membership outweigh the benefits. Therefore, since an individual does choose his or her job, which includes the characteristic of bargaining coverage presence or absence, the use of the coverage variable is more consistent with the choice-theoretic framework employed.

Returning to the variables in the structural demand and supply equations, the only variable common to both is the



relative price of membership ( $P$ ). This variable comprises initiation fees, dues, and other expected assessments relative to the price of other assets. In practice, it is difficult or impossible to get reliable data on the cost of membership. As a result, structural demand and supply equations cannot be estimated. Instead, a reduced form equation of union membership is typically estimated by exploiting the fact that  $U$  and  $P$  are functions of all the other exogenous variables; thus, equations (1) and (2) comprise a system of two equations in two unknowns,  $U$  and  $P$ . This procedure yields the following reduced form equation of the equilibrium level of union services:

$$(4) \quad U = f(Y, \delta, B, S, T, C).$$

The preceding analysis of the determination of union status is derived from the original literature referring to the private sector; to this point, no specific account has been taken of the fact that the object of this thesis is public sector unions. The reason for this omission is simple: the same demand and supply framework developed for the analysis of private sector unions applies, essentially intact, to the public sector as well. Several important differences exist between employment characteristics of the public and private sectors, however. Two of the major differences involve the determination of compensation and work conditions, and the legal environment surrounding unionism. In the public sector, wage and non-wage outcomes

are determined in the political market; the implication in terms of union activities, then, is that political lobbying and voting are more important as union goals in the public sector than in the private sector. Regarding the legal structure, a great difference exists between the two sectors. The passage in 1935 of the National Labor Relations Act (NLRA) guaranteed private sector employees the right to organize, to bargain collectively, and to strike. Public sector employees are not covered by the NLRA. Instead, organized activities by public employees are regulated on a state-wide basis. In the 1960's and 1970's states began passing laws addressing the rights of state and local employees to bargain collectively and to strike. In addition, laws addressing union recognition and union security provisions in the public sector were passed. Complicating matters further, different employee groups within the same state do not necessarily have the same rights. In contrast, the only major legal feature distinguishing private sector union activity across states is the right-to-work law (RTW).

Another distinction between the sectors involves differing union goals motivated by different relative time perspectives; that is, the discount rates exhibited by public and private sector unions and employers probably differ systematically. In the private sector, profit-maximizing firms are expected to have a longer time

perspective than do unions, with their incomplete ownership rights. In the public sector, however, politicians are generally assumed to have short time perspectives: their tenure in office is often not long, and even where it is, they are expected to favor special interest wealth transfers which are funded by future tax liabilities. The characteristic of incomplete property rights applies equally to unions in both the public and the private sectors; however, since job tenure in the public sector tends to be longer than in the private sector, a longer time perspective may be expected of unions in the former.

In spite of these differences, however, significant similarities between the two sectors remain which allow the previously developed framework for analyzing the demand for and supply of union services to accomodate both public and private employees. The demand for labor in the public sector is expected to be a negative function of wages even in the absence of profit-maximizing behavior by employers. It should be also noted that despite early claims to the contrary, the demand for labor in the public sector is not substantially more inelastic than in the private sector (Ehrenberg and Smith (1985), pp. 421, 100). (Clearly, however, the demand for public employees and thus the demand for public sector unionism are dependent upon voter attitudes and budget size, both of which may be accounted for within the conventional framework.) In addition, the

supply of labor in the public sector is expected to be a positive function of compensation levels greater than or equal to those in the private sector.

It is therefore concluded that, despite clear and significant differences between the two sectors, it is nonetheless appropriate to analyze the determination of union outcomes in the public sector within the demand and supply framework presented above.

One final issue relating to this demand and supply framework should be mentioned before returning to the discussion of the theoretical variables in the structural equations. This issue involves equation (3),  $U=U_d=U_m$ , the equilibrium or market-clearing condition. As noted by Abowd and Farber (1982), this condition is more appropriate to a model explaining the union status of jobs rather than of individuals. In other words, the market-clearing assumption is theoretically more plausible in an aggregate model explaining the extent of unionism than in a micro data model explaining the union status of individuals. The reasoning behind this is simple: the major costs of unionization occur when a unit is being organized; therefore, if the benefits of unionism exceed the costs, the jobs will become covered. This implies that, in most current situations, an individual's decision to join a union is in reality the product of his or her present choice and past choices made by other workers which resulted in covered jobs. Thus, the

probability that an individual will join a union is a joint probability consisting of the following two components:  $\text{Prob}(\text{individual } A \text{ is in the union queue (i.e., desires a union job)}) * \text{Prob}(\text{individual } A \text{ is selected for employment/individual } A \text{ is in the union queue})$ . It can be seen, then, that utilizing the market-clearing assumption implies greater caution be used when interpreting results from individual data.

### 3.1 The Demand for Union Services

Returning to the theoretical variables in the structural system, in the demand equation the variables are hypothesized to have the following effects on the demand for unionism:

$$U^1_P = 0, U^1_Y, U^1_S, U^1_B, U^1_E > 0.$$

The relative price variable  $P$  was discussed earlier; clearly, the law of demand holds. Permanent income  $Y$  should have a positive effect assuming union services are normal goods. On the other hand, it is possible that a negative effect exists if the substitution effect dominates: that is, if the opportunity cost of engaging in union activities rises with income. Empirically, permanent income is often proxied by earnings; ultimately, its sign is an empirical question. An important point here is that wages and unionization are jointly determined variables (see: Ashenfelter and Johnson (1972), Wessels (1981), Hunt, Terza,

White, and Moore (1986)). A simultaneous equations specification is indicated in order to avoid possible bias in the estimated wage coefficient.

The proportional union-nonunion wage differential clearly is expected to exert a positive influence on unionization. Obtaining a reliable measure of this variable is very difficult, however, since generally one must compare the wages received by different individuals in the union and the nonunion sectors. It is virtually impossible to completely control for personal characteristics which affect an individual's job productivity, and therefore wages. As a result, two individuals with the same measured characteristics are unlikely to be identical; they will probably differ in ways which are intrinsically unmeasurable. Thus, omitted variable bias is likely to cast severe doubt on estimates of this differential. Due to this problem, the differential is often proxied by personal and industry variables expected to represent the expected benefits and costs of union representation. Often used in private sector studies, for instance, are industry variables attempting to capture benefits to unionism resulting from inelastic labor demand. Product market concentration ratios may proxy greater benefits due to more inelastic labor demand, as a consequence of lower output demand elasticity; in addition, it is hypothesized that highly concentrated firms are associated with lower costs of union organization.

Along these same lines, the capital-labor ratio may proxy greater benefits to unionism if highly capital-intensive firms exhibit lower elasticity of labor demand. Various industry dummies are also frequently used, with appropriate hypotheses concerning the effects of their respective workplace and job characteristics on the benefits and costs of unionization.

In terms of personal characteristics, the variables age, race, sex, region, education, and occupational mix or skill level among others, are traditionally included to proxy expected compensation benefits to unionism. (The systematic effect of age, or years of experience, on union membership was discussed in Chapter Four of Topic One.) Most studies have found that nonwhites are significantly more likely than whites to be union members. This result is based on many other studies which conclude that a relatively larger union wage effect does indeed exist for black males than for white males (Ashenfelter (1978), Table 2.1, p.33). (One should recall the previously noted problems involved in estimating union-nonunion wage differentials, however.) An alternative explanation supporting the greater relative likelihood of union membership by nonwhites is simply that nonwhites estimate a greater differential than do whites, perhaps due to the perception of less discriminatory treatment resulting from structured pay scales and seniority-based promotion rules.

With few exceptions, studies have found women to be significantly less likely than men to join unions. In this case, most studies find no significant differences between estimated male and estimated female union-nonunion wage differentials (Ashenfelter (1978), Table 2.1, p.33). If one believes these estimated differentials to be reliable, then a preference explanation deriving from differences in women's labor force participation rates and occupational distribution seems reasonable.

Region is customarily included to proxy pro- or anti-labor regional preferences. As noted in Chapter 4 of Topic One, the South has historically been more hostile to unions than other regions, and this factor has inhibited union growth.

In terms of occupational mix or skill level, the workplace and personal characteristics of production or blue-collar workers systematically affect their demand for unionization. They are significantly more likely to be unionized than are white-collar workers. Production workers tend to face less flexible work conditions, more team production, and greater worker-machine complementarity; according to Duncan and Stafford (1980, 1982), these characteristics are associated with pro-union preferences. In addition, it is hypothesized that organizing costs are lower among blue-collar workers due to the following associated personal characteristics: less identification



with management, smaller likelihood of self-employment, and (possibly) more homogeneous preferences in general as a group.

Finally, education has had ambiguous effects in different studies. Frequently education is found to have no significant effect on the probability of union membership after controlling for other characteristics; certainly, this is consistent with the finding that union membership is significantly less likely at education levels greater than high school. On the other hand, education and income are positively correlated; if education is assumed to be an empirical proxy for income, a positive coefficient is interpreted as representing the income effect.

Non-pecuniary union benefits,  $S$ , exert the same effect on the demand for union services as the wage differential. Although it is difficult to directly measure the non-pecuniary benefits of unionism in the workplace, unionism is expected to arise in environments in which formalization of work rules, pay scales, promotion criteria, and worker-management communications procedures provides the greatest benefits to workers. It is expected that these types of environments are characterized by large firm size, highly capital-intensive production processes, high accident risk, and greater expectations of strike activity.

Substitutes for union services,  $S$ , include, for example, government welfare payments and tax advantages for privately

financed pension plans (Neumann and Rissman (1984)).

Finally, tastes and preferences,  $T$ , are influenced by the wage and non-wage benefits of unions across workers and jobs. Personal and industry characteristic control variables such as region, urbanization, sex, race, age, occupation, education, work experience, and RTW laws are commonly used to proxy differences in attitudes toward unions.

### 3.2 The Supply of Union Services

Turning now to the structural supply equation, the variables are expected to exert the following effects on the supply of union services:

$$U^1_F > 0, U^1_G < 0.$$

The assumption of profit-maximization cannot be ascribed to unions; the relationship between union members and the union itself is typified by a principal-agent model, so that unions exercise incomplete proprietary rights over residual revenues. It is the assumption of profit maximization within the conventional price-theoretic model which yields the signs of the partial derivatives of the  $U_u$  function above. Nonetheless, the only assumption required to derive these signs is of a binding budget constraint on the organization. Since unions must meet organizing costs and other costs involved with the provision of services, this is a reasonable assumption. Therefore, the law of

supply holds with respect to the production of union services.

The cost element, as previously noted, is composed of two elements: organization costs, and the costs of providing services. Both have a relatively large fixed cost component. Organization costs in particular exhibit sizeable economies of scale over a wide range, but services such as collective bargaining and information distribution are subject to declining per unit costs as well. For this reason, larger firms and more highly concentrated industries are expected to be associated with greater union activity; industry dummies are thus often used to proxy degrees of scale economies.

Additionally, employers' attitudes toward unionism and the legal structure regulating union activities affect the costs of providing services. In terms of the private sector, firms in very competitive industries which face a very elastic output demand schedule may exert strong resistance to organization efforts. Also, apart from economic incentives to resist unionism, differences in firm preferences are expected to exist over regions and types of firms, motivating the inclusion of regional and firm dummies as proxies. In addition, for both the public and private sectors, the level of employer resistance to unionism is often proxied by the number of unfair labor practice cases charged against firms.

Finally, in terms of public employees, legislation regulating collective bargaining rights, the scope of bargaining, union recognition and security provisions and the strike weapon, is expected to systematically affect costs as well.

## CHAPTER 4

### EMPIRICAL ANALYSIS

#### 4.1 Estimation Technique

The model developed in Topic One of this thesis explaining the determinants of bargaining laws is also employed here; in Topic Two, however, the model undergoes a major specification change. This modification accounts for the simultaneous determination of unionization and the legal environment regulating unionization. Therefore, a two equation model is indicated; bargaining law status is now a jointly determined endogenous variable along with the extent of unionization.

In the past, econometric difficulties associated with the simultaneous estimation of discrete and continuous endogenous variables limited the analysis of bargaining law causes and effects. A technique developed by Heckman (1978) has more recently been exploited to handle this situation, and this thesis employs a variation of the estimation procedure outlined in his article.

As mentioned previously, the basis for Heckman's general model (and of course for all the special cases contained within it) is the assumption that dummy endogenous

variables are generated by continuous underlying variables crossing thresholds. In his article, Heckman explicitly considered only binary (or dichotomous) variables; his analysis, however, generalizes to the n-chotomous case, which is employed in this thesis. First, Heckman's model and two-step estimation procedure is described for the case of a dichotomous dummy endogenous variable. Then, a procedure is developed which extends this model and estimation technique to handle the case of an n-chotomous dependent variable.

#### 4.1.1 The Heckman Model

The dual role of dummy variables in this analysis is of crucial importance. Dummy variables may serve either as proxies for underlying, unobservable variables, or as direct shifters of equations. Thus, Heckman's most general model may be written in the two equation case for two jointly determined, continuous latent random variables  $Y_1^*$  and  $Y_2^*$ . In addition to this Heckman notes six special cases of the model, of which the most general is the Hybrid Model with Structural Shift. In this formulation, only one of the endogenous variables is latent; the other is an observed continuous variable. Since this reflects the empirical model estimated in this chapter, the following presentation is of Heckman's Hybrid Model with Structural Shift (see Amemiya (1977)). The model may be written:

$$(1a) \quad Y_1 = \theta_1 Y_2^* + X_1 B_1 + \delta_1 d + u_1$$

$$(1b) \quad Y_2^* = \theta_2 Y_1 + X_2 B_2 + \delta_2 d + u_2$$

$$(1c) \quad d_t = \begin{cases} 1 & \text{if } Y_{2t}^* > 0 \\ 0 & \text{o.w., } t=1, \dots, T. \end{cases}$$

$X_1$  and  $X_2$  are matrices of known constants; in addition,  $(u_{1t}, u_{2t})$  are assumed to be i.i.d. bivariate normal random variables, and the restriction  $\delta_2 = -\theta_2 \delta_1$  is imposed. This restriction is termed the principal assumption; Heckman shows that it is a necessary condition for the structural and reduced form equations to exist. An intuitive explanation of the rationale underlying the principal assumption is presented shortly. Next, the structural equations (1a) and (1b) are written as standard reduced form equations, under the assumption that the  $\text{Prob}(d_t / X_{1t}, X_{2t}) = 1$ :

$$(2a) \quad Y_1 = \delta_1 d + X_1 \pi_1 + v_1$$

$$(2b) \quad Y_2^* = X_2 \pi_2 + v_2$$

$$(2c) \quad d_t = \begin{cases} 1 & \text{if } Y_{2t}^* > 0 \\ 0 & \text{o.w., } t=1, \dots, T. \end{cases}$$

In addition,  $E(v_{1t}) = \sigma_1^2$ ,  $E(v_{2t}) = \sigma_2^2$ , and  $\text{cov}(v_{1t}, v_{2t}) = \sigma_{12}$ . Also, as is standard in binary or limited dependent variable models, the normalization  $\sigma_2^2 = 1$  is imposed since  $\pi_2$ , and therefore some of the structural parameters, are identified only up to a scalar multiple.

Turning back to the principal assumption, it can be shown that this restriction does not allow  $d$  to appear on the RHS

of equation (2b). The assumption is intuitively plausible and may be explained in the context of the reduced form equation (2b): in order to assign a unique probability  $P_i$  to the occurrence of the events  $d_i = 0$  or  $d_i = 1$ , it is clear that this probability cannot be a determinant of the event itself. This is why  $d$  cannot be included in equation (2b), and thus explains the necessity of the principal assumption for the logical consistency of the model.

Estimation proceeds, then, in the following manner. In the first step, equation (2b) is estimated by probit analysis (that is, by maximum likelihood estimation of the probit model) in order to derive the conditional probabilities of the events  $d_i = 1$  and  $d_i = 0$ . The resulting estimate of  $\pi_e$  will be denoted by  $\pi^*_e$ . In the next step, the estimated reduced form equation (2b) is substituted into the first structural equation (1a), (with observed dependent variable  $Y_i$ ). This yields:

$$\begin{aligned} Y_i &= \theta_1 X \pi^*_e + X_i B_1 + \delta_1 d + v_i - \theta_1 X (\pi^*_e - \pi_e) \\ (4) \quad &= (XH^*)\alpha_1 + (F^*)\delta_1 + w_i^*, \end{aligned}$$

where  $H^* = (\pi^*_e, J_1)$ ,  $J_1$  defined such that  $XJ_1 = X_i$ ,

$$\alpha^1_1 = (\theta_1, B^1_1), \text{ and}$$

$$w_i^* = v_i - \theta_1 X (\pi^*_e - \pi_e) + \delta_1 (d - F) - \delta_1 (F^* - F),$$

where  $F$  represents the standard normal c.d.f., so that  $F$  and  $F^*$  are the values of the c.d.f. evaluated at  $(\pi_e X)$  and  $(\pi^*_e X)$  respectively. The structural parameters to be estimated are  $\alpha_1$  and  $\delta_1$ ; this is accomplished by the



application of OLS to equation (4).

Having estimated the parameters of the first structural equation, we turn now to estimation of the second structural equation (1b). Again, substitute the estimated reduced form equation (2b) into the second structural equation (1b). Since the dependent variable  $Y_{2t}^*$  is unobservable, this equation is solved for  $Y_{1t}$ , yielding:

$$\begin{aligned} Y_{1t} &= (1/\theta_2)X_t\pi_2^* - (1/\theta_2)X_tB_2 + \delta_1d + v_{1t} \\ &\quad - (1/\theta_2)X_t(\pi_2^* - \pi_2) \\ (5) \quad &= (XQ^*)\phi + (F^*)\delta_1 + w_{2t}^*, \end{aligned}$$

where

$$w_{2t}^* = w_{2t} + \delta_1(d - F) - \delta_1(F^* - F),$$

$$Q^* = (\pi_2^*, -J_2), J_2 \text{ defined such that } XJ_2 = X_2,$$

and

$$\phi^* = ((1/\theta_2), (1/\theta_2)B_2^*).$$

The structural parameters to be estimated are  $\phi$  and  $\delta_1$ ; this is accomplished by applying OLS to equation (5). (The correct standard errors, however, are not yielded by the usual LS formulas.)

#### 4.1.2 An Extension of the Heckman Model: The Case of an Ordinal Endogenous Variable

To account for an  $n$ -chotomous dummy endogenous variable, the two-equation system of structural equations may be written:

$$(1a) \quad Y_{1t} = \theta_1 Y_{2t}^* + B_{11}^* X_{1t} + \delta_{11}^* z_t + u_{1t}$$

$$(2a) \quad Y_{2t}^* = \theta_2 Y_{1t} + B_2' X_{2t} + \delta_2' z_t + u_{2t},$$

where  $\{u_{1t}, u_{2t}\}$  are i.i.d. bivariate normal,  $Y_{1t}$  is the observed random variable,  $Y_{2t}^*$  is the unobservable latent variable and  $z_t$  is an observable n-chotomous random vector such that

$z_{tk} = 1$  if the  $k^{th}$  category is selected

0 o.w.,  $k=1, \dots, M-1=M^*$ .

The  $M^{th}$  category is omitted; otherwise,  $z_t$  and the model's overall intercept would be perfectly collinear. There are  $M$  response categories  $R_1, \dots, R_M$  and the  $k^{th}$  is observed if

$\mu_{k-1} \leq Y_{2t}^* \leq \mu_k$ , where  $\mu_0 = -\infty \leq \mu_1 \leq \dots \leq \mu_{M^*} \leq +\infty = \mu_M$  are threshold values for the latent variable  $Y_{2t}^*$ .

In matrix notation, the standard reduced form equations may be written

$$(1b) \quad Y_1 = X\pi_1 + Z\delta_1 + V_1$$

$$(2b) \quad Y_2^* = X\pi_2 + V_2.$$

Just as before the principal assumption is applied, so that the matrix of n-chotomous dummy variables  $Z$  does not appear on the RHS of equation (2b).  $\{V_{1t}, V_{2t}\}$  are bivariate normal with zero means and covariance matrix  $\Sigma$ , where

$$\Sigma = \begin{pmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{12} & 1 \end{pmatrix}.$$

The correct asymptotic covariance matrix is derived in Waters, Moore, Hill, and Newman (1989).

The two-step estimation procedure follows as before;

however, in the first stage estimation of the reduced form equation (2b), maximum likelihood estimation of an ordinal probit model as developed by McKelvey and Zavonia is substituted for binary probit analysis. (The McKelvey and Zavonia procedure is described in Topic One.)

In terms of the empirical model, the structural equation (1a) models the determination of state-wide union density over two years, 1970 and 1980. Structural equation (1b) models the process by which sentiment toward public sector bargaining laws is formed. Sentiment,  $Y_{2t}^*$ , is an unobservable variable; therefore, the dependent variable is measured in discrete units by the observed random variable  $z_{tk}$ . As noted previously, for the years 1970 and 1980 our dependent variable takes the value zero for states which prohibit bargaining (or have no laws) for two or more public employee groups; it equals one for states with MMC laws for two or more groups; and it equals two for states with an MBL for two or more groups. This variable represents an escalating intensity of preferences in favor of bargaining laws.

The interpretation of the two roles played by the dummy variables in our model is the following.  $Y_{2t}^*$  represents sentiment toward bargaining laws or more generally public sector unionism; if the intensity of pro-union sentiment in a state is sufficiently strong, so that  $Y_{2t}^* > 0$ , then favorable bargaining laws may be enacted. This event is

observed and denoted by the n-chotomous dummy variable  $z_t$ , which acts as a pure shift variable in both structural equations. Therefore, in equation (1a) union density is affected by two separate components: the presence of bargaining laws of varying intensity ( $z_t$ ), and sentiment toward unionism ( $Y_{2t}^*$ ). As Heckman points out, this formulation allows one to infer the true, independent effects of bargaining laws on unionization, abstracting from sentiment. In other words, if union sentiment were not included as a separate and explicitly measured determinant of union density, then the laws might serve as a proxy for sentiment. In this case, the measured effect of legislation on unionization would be spurious. In addition, in structural equation (2a) this formulation allows the actual presence of laws in a state to affect sentiment toward unions. If then the parameter coefficient on the dummy variable  $z_t$  were significant, it would imply that the very existence of laws determining the legal status of bargaining independently influences peoples' attitudes toward unions.

#### 4.2 The Model

This section describes the two equation model of the determinants and effects of state-wide bargaining laws over time (1970 and 1980). As noted, the second equation models the determinants of legislation with dependent variable SENTIMENT, the subject of Topic One. The equation of Topic

One is estimated here with just one exception: the variable PRIOR-LEG is excluded. This is a reasonable omission in light of the additions to the structural equation required by the Heckman formulation: dummy variables representing the discrete effect of the laws per se on sentiment. Since PRIOR-LEG measures the proportion of neighboring states having passed an MBL prior to the observation years, the addition of explanatory variables indicating the legal status of laws in each state introduces an extremely high level of collinearity between the two variables. Collinearity diagnostics indicate that PRIOR-LEG is also fairly highly correlated with GOVWAGE; thus deleting PRIOR-LEG from the second equation is preferable within a system in which the overall degree of multicollinearity among the variables must be of concern.

#### 4.3 The Determinants of Bargaining Laws: Equation Two

The estimated laws equation from Topic One, with dependent variable SENTIMENT, contains the following variables (excepting PRIOR-LEG). (For a complete discussion of the included variables, as well as other variables tested but omitted from the final specification, see Topic One.)

##### 4.3.1 DEMAND VARIABLES

###### Interest Group

(1) PUBLIC UNION - the percentage of the public sector unionized. Its sign is expected to be positive.

(2) SALARY - the average earnings of all state and local full-time employees within a state. As discussed in Topic I, this sign could be either positive or negative.

#### Opposition Group

(1) UNFAIR - the number of unfair labor practice cases charged against employers, lagged one year. This sign should be negative.

#### Third Party Group

(1) PRIVATE UNION - the proportion of nonagricultural, private sector employment unionized. Again, as discussed in Topic I, this sign could be positive or negative.

#### Tastes

(1) NWLF - the proportion of the state's labor force which is nonwhite. Based on previous empirical research, this sign is expected to be positive.

### 4.3.2 SUPPLY VARIABLES

#### Political Cost

(1) COPE - a state's average COPE rating by the AFL-CIO's Committee on Political Education: the rating of Congressmen according to their votes on issues of interest to organized labor such that a higher score indicates a greater agreement with the AFL-CIO's positions. This sign should be positive.

(2) D1 and D2 - as discussed earlier in this chapter, the methodology developed by Heckman allows the true, independent effect of legislation to be discerned in both structural equations. In extending Heckman's model to

account for a trichotomous ordinal dependent variable, his dummy variable as a pure shift factor becomes two dummy variables. As noted, one of the categories must be omitted to avoid perfect collinearity with the overall intercept. Therefore, D1 equals one if a state either prohibits bargaining or has no bargaining law for two or more public employee groups, zero otherwise. D2 equals one if a state has a MMC law for two or more groups, zero otherwise. As usual, the estimated coefficients on D1 and D2 are interpreted relative to the omitted category; in this case, the omitted category represents the most favorable legal status, mandatory bargaining for two or more groups (MBL).

This variable acts as a pure shifter of the structural equation determining sentiment, representing the effect of laws per se. Although D1 and D2 are included under supply variables, it is equally plausible that they work through the demand side. The supply effect rationale involves the political (or economic) costs which may be associated with changing the status of bargaining laws from less to most favorable. For D1 this implies that a legislator in a state currently prohibiting (or having no provision for) bargaining might associate political or economic costs with changing the law to mandate bargaining. Therefore, the probability of a favorable change is lower, which is reflected in equation two as a negative influence on sentiment. The negative effect of D1 is expected to be

stronger than that of D2, which represents a change from voluntary to mandatory bargaining.

The demand side hypothesis is that the very existence of laws has the ability to influence the public's attitudes, values, and beliefs. This is expected to occur over time as a result of some change in behavior which is mandated by law. (An example illustrating this possibility is the enactment of federal law prohibiting discrimination by race or sex, and affirmative action regulations.) It is possible, then, that overall demand for bargaining rights may be shifted down by the presence of unfavorable bargaining laws.

#### Economic Cost

(1) Log MAJ-PARTY - the natural log of the ratio of the number of members of the legislature's majority party to the total number of legislators. This variable could be either positive or negative.

### 4.4 The Determinants of Public Sector Union Membership:

#### Equation One

The dependent variable in the first equation is PUBLIC UNION and the following explanatory variables were tested.

#### 4.4.1 DEMAND VARIABLES

(1) GOVWAGE - as defined above, with the same ambiguous implications in terms of its effect on the union membership decision.



(2) EAG - the percentage of a state's employment in the agricultural sector. This variable should have a negative influence on unionization.

(3) SOUTH - a dummy variable equalling one if a state is in the South, zero otherwise. Its sign should be negative.

(4) EGS - the percentage of a state's employment in the public sector. As discussed in Topic I, this sign cannot be predicted a priori.

(5) COPE - as above, its sign is expected to be positive, implying that greater pro-union preferences within a state represent a positive shift factor on the demand for union services.

(6) NWLF - as above, it is expected to exert a positive effect on unionization in a state.

(7) PRIVATE UNION - again, the sign of this variable is not clear a priori.

#### 4.4.2 SUPPLY VARIABLES

(1) SENTIMENT - representing increasingly favorable bargaining law (or more generally union) sentiment as discussed previously, this variable should have a positive effect on unionization.

(2) RTW - a dummy variable equalling one if a state has an RTW law, zero otherwise. This variable is tested as an attempt to determine whether RTW laws, which apply to government employees in sixteen of the twenty RTW states, independently affect unionization. (Although identified

here as a supply variable, the discussion of the RTW hypotheses in Chapter Two of this Topic indicates that demand may be affected as well.)

(3) PRIOR-LEG - as defined above, with its sign expected to be positive.

(4) D1 and D2 - the interpretation of the pure effect of the law is more intuitive and straightforward in the context of the unionization equation. In analyzing the determinants of public unionization across states, Heckman's procedure allows separation of the pure effect of public sector legislation from that of sentiment. Again, D1 should have a greater negative impact than D2. If D1 and D2 are significant, then the conclusion may be drawn that laws matter; if the parameter coefficients are insignificant, this implies that the measured effect of public sector bargaining laws in conventional models may be spurious, nothing more than a proxy for sentiment.

Although included under supply variables, it is reasonable to adopt the same hypotheses about the effects of D1 and D2 that pertain to RTW laws, excluding the taste hypothesis. Like most private sector models estimating reduced form equations, however, it is not possible to distinguish between the free rider and the bargaining power hypotheses in the context of this specification. In any case, the effect on union membership should be negative from either a decrease in the demand for or supply of union

services or both.

In addition to these variables, others were experimented with; for example, the proportion of women in the labor force, its age distribution, its proportion of blue-collar workers, several variables characterizing the industrial distribution of the labor force, and urbanization. All of these variables, and in addition some of the numbered variables above, were omitted in early tests of the model's specification due to insignificance.

#### 4.5 Estimation Results

The empirical analysis is reported in Table 2. The results of simultaneous estimation of the system are contrasted with those of single equation estimates of each equation. Discussing the simultaneous estimation results first, in equation one SENTIMENT has no significant effect on the dependent variable (percentage of the public sector unionized); this is not too surprising given the collinearity between SENTIMENT and the other explanatory variables which also capture tastes. However, D1, capturing the effect of the law per se, does exert a negative and significant influence. D2 is not significant in either equation, and is estimated very imprecisely; this is not surprising, however, because only three of the 96 observations on SENTIMENT fell into the MMC category.

In equation two, with SENTIMENT as the dependent

TABLE 2  
SIMULTANEOUS VERSUS SINGLE-EQUATION ESTIMATION: THE  
GENERAL MODEL OF BARGAINING LAWS  
(asymptotic t-statistics in parentheses)

| Explanatory<br>Variables | Equation One: Dependent Variable - PUBLIC UNION |                   | Equation Two: Dependent Variable - SENTIMENT |                              |
|--------------------------|---|-------------------|--|------------------------------|
|                          | Simultaneous<br>Estimation                      | OLS<br>Estimation | Simultaneous<br>Estimation                   | Ordinal Probit<br>Estimation |
| INTERCEPT                | 48.825 (6.929)                                  | 42.786 (9.9267)   | 15.187 91.874)                               | 14.735 (2.442)               |
| GOVWAGE                  | -0.0119 (-5.186)                                | -0.011 (-5.196)   | 0.0025 (2.341)                               | 0.0019 (3.704)               |
| EAG                      | -0.793 (-3.665)                                 | -0.781 (-3.695)   |  |                              |
| SOUTH                    | -5.703 (-1.757)                                 | -6.183 (-2.779)   |  |                              |
| PRIVATE UNION            | 0.2322 (2.0158)                                 | 0.222 (2.012)     | -0.087 (-1.596)                              | -0.055 (-1.628)              |
| PRIOR - LEG              | 17.360 (3.068)                                  | 13.093 (3.948)    |  |                              |
| SENTIMENT                | -2.010 (-1.116)                                 | 2.738 (2.770)     |  |                              |
| PUBLIC UNION             |   |                   | 0.199 (1.973)                                | 0.080 (3.527)                |
| UNFAIR                   |   |                   | -0.0014 (-1.946)                             | -0.001 (-2.746)              |
| NWLF                     |   |                   | 0.1019 (1.619)                               | 0.041 (1.225)                |
| COPE                     |   |                   | 0.0217 (1.315)                               | 0.027 (2.421)                |
| Log MAJ-PARTY            |   |                   | -6.133 (-2.410)                              | -4.795 (-3.239)              |
| D1                       | -10.7819 (-1.553)                               |                   | -8.659 (-1.231)                              |                              |
| D2                       | 38.118 (0.657)                                  |                   | 27.966 (0.495)                               |                              |

variable, the law per se has no significant influence on sentiment; D1 just misses significance at the .10 level. Also in equation two, the sign of the jointly endogenous PUBLIC UNION is positive as expected.

In equation one, GOVWAGE is negative, implying that the probability of union membership is greatest for lower wage public sector workers. The other variable in this equation the sign of which could not be predicted a priori is PRIVATE UNION. Its positive influence implies that a large union presence in the private sector reflects more favorable tastes toward unionization within the state, and may but does not necessarily imply direct support from private union members toward public unionism.

In equation two, GOVWAGE's coefficient is reversed. Higher government wages tend to increase sentiment, increasing the likelihood that a more favorable bargaining law is passed. In addition, the effect of private unionization on sentiment is not significant. One final sign which could not be predicted a priori is Log MAJ-PARTY, included as a supply side determinant of bargaining law sentiment. It is negative, which may support the monopoly theory hypothesis that less competition for legislative seats decreases the production of special interest legislation (see Waters and Moore (1989) for other explanations). The remaining variables in both equations are of the predicted sign, and significant according to the

appropriate one-tail or two-tail test.

#### 4.6 Comparison of Simultaneous and Single-Equation Estimation

Least squares estimation of the first equation yields very similar magnitudes for the parameter estimates and standard errors with the exception of SENTIMENT. The coefficient on SENTIMENT is highly significant and positive. In this single equation context, SENTIMENT simply represents bargaining law strength within a state. Treating laws as exogenous leads in this case to the conclusion that more favorable bargaining legislation independently increases union membership. This is the same conclusion reached when SENTIMENT is treated as endogenous; however, in the OLS equation it cannot be known with certainty whether the independent variable SENTIMENT does in fact represent the law itself or is acting as a proxy for unobservable taste factors. Heckman's procedure allows one to infer with more certainty that laws do matter, and in addition indicates that after one controls for sentiment explicitly, the effect of the law is less significant than OLS estimation implies.

Equation two is estimated separately by ordinal probit. Comparing this equation with its simultaneously estimated counterpart, it can be seen that the estimated coefficients and standard errors of each are reasonably similar. The effect of PUBLIC UNION is considerably more significant,

however. For this equation the advantage of Heckman's simultaneous estimation procedure is to allow for the possibility that the law per se affects SENTIMENT, interpreted as sentiment toward laws as reflected in the observed bargaining law category. In the OLS equation, the dependent variable SENTIMENT simply represents the bargaining law status observed within a state; therefore, no such test is possible in a single equation context. Although the law (D1) was found to be an insignificant determinant of SENTIMENT in the simultaneous system, it should be repeated that D1 just missed significance at the .10 level. One might infer that the possibility that bargaining laws influence attitudes is still open and should be explored further within the area of labor legislation.

#### 4.7 Summary

Finally, in terms of the theoretical framework from which the empirical model was derived, the Heckman procedure largely supports the theory of economic regulation. The Chicago School demand variables receive the strongest support, the Economics of Legislatures School cost variables the least. This latter result is consistent with Farber (1988), as is the conclusion drawn: either more appropriate proxies for legislative supply variables need to be found, or the contribution of this school to the theory of economic regulation reevaluated.

## CHAPTER 1

### INTRODUCTION TO TOPIC THREE

The final topic of this dissertation takes the basic general model of bargaining laws and unionization from Topic Two, and disaggregates it in terms of the public employee groups under study. In Topic Two, the ordinal index characterizing legal status is constructed by counting the number of employee groups per bargaining law category; if two or more groups fall into one of three designated categories, then the appropriate value is assigned to this jointly endogenous variable (one for bargaining prohibited or no law, two for Mandatory Meet and Confer (MMC), three for Mandatory Bargaining Law (MBL)). Here, three of the five public employee groups are analyzed separately to determine the similarities and differences among them in the processes which jointly determine bargaining law status and unionization. The three groups chosen are teachers (excluding college and university teachers), local firefighters, and local police.

The analysis follows the Topic Two methodology, in terms of both the data and the econometric specification. That is, state-level data are employed, with unionization



and legal status jointly determined. This procedure allows direct comparisons among each of the three disaggregated employee group models, as well as between them and the general model of Topic Two. Chapter 2 contains a review of the literature pertaining to the analysis of legislation and unionization among individual employee groups. Much of this literature is reviewed in Topics One and Two; therefore, only the primary conclusions of these articles will be repeated here. Chapter 3 presents the empirical analyses of the three models, utilizing the basic econometric procedure previously described in Topic Two. In addition, Chapter 3 concludes the topic and suggests further research possibilities for local-level sub-group analysis within this simultaneous equations context.

## CHAPTER 2

### REVIEW OF THE LITERATURE

Most of the public sector literature dealing with legislation and unionization has focused on teachers. Recently, with the introduction of the NBER Public Sector Bargaining Law Data Set, several articles have studied characteristics of the bargaining processes of firefighters and police. First, the evidence on teacher bargaining and legislation will be reviewed; following this are the articles analyzing the same attributes of the following groups: firefighters, police officers, other local government employees, and state employees. These articles comprise the bulk of the literature review; following this, two articles studying bargaining and wage-setting interrelationships between police and firefighters are summarized. These latter two articles provide an important institutional framework linking bargaining coverage as well as bargaining law sentiment between police officers and firefighters.

#### 2.1 Teachers

One of the earliest quantitative articles on the determinants of the passage of teacher bargaining laws is

Moore and Newman (1976), reviewed in Topic I. Using discriminant analysis, the following results are reported. The proportion of employment in the government sector has a negative influence on the passage of pro-union bargaining legislation, as does a South dummy variable. The level of urbanization and the percent of the government sector unionized are both associated with more favorable teacher legislation. Surprisingly, the coefficient on the proportion of employment in the agricultural sector is largest for MMC-type laws, and smallest for the least permissive law group. Variables found to be insignificant are a RTW dummy variable and the total union and employee association membership within a state.

The next article examines the same topic: the determination of teacher bargaining legislation, using SMSA-level data. Reviewed in Topic I, Hunt and White (1983) report the following conclusions derived from n-chotomous probit estimation of a four-level index of teacher bargaining status. The variables with a significant and positive influence on bargaining law strength are state and local education expenditures (as a percent of state per capita income), the percent of non-practitioner employment in the health profession, the percent of the private sector organized, the labor force separation rate, and the percent of teachers who are male. The variables exerting a significant and negative influence are the number of unfair

labor practice charges (per representation election), and the percent of teachers in the workforce. Among the variables with no significant effect are the share of government employment and average teacher salary (relative to median male income).

A third article examining both teacher bargaining coverage and bargaining laws within a single equation context is Saltzman (1985). Reviewed in both Topics I and II, the major results will be very briefly summarized. First, changes in bargaining law status are the most significant determinants of changes in the extent of teacher bargaining contract coverage. Other significant variables are per capita income (positive), growth in teacher employment (negative), teachers per school (positive), and proportion of teachers who are male (positive). Second, the probability that a current law will change to a stronger (more pro-bargaining) law is influenced by the proportion of contiguous states with a mandatory bargaining law (positive), the percentage of government labor protected by a merit system (positive), the strength of Democratic party control of state government (positive), per capita income (positive), and the change in teacher bargaining coverage (positive), among others. Third, Saltzman concludes that the direction of causality is primarily (but not wholly) from the legal environment to bargaining coverage.

The next article provides the only simultaneous

equations framework in this area of research for the public sector. Hunt, Terza, White, and Moore (1986) specify teachers' wages and unionization as the jointly dependent variables, and condition the system on bargaining law status as discussed in Topic II. Estimation of this system yields the following results for the equation explaining the level of teacher unionization. The percent of professionals in the workforce, the average annual percent change in state population, and the number of unfair labor practice charges are all negatively related to the extent of unionization. Wages exert a positive and significant influence, as does a pro-bargaining legislation shift variable.

A recent study by Farber (1988) analyzes the evolution of bargaining laws for three groups: police, teachers, and state workers (reviewed in Topic I). Only the results for teachers will be noted in this section. Using a Markov transition model to estimate (and predict) changes from one legal category of bargaining rights to another, Farber based his model on two elements: variables describing the intensity of preferences for or against public sector bargaining (or more generally, public sector unionism), and the legislative cost of changing laws. The results of unconstrained and several different constrained specifications indicate clearly that the legislative cost variables are completely lacking in explanatory power. (His supply constraint proxies are the number of days a

legislature meets, the number of legislative enactments by a state government, and a dummy variable indicating single party control of the legislature and the governor's office.) In terms of the intensity of preferences variables, the COPE score is significant and positive, and a South regional dummy variable significant and negative.

## 2.2 Firefighters

Firefighters are the least studied group among the three. In a recent article, Valletta (1987) uses a selectivity approach to study the evolution and effects of collective bargaining activities by both firefighters and police. This paper has several goals. One is to estimate public union wage effects and in addition public union employment effects in a standard single-equation context. As noted by Valletta, recent research indicates that municipal unions (such as police and firefighters) tend to increase the demand for their services, thereby increasing both employment and wages (Zax (1985), Freeman and Valletta (1986)). The political nature of public employee bargaining which allows this dual effect is one of the factors distinguishing public from private sector unionism. Second, Valletta estimates the union wage and employment effects after accounting for union endogeneity, i.e., the selectivity-corrected wage and employment differentials. Finally, Valletta models factors influencing the probability

of collective bargaining coverage by police and firefighters, focusing on the effect of expected wage gains to unionism.

Since the focus of this topic is collective bargaining and bargaining coverage, only the results pertaining to the probability of coverage are included here. This information is derived from a general approach to estimating union wage and employment effects, allowing for union endogeneity; Valletta calls this the "switching model" (see Lee (1978)). Union status, or the probability of bargaining coverage, is a function of the union-nonunion wage differential, and in addition, of appropriate exogenous variables describing city demographic characteristics and department-specific factors. Then, to allow for interactions between union status and wages, separate union and nonunion wage equations are specified, each as functions of exogenous department-specific and city characteristics. Since the covariance between the error term in the union status equation and those in the two wage equations is expected to be nonzero, a two-step estimation procedure described by Lee (1978) and Heckman (1978) is employed. In the first step, the conditional means (or selectivity terms) are estimated from the (0,1) union status equation. The second step then consists of estimating by weighted least squares both selectivity-corrected wage equations. This procedure provides consistent although not efficient estimates of the

wage equation parameters. What is of interest here, however, is the union status equation. Therefore, the estimated union-nonunion wage differential is substituted into the structural probit union status equation as a regressor, yielding consistent parameter estimates. In addition, this same procedure is used to generate a union-nonunion employment differential; both the wage and employment gaps are proxies for the expected benefits from unionization. These are the results which will be looked at to analyze the determinants of the union status decision, first for firefighters, then in the following section for police.

For fire (and also police) departments, three different specifications are estimated, each with the same set of purely exogenous variables. The first specification includes the union-nonunion wage differential, the second the union-nonunion employment differential, and the third includes both. The firefighters' results indicate that in no specification does either the wage or employment gap significantly influence the probability of a fire department's coverage by a collective bargaining contract. Most of the variation in coverage is explained by three variables describing the legal environment surrounding public unionism. A dummy variable specifying the presence of a union recognition procedure is consistently highly significant and positive, as is a nine-category legislative



index representing an escalating intensity of preferences in favor of unionism. This legislative index accounts for three different regulations: bargaining rights, impasse resolution, and strike provisions. Finally, the presence of an RTW law covering public sector employees significantly decreases the probability of bargaining coverage for fire departments. Other included explanatory variables which do not exhibit a consistently significant pattern are population, percent black in the population, per capita income, median value of owner-occupied housing, median age, and three regional dummy variables.

### 2.3 Police

The first evidence presented is from the previous article; Valletta's results for police departments follow essentially the same general pattern as those for fire departments. That is, most of the variation in police department bargaining coverage is explained by the three legal environment variables listed above. Again, neither the union-nonunion wage differential nor the employment differential contributes to the model's explanatory power. Also, none of the other explanatory variables listed above is consistently significant in any of the model specifications.

Overall, Valletta concludes that both the fire and police department models explain the extent of bargaining

coverage well: the null hypothesis of no slope effects is rejected at the .01 level by likelihood ratio tests for both. Additionally, predictions from both models match the actual (0,1) observations on bargaining coverage approximately 75% of the time.

Finally, Valletta concludes that the apparent lack of importance of expected gains to unionization (i.e., the wage and employment gaps), in explaining the bargaining coverage decision for both police and fire departments is the result of one of three factors: unobservable variables at the municipal level, data limitations, or econometric deficiencies.

Continuing with evidence on police unionization and bargaining rights, Farber's (1988) results on the evolution of police bargaining laws will be summarized. Using the previously noted Markov transition model, the results are roughly similar to those for teachers. That is, under several different specifications, the legislative cost variables are consistently insignificant in predicting a state's change from one category of police bargaining rights to another. Turning to the variables describing intensity of preferences toward unionization, in the unconstrained model only COPE (positive) and a South dummy variable (negative) are significant. In one version of the constrained model, in which only a constant term is included in the legislative cost vector, per capita income and per

capita government expenditures in addition to COPE and the South dummy variable are significant and positive.

Another model of police unionization and bargaining laws utilizing an unusual method of estimation is Ichniowski's (1988) proportional hazards model. As reviewed in Topic II, this study attempts to determine the causes of growth over time in police unionization, with a particular emphasis on the role of the legal environment in this process. Briefly recounting the empirical results for this municipal-level data, Ichniowski finds that the most important factor in determining the rate of police unionization is the nature of the bargaining law in effect. Other significant variables are private sector unionization, regional dummy variables, and central city status. Among the variables with no significant effect on police unionization rates are per capita city income, per capita city revenue, and city population.

#### 2.4 Other Groups

Within this bargaining laws framework Farber (1988) has also separately modelled changes in legislation for the group comprised of all state employees in addition to local-level teachers and police as previously reviewed. First, Farber's state employee results will be summarized and compared with his teacher and police evidence. Second, an article by Freeman and Valletta (1988) modelling the

effects of labor legislation for six local government employee groups completes this section of the review of the literature.

Farber's results from the Markov transition model for state employees are similar to those for teachers and police. The legislative cost variables perform poorly in explaining changes in policy. In terms of the determinants of the intensity of preferences toward unionization, again a similar pattern prevails. For the unconstrained model, three variables are significant: COPE (positive), a South dummy variable (negative), and per capita income (marginally significant and positive). For the constrained model, which includes only a constant in the legislative cost vector but the full set of parameters in the intensity of preferences vector, one additional variable exerts some influence: per capita government expenditures is marginally significantly positive.

A comparison of the three groups tested in Farber's article clearly reveals the systematic failure of the proxies representing the legislative cost of policy changes. In terms of the variables proxying the intensity of preferences for or against unionism, four variables appear to systematically affect the probability that a more favorable bargaining law will be passed for teachers, police, and state employees: COPE, the southern region, per capita income, and (less strongly) per capita government

expenditures.

Finally, Freeman and Valletta (1988) examine the effects of a legislative index on collective bargaining, wages, and employment in municipalities. The index is constructed by combining the effects of two legal categories pertaining to six local government employee groups, and ranking them in terms of their favorableness toward collective bargaining. The two legal categories are bargaining rights and dispute resolution. In the latter category the authors distinguish between three categories: nonbinding mediation and fact-finding; compulsory interest arbitration, which guarantees closure of the bargaining process; and the legal status of strikes.

This study is briefly reviewed in Topic Two, and its results for all six employee groups are summarized together here, because most of the extensive empirical analysis of this paper focuses on wage and employment effects. That is, most of the analysis is comprised of the estimation of several different reduced-form wage and employment specifications, while only a small portion deals with the estimation of a bargaining coverage variable for each group. Since only the latter results are directly relevant, a summary of these results for all groups is briefly presented here. As noted in Topic Two, two different data sources (the CPS and the SOG) are used to form two separate bargaining coverage models. In the CPS model, the

dichotomous dependent variable takes the value one if an individual is either a union member or covered by a collective bargaining contract, zero otherwise. In the SOG model, the dependent variable is one if the city department was determined to have a collective contract, zero otherwise. The legal index described earlier, plus numerous control variables, are the regressors. Only the estimated coefficients on the legal index are reported by Freeman and Valletta. Both data sources are consistent in finding a significant positive effect of the legal index on contract coverage for police, firefighters, teachers, sanitation and streets and highways employees, other local employees, and finance and control employees. The parameter coefficient on the legal index ranges from a high of .21 for police, to a low of .014 for sanitation workers, both in the SOG cross-section.

## 2.5 Police and Firefighter Bargaining Spillover Evidence

The final section of the literature survey consists of two articles providing evidence of an institutional link between police and firefighters' bargaining activities and outcomes. First, Ehrenberg and Goldstein (1975) estimate a general model of public sector wage determination allowing for both occupational and geographic spillovers among municipal government employees in 478 cities in 1967. Several specifications of an interrelated system of wage

equations for ten (noneducational) municipal government employee groups are estimated. The first specification allows for only occupational spillovers, the second only geographic, and the third allows for both types. These may then be compared with wage equations allowing no forms of spillover so that more accurate conclusions of the true union effect on municipal employee wages may be drawn. Clearly, if spillovers exist, previous estimates of the union-nonunion wage differential underestimate the actual gap and the impact of public unionism.

First, a system of ten reduced form wage equations allowing for occupational spillovers is estimated. The presence of spillovers is accounted for by including in each employee category wage equation the percent unionized of all the other employee categories in the city. (Other city-wide explanatory variables include median education, percentage of blacks in the population, population density, median family income, median value of single family housing, and average weekly earnings in manufacturing; estimated parameter coefficients for these variables were not reported for the spillover models.) Estimation of the occupational spillover models indicates that a positive wage spillover effect exists in all but two of the wage equations. That is, F-tests of the null hypothesis that all of the unionization coefficients (except the own-unionization coefficient) are zero is rejected for all employee group

wage equations except two: general control, and parks and recreation. Individual unionization coefficients are usually insignificant according to t-tests for all the wage equations, however; this is probably due to the high degree of multicollinearity among the unionization variables.

Briefly, results of the geographical spillover model indicate significant wage spillovers exist within occupations within SMSA's; moreover, the spillovers run primarily in one direction: from the suburbs to the central city. The authors conclude that ignoring occupational and geographic spillover effects on the wages of municipal employee groups leads to a substantial underestimation of the impact of public sector unionism. Additionally, it is expected that if a bargaining contract coverage variable were substituted for the extent of unionization variable, its measured influence on the wages of other employee groups would be even greater.

Finally, the last article to be reviewed deals specifically with bargaining spillover effects between police and firefighters. Victor (1979) examines the existence and effects of "key" bargains between a municipal employer and one or more municipal employee groups. He points out that ignoring pattern-setting wage bargains, if they result in spillovers across municipal occupations, results in underestimating the potential effects of public unionism. More specifically, the effects of pattern-setting



municipal unions are underestimated, while the union effects of pattern-following groups are overestimated.

To test for the existence of key bargains, police and firefighter wage and employment equations for municipalities in 1975 are estimated by Two Stage Least Squares. Only the wage equation results are reported, however. First, the models are estimated assuming no pattern-setting behavior; next, the models are reestimated assuming key bargains exist, as proxied by unionism measures of the pattern-setting group. The explanatory variables included are the jointly endogenous per capita employment of the department under study, city per capita income, per capita budget allocation for all municipal services except the one under study, a measure of the union strength of the department (discussed below), a measure of the alternative private sector wage, and per capita intergovernmental grants to the city. Again, only the parameter coefficients of the variables directly under study are reported: the unionization measures.

Three alternative measures of "union strength" are separately included in the models. The first is the proportion of the occupation organized (U1). Although a useful approximation of union strength, a more discerning measure would relate specifically to the bargaining process. It is well known that many unions and employee organizations do not bargain collectively. Some public sector unions

without written contracts are nevertheless very successful in securing favorable wage and nonwage outcomes through the lobbying of state legislatures or appropriate city officials. Thus, a second measure of union strength tested is a binary variable equalling one for the presence of a recognized union, zero otherwise (U2). And finally, the third measure, also binary, indicates the existence or nonexistence of a collective bargaining contract (U3).

First, the separate police and firefighter wage equations without spillovers are presented; therefore, only the own-unionism measure is included. For both groups, positive and significant own-unionism effects on wages are found. Comparisons of each of the three union strength measures reveal that all three are significant, and the parameter coefficient on U3 exceeds that of U2, which exceeds that of U1 for both groups as expected. That is, the more accurate the measure of union bargaining strength, the greater is the measured effect on wages.

These results may be compared with the second set of results, which hypothesizes a key bargaining relationship. U1, U2, and U3 are separately included in each wage equation for both police and firefighters; if the coefficients on these union strength variables are positive and significant, a bargaining spillover is indicated. In the police wage equations, the own-unionism measures U2 and U3 are each significant in their separate equations. The parameter

estimate for U2 is approximately the same as in the first set of results (11.1% versus 11.2%), while the estimate for U3 diminishes (12.3% versus 9.9%). However, none of the three firefighters' unionization measures attains significance, leading the author to conclude that firefighters are not pattern-setters for police.

In the firefighters' wage equations a different pattern emerges. Of the own-unionism measures only U3 is significant, and like U1 and U2 its coefficient is greatly diminished relative to the first set of results. Most importantly, all three police unionism measures are significant and positive (U1=11.4%, U2=13.4%, U3=10.7%), leading to the conclusion that police are the pattern-setters and firefighters the pattern-followers. The police wage-setting process is the key bargain.

These final two articles shed light on an institutional feature of municipal-level employee bargaining. This institutional analysis complements the traditional demand and supply framework within which both bargaining laws and the extent of bargaining coverage are modelled in this dissertation.

### CHAPTER 3

#### EMPIRICAL ANALYSIS

In this chapter, we attempt to model the simultaneous determination of bargaining laws and bargaining coverage for three public employee groups--teachers, police officers, and firefighters. Initially, the same theoretical foundation and the same state-wide explanatory variables as employed in Topic Two are used in order to provide a direct comparison of the aggregative model of public employees versus three of its disaggregated components.

The three chosen are all local-level employee groups. State-employed or college teachers are omitted because they are clearly a group distinct from primary and secondary school teachers; the proportion of college teachers who bargain collectively is quite small. Also, firefighters are almost exclusively employed at the local level. Finally, the NBER public sector bargaining law data set, from which we derive the legal status of all three groups, describes state-wide laws for local police only, which is by far the largest group.

By utilizing the same basic econometric procedure and the same state-wide explanatory variables, useful

conclusions can be drawn about the similarities and differences among all the models of Topics II and III. This in turn points to future areas of research which are indicated by the comparisons.

### 3.1 Estimation Technique

Before analyzing the model results, a few points about the data limitations for these groups must be noted which have implications for the use of the Heckman-like econometric procedure. While the NBER data set provides easy access to a substantial amount of information on the bargaining (and other) law status of all public employee groups, data on the other jointly dependent variable, unionization or bargaining contract coverage as a proportion of employees, are difficult to find. For the various subgroups of public employees, the data are scattered and still available for only a limited number of years. For teachers the data used cover three years: 1972, 1977, and 1982. The 1972 data are published in the NEA Negotiation Research Digest (January 1974). The 1977 and 1982 data are published in the Census of Governments beginning with the 1977 publication. These data are the proportion of local teachers covered by a collective bargaining contract. For firefighters and police, only the comparable Census data for 1977 and 1982 could be found. (Although the Census of Governments is published every five years, 1977 is the first

year for which bargaining coverage data are available for any group, and the 1987 volumes have not yet arrived.)

The major implication for the police and firefighter models from using 1977 and 1982 (rather than 1970 and 1980 as in Topic II) as the observation years is that the major period of bargaining law activity was the 1960's and early to middle 1970's; by the late 1970's, bargaining law enactments and changes had begun to slow. Being forced to use these two (later) years means there is less variation in the data to explain. In terms of our econometric procedure, it appears that using a trichotomous, ordinal dependent legal variable is asking too much of the data. For teachers, even with three observation years similar problems occur when using a trichotomous legal index. It appears that by the 1970's, the difference between the effects of MMC and MBL laws on bargaining activity diminished. Put another way, the same level of sentiment seems to underly both laws at least for the later observation years.

Due to these data problems, the trichotomous index is not truly ordinal in nature. The solution to this problem for all three groups is to recategorize the bargaining index as a dichotomous variable: the bargaining law or sentiment variable takes the value zero if bargaining for the individual employee group is prohibited (or no law exists), and the value one if the group has either an MMC or an MBL statute. This combination appeared a priori to be the

accurate representation, but a recategorization with bargaining prohibited and MMC both taking the value zero, and MBL the value one was tested for the purpose of comparison; as anticipated, this formulation proved unsuccessful. This means, of course, that these three models are estimated by Heckman's original formulation for one binary and one continuous endogenous variable.

### 3.2 Estimation Results: Application of the General Model to Sub-Groups

#### 3.3 Teacher Results

##### 3.3.1 Equation One (Bargaining Coverage): Simultaneous Estimation

The simultaneous and single equation results for teachers from the application of the general model of Topic Two are reported in Table 3.3. Simultaneous estimation of the bargaining coverage equation for teachers yields the following results.

Neither SENTIMENT nor the dummy variable representing the pure effect of the law (D2) is significant. As noted in Topic Two, one of the legislative dummy variables must be omitted to avoid perfect multicollinearity; in all three of the binary models, the first legal category is omitted, i.e., bargaining prohibited (or no law). Therefore, the coefficient on D2, a more favorable bargaining category, is expected to be positive.

TABLE 3.3  
TEACHERS  
Simultaneous Versus Single-Equation Estimation  
(asymptotic t-statistics in parenthesis)

| Explanatory Variables | Simultaneous Eq. One<br>Bargaining Coverage | Single Eq. One<br>Bargaining Coverage | Simultaneous Eq. Two<br>Sentiment | Single Eq. Two<br>Sentiment |
|-----------------------|---|---------------------------------------|-----------------------------------|-----------------------------|
| SENTIMENT             | -1.10 (-0.178)                              | 15.19 (3.86)                          |                                   |                             |
| GOVWAGE               | 0.018 (3.9)                                 | 0.018 (3.88)                          | -.002 (-0.66)                     | 0.00 (0.52)                 |
| EAG                   | -1.45 (-3.20)                               | -1.526 (-3.7)                         |                                   |                             |
| SOUTH                 | -36.78 (-8.13)                              | -36.12 (-8.6)                         |                                   |                             |
| PRIVATE UNION         | 0.036 (0.15)                                | -0.00 (-0.00)                         | -0.01 (-0.15)                     | 0.018 (0.69)                |
| PRIOR-LEG             | 0.207 (3.025)                               | 0.19 (3.8)                            |                                   |                             |
| OWN-UNIONIZATION      |   |                                       | 0.10 (0.99)                       | 0.02 (2.91)                 |
| UNFAIR                |   |                                       | 0.00 (0.05)                       | -0.00 (-0.05)               |
| NWLF                  |   |                                       | -0.04 (-0.38)                     | -0.06 (-2.51)               |
| COPE                  |   |                                       | -0.01 (-0.53)                     | 0.003 (0.37)                |
| Log MAJ-PARTY         |   |                                       | 4.03 (0.95)                       | 1.79 (1.52)                 |
| D2                    | 14.7 (0.65)                                 |                                       | 24.07 (0.97)                      |                             |



The insignificance of SENTIMENT is not surprising due to the presence of other variables in the equation which also represent or determine sentiment; the same result was found for the general model as well. The insignificance of D2 suggests that the existence of more favorable teacher bargaining laws does not encourage greater bargaining during the sample period. In contrast, a significant law coverage effect did show up in the general model, indicating that unfavorable bargaining laws constrain general bargaining coverage.

Looking at the other variables, GOVWAGE is positive and significant; in contrast, it is negative and significant in the general model. As previously noted, this variable is subject to opposing influences. The positive sign for teachers supports the straightforward interest group demand effect: assuming union services are normal goods, an increase in income results in greater demand for these services. In addition, GOVWAGE could proxy the effect of an increased demand for educational services as a result of an increase in income; this increased demand then supports teachers' increased demand for union services. (The rationale for a negative sign on GOVWAGE is the hypothesis that workers who support unions tend to be relatively low wage employees.)

PRIVATE UNION is not significant for teachers, although it is significant and positive in the general model. Like

GOVWAGE, the sign on PRIVATE UNION cannot be predicted a priori. Two opposing effects are possible within the context of the special interest theory. The first represents the interest group demand of organized labor; PRIVATE UNION may proxy the strength of the labor movement. On the other hand, as previously discussed, private sector rank-and-file union members may be more influenced by their position as a taxed group than by their common membership in the labor movement. That is, private union members may be more influenced by the possibility of an increased tax burden to support gains to teachers made possible by increased bargaining. In the teacher model, these two effects may have offset each other.

PRIOR-LEG is strongly significantly positive for teachers, as for the general model. PRIOR-LEG proxies demand for bargaining through the demonstration effect of teacher bargaining in neighboring states.

Finally, the last two variables are EAG and SOUTH. As expected, both are negative, and also strongly significant. As discussed earlier, both variables represent tastes and preferences toward unionism. The lower levels of unionization in the South and in the agricultural sector are well known, and therefore both EAG and SOUTH represent negative demand shift variables. The same results are found for the general model as well.

### 3.3.2 Single versus Simultaneous Estimation of Equation One

Ordinary Least Squares (OLS) estimation of the teacher bargaining coverage equation provides an interesting comparison to its simultaneously estimated counterpart. The comparison is of interest because it reaffirms the importance of the treatment of bargaining coverage and bargaining legislation as jointly determined variables.

First, the two estimation techniques yield extremely similar values for both the parameter coefficients and their standard errors for all variables excepting those capturing the effect of the law. When teacher bargaining legislation (SENTIMENT) is treated as a purely exogenous variable in single equation estimation, its estimated coefficient is positive and highly significant. This implies that the law itself exerts an independent influence on the extent of teacher bargaining.

When estimated simultaneously, however, the effect of the law per se is captured by D2, which is not significant for the sample period. This suggests that in single equation models of bargaining, with legislation treated as exogenous, the legal variable is in fact acting as a proxy for sentiment. When teacher legislation and bargaining coverage are treated as joint outcomes of the same process, with sentiment and legislation explicitly separated by the Heckman technique, legislation no longer exerts an independent effect.

### 3.3.3 Equation Two (Sentiment toward Bargaining

Legislation): Simultaneous estimation

Again, Table 3.3 contains the results of the application of the general model of Topic Two to teachers. Simultaneous estimation of equation two, with SENTIMENT as the dependent variable, yields the following results.

First, the jointly endogenous variable extent of teacher bargaining coverage exerts no significant effect on SENTIMENT during the sample period. (In contrast, the level of own-unionization is significantly positive for the general model.) Similarly, D2 is also insignificant (as is the effect of the law on SENTIMENT in the general model).

In fact, all the variables in equation two are insignificant determinants of sentiment toward legislation. Both GOVWAGE and PRIVATE UNION are included, and were elaborated on in the discussion of teachers' equation one.

The other variables in the equation will be briefly related to their respective hypotheses, which are contained in greater detail in Topics One and Two. First, UNFAIR (the number of unfair labor practice cases charged against employers) represents the negative demand effect of an opposition group, as predicted by the special interest theory. It proved to be significantly negative for the general model.

Next, NWLF represents a taste factor in the demand specification. Based on previous research, including results from the general model, it is hypothesized to be

positive. As discussed in Topic Two, non-whites are expected to exhibit greater demand for union services, thus supporting favorable union legislation, based on their relatively greater expectation of the returns to unionization.

Third, COPE proxies a special interest legislation supply constraint on legislators. Again, this represents a political cost variable motivated by the Public Choice extension of the Chicago School special interest framework. As previously noted, a legislator's political cost of passing favorable labor legislation is lower, the more pro-labor his or her constituents. COPE is a proxy for a state's preferences towards labor issues: the higher is COPE, the more favorable are these preferences; thus, the political cost of benefitting union members by supporting favorable bargaining legislation is lower.

Fourth, Log MAJ-PARTY is a proxy for the economic cost of supplying special interest legislation as put forth by the Economics of Legislatures School; it also represents a supply constraint and therefore further extends the Chicago School theory. Opposing hypotheses are attached to this variable, however. The Economics of Legislatures School argument is that legislative output as controlled by the majority party is subject to strong scale economies. In addition, Stigler (1972) predicted positive returns to party dominance, but subject to diminishing returns to scale.

Opposing this is the view that large majority proportions represent effective entry barriers to legislatures; rather than increasing output through lowered costs of reaching agreement, the effect of lower political competition on legislative output is that predicted by monopoly theory: restricted output levels at a higher per unit price.

Clearly, the second equation of the general model applied to teachers performs very poorly. It turns out that this is a general pattern for all three sub-groups: good results for the first (bargaining coverage) equation, unacceptably poor results for the second (bargaining law sentiment) equation.

#### 3.3.4 Single versus Simultaneous Estimation of Equation Two

Equation two is estimated separately by the method of maximum likelihood applied to a standard binary probit model. The results from this method are quite different from the simultaneous equation estimates, as shown in Table 3.3.

The result of primary importance is that of bargaining coverage. Single equation estimation yields a positive and strongly significant effect of coverage on SENTIMENT, whereas its coefficient is insignificantly different from zero when treated as jointly endogenous using Heckman's technique. The implication one would draw from the incorrect single equation specification is that during the sample period, greater bargaining by teachers encouraged

passage of more favorable legislation.

Among the other variables, GOVWAGE, PRIVATE UNION, UNFAIR, and COPE are also insignificant in the single equation model where they are significant in the simultaneous equation model. Log MAJ-PARTY is significant at the .10 level, but its positive sign is opposite that of the general model of Topic Two (although the hypothesis is in fact two-sided). The only variable in the singly estimated model significant at the .05 level or better is NWLF, and its negative sign does not support its hypothesis.

The performance of separate binary probit estimation of equation two is clearly poor, as is its simultaneously estimated counterpart. However, the importance of using the correct simultaneous specification is indicated again by the result on bargaining coverage. It matters a great deal whether this variable is treated as a purely exogenous or a jointly endogenous variable.

### 3.4 Firefighter Results

#### 3.4.1 Equation One (Bargaining Coverage): Simultaneous Estimation

The simultaneous and single equation results for firefighters from the application of the general model of Topic Two are reported in Table 3.4. Simultaneous estimation of the bargaining coverage equation for firefighters yields the following results.

TABLE 3.4  
FIREFIGHTERS  
Simultaneous Versus Single-Equation Estimation  
(asymptotic t-statistics in parenthesis)

| Explanatory Variables | Simultaneous Estimation<br>Eq. One | Single Eq. Estimation<br>Eq. One | Simultaneous Estimation<br>Eq. Two | Single Eq. Estimation<br>Eq. Two |
|-----------------------|------------------------------------|----------------------------------|------------------------------------|----------------------------------|
| SENTIMENT             | -4.1 (-0.50)                       | 13.5 (3.11)                      |                                    |                                  |
| GOVWAGE               | 0.00 (0.07)                        | 0.00 (0.12)                      | 0.00 (0.61)                        | -0.00 (-0.56)                    |
| EAG                   | -0.48 (-0.99)                      | -0.46 (-0.87)                    |                                    |                                  |
| SOUTH                 | -34.8 (-4.58)                      | -34.78 (-5.99)                   |                                    |                                  |
| PRIVATE UNION         | 1.05 (3.57)                        | 1.15 (4.2)                       | 0.19 (0.62)                        | 0.018 (0.44)                     |
| PRIOR-LEG             | -8.7 (-0.80)                       | -4.57 (-0.58)                    |                                    |                                  |
| RESIDPOLICE           | 0.51 (6.09)                        | 0.49 (5.77)                      |                                    |                                  |
| OWN-UNIONIZATION      |                                    |                                  | 0.10 (0.99)                        | 0.02 (2.91)                      |
| UNFAIR                |                                    |                                  | -0.00 (-0.74)                      | 0.00 (0.46)                      |
| NWLF                  |                                    |                                  | -0.10 (-0.51)                      | -0.07 (-2.14)                    |
| COPE                  |                                    |                                  | -0.00 (-0.26)                      | -0.01 (-0.79)                    |
| Log MAJ-PARTY         |                                    |                                  | -1.10 (-0.68)                      | 2.16 (1.65)                      |
| RESIDPOLICE           |                                    |                                  | 0.05 (0.66)                        | -0.00 (-0.46)                    |
| D2                    | 49.70 (1.30)                       |                                  | 45.95 (0.68)                       |                                  |



SENTIMENT is insignificant, but D2 has a marginally significant effect (at the .10 level for a one-tail test). The implication is that for the sample period, more favorable bargaining laws weakly induced greater bargaining coverage for firefighters.

Among the other variables, the most significant by far is the single addition to the general model specification: RESIDPOLICE. The original motivation behind this variable was to test for the existence of an institutional bargaining relationship between firefighters and police as discussed in the previous chapter: some studies have shown that bargaining spillovers exist between the two groups.

As a first attempt, the extent of police bargaining coverage was included directly as an explanatory variable in the firefighters bargaining coverage equation, but it was not significant. It is expected that the high degree of collinearity among the variables is the cause. In order to eliminate the collinearity and provide a second-best alternative, a residualization technique was performed by regressing police bargaining coverage on the set of explanatory variables in the firefighters bargaining coverage equation. Then the residual vector from this least squares regression was calculated, and called RESIDPOLICE. RESIDPOLICE was then entered as a RHS variable in the firefighters' first equation. (A variable called RESIDFIRE was calculated in a directly analogous fashion for the

police model.)

Two different interpretations of this variable are possible. The first is that it proxies the key bargain or bargaining spillover between police and firefighters for which we want to test. The second is that, as a residual, it simply represents some random, unmeasurable components of bargaining which we are unable to identify or quantify; if significant in the firefighters equation, then, these unobservable factors are common to both groups. A third possibility is, of course, that some combination of these two effects obtains.

As shown in Table 3.4, RESIDPOLICE is in fact positive and highly significant, and the best that can be said is that the bargaining spillover relationship described above may exist. The other variables attaining significance for firefighters are, first, PRIVATE UNION, which is positive as in the general model; this supports the Chicago School's interest group demand of organized labor hypothesis. The remaining significant variable is SOUTH, negative as expected, and as in both the general and the teacher model.

Three variables, PRIOR-LEG, EAG, and GOVWAGE, do not attain significance for firefighters as they do in the case of public employees in general. These results indicate that the general model is not directly applicable to all subgroups of public employees.

### 3.4.2 Single versus Simultaneous Estimation of Equation One

A comparison of OLS versus simultaneous estimation of the firefighter bargaining coverage equation yields implications very similar to those drawn for the teacher comparison. As with teachers, with the exception of SENTIMENT both methods produce parameter coefficients and standard errors which are quite similar. Again, however, when estimated by OLS and thus treated as exogenous, the variable SENTIMENT (measuring the effect of the law per se in the single equation context) is strongly and significantly positive. When treated endogenously, the effect of the law is captured by D2, and as noted is only very weakly significant (and positive).

The comparison of the two model specifications for firefighters again emphasizes the importance of using the correct specification; very different inferences are drawn from the two different models.

### 3.4.3 Equation Two (Sentiment Toward Bargaining Legislation): Simultaneous Estimation

Table 3.4 contains the results of the application of the general model to firefighters' equation two, with SENTIMENT as the dependent variable. As noted, the equation again performs very poorly when applied separately to a specific sub-group.

As in the teacher model, none of the general model

variables are significant. The jointly endogenous bargaining coverage variable, then, appears not to affect legislation for firefighters for the sample. Basically, the only similarity between equation two of the general model and equation two as applied to firefighters is the insignificance of the legislative shift variable on SENTIMENT. Apparently, the law per se has no effect on sentiment toward bargaining legislation for firefighters, teachers, or the aggregate general model index.

#### 3.4.4 Single versus Simultaneous Estimation of Equation Two

Equation two is again estimated separately by binary probit analysis. Once again, the differences between the separately estimated and the simultaneously estimated equation are much greater for this equation than for the first. The primary result is that of the jointly endogenous bargaining coverage. As in the teacher model, single equation estimation indicates a positive and significant effect of coverage on legislation. When treated endogenously, however, bargaining coverage no longer affects SENTIMENT.

Despite the poor fit of equation two, it is reassuring to note that single equation estimation produces consistent results for both teachers and firefighters. That is, in addition to the similar result for bargaining coverage, those variables which are significant (or very nearly so)

are the same in both equations. In the firefighter model, NWLF is significantly negative and Log MAJ-PARTY significantly positive; in the teacher model, NWLF is significantly negative, while Log MAJ-PARTY is close to but does not reach significance at the .10 level for a two-tail test.

Despite the failure of equation two to yield any significant coefficients in the simultaneous model, nonetheless the comparison between it and its separately estimated counterpart once again indicates the importance of making inferences based on the more correctly specified simultaneous model of bargaining laws and bargaining coverage.

The final sub-group to which the general model is applied, local police officers, will produce several results very similar to those already seen for teachers and firefighters.

### 3.5 Police Results

#### 3.5.1 Equation One (Bargaining Coverage): Simultaneous Estimation

The simultaneous and single equation results for police from the application of the general model of Topic Two are reported in Table 3.5. Simultaneous estimation of the police bargaining coverage equation produces the following results.

TABLE 3.5  
POLICE  
Simultaneous Versus Single-Equation Estimation  
(asymptotic t-statistics in parenthesis)

| Explanatory Variables | Simultaneous Estimation<br>Equation One<br>Bargaining Coverage | Single Eq. Estimation<br>(OLS) Equation One | Simultaneous Estimation<br>Equation Two<br>Sentiment | Single Eq. Estimation<br>(Binary Probit)<br>Equation Two |
|-----------------------|--|---|--|--|
| SENTIMENT             | -14.03 (-0.64)   | 18.82 (4.96)                                |  |  |
| GOVWAGE               | 0.01 (2.93)  | 0.01 (3.51)                                 | 0.00 (0.80)  | -0.00 (-1.30)  |
| EAG                   | -1.34 (-2.54)  | -1.32 (-2.46)                               |  |  |
| SOUTH                 | -0.92 (-0.17)  | -4.29 (-0.81)                               |  |  |
| PRIVATE UNION         | 1.98 (6.70)  | 1.60 (5.85)                                 | 0.16 (0.84)  | -0.05 (-1.17)  |
| PRIOR-LEG             | 31.35 (3.23)   | 20.89 (3.05)                                |  |  |
| RESIDPOLICE           | 0.54 (5.73)  | 0.55 (5.80)                                 | 0.05 (0.85)  | -0.03 (-2.78)  |
| OWN-UNIONIZATION      |  |   | -0.09 (-0.88)  | 0.07 (3.98)  |
| UNFAIR                |  |   | 0.00 (0.33)  | -0.00 (-1.02)  |
| NWLF                  |  |   | 0.04 (0.78)  | -0.08 (-2.26)  |
| COPE                  |  |   | 0.02 (0.88)  | -0.01 (-0.66)  |
| Log MAJ-PARTY         |  |   | -0.29 (-0.27)  | 2.10 (1.50)  |
| D2                    | 43.61 (0.66)   |   | 68.95 (1.59)   |  |

Neither SENTIMENT nor the legislative shift dummy D2 is significant. This is consistent with the teacher results; of the sub-groups, only firefighters produced a (marginally) significant coefficient on the legal variable, coinciding with the general model result.

Like the other models, this equation performs quite well. First, GOVWAGE is significantly positive (as for teachers, while it is negative for the general model); second, PRIVATE UNION is strongly significant and positive (as for firefighters and the general model both).

Turning to the final variables, it is interesting that SOUTH is insignificant; it is strongly significant in all the other models. EAG, however, is significant and negative (as for teachers and the general model). Lastly are the two variables PRIOR-LEG and RESIDFIRE, with the latter being the only deviation from the direct application of the general model to police. PRIOR-LEG is positive and significant (as for teachers and the general model). RESIDFIRE also performs very well: it is strongly significantly positive, just as its counterpart RESIDPOLICE is in firefighters' equation one.

### 3.5.2 Single versus Simultaneous Estimation of Equation One

As mentioned, a comparison of the OLS estimated and simultaneously estimated police bargaining coverage equations generates implications essentially identical to

those for teachers and firefighters. Excepting the variable representing bargaining law status (SENTIMENT in the single equation model, D2 in the simultaneous model), both estimation methods produce very similar parameter coefficients and standard errors. As is familiar by now, treating the law as purely exogenous leads one to conclude that favorable bargaining laws exert a significant positive influence on the extent of police bargaining. When one allows for the endogeneity of legislation, however, the coefficient on the legal variable D2 loses significance for the sample period under study.

In all four models, the pure effect of the law on bargaining either disappears (teachers, police), or is severely diminished (firefighters, the general model) when legislation and bargaining are estimated as joint outcomes of the same process. Furthermore, evidence from simultaneous estimation of all four models indicates that the bargaining coverage equation has good explanatory power and is reasonably robust. Finally, the consistency with which OLS single equation estimation matches the results from simultaneous estimation (excepting the endogenous SENTIMENT) provides further evidence of the reliability of the Heckman estimation technique.

### 2.5.3 Equation Two (Sentiment Toward Bargaining Legislation): Simultaneous Estimation



Once again a consistent pattern is seen for the general model applied to the sub-groups. Unfortunately, for equation two, with SENTIMENT as the dependent variable, the pattern is not encouraging. The variables in equation two provide only slightly better results for police than for teachers and firefighters.

As reported in Table 3.5, the jointly dependent variable bargaining coverage exerts no significant effect on sentiment toward police bargaining legislation. However, in an interesting departure from all three of the other models, D2 is significantly positive for police. It may be recalled from Topic Two that the legislative shift variable was close to attaining significance; it was noted at the time that the possibility that the law per se affects peoples' attitudes or sentiment might still be considered an open question. The direct application of this general model to three distinct employee groups resulted in a significant legislative effect on sentiment in one of them.

In common with the other sub-groups, however, no other variable in equation two came anywhere close to significance. In general, the general model does a poor job of explaining legislation for sub-groups of public employees in a simultaneous equation framework.

#### 3.5.4 Single versus Simultaneous Estimation of Equation Two

Binary probit estimation of police equation two yields

the same pattern as seen for teachers and firefighters; in addition, comparison of the two estimation techniques results in patterns and implications entirely consistent with those attached to the other two sub-groups.

First, the major result is a comparison of the results on the endogenous bargaining coverage variable. Single equation estimation, i.e., treating coverage as exogenous, produces a strongly significant and positive coefficient; when properly treated as endogenous, once again the extent of bargaining coverage loses all significance (see Table 3.5).

Second, in addition to bargaining coverage the other significant variables produced by probit estimation are similar to those for the other two sub-groups. As noted, simultaneous estimation produced only one significant variable, D2. Single equation estimation produces two besides coverage: NWLF (negative), and RESIDFIRE (negative). The negative sign on the latter variable is unexpected; one hypothesis is that it implies bargaining competition (in contrast to spillovers) between police and firefighters. This result has not been found in previous literature, however, and it runs counter to its sign in the correctly specified simultaneous model of this Topic. It is therefore concluded that RESIDFIRE'S negative sign in single equation analysis is one more indication of the inadvisability of drawing inferences from incorrectly

specified models of legislation.

### 3.6. Modifications of the Sub-Group Models

It has become clear that the general model of Topic Two performs well only for the bargaining coverage equation; equation two is virtually worthless as far as identifying individual variables significantly affecting sentiment toward any of the sub-groups. In order to try to capture any systematic differences between the three distinct employee groups of this Topic, each sub-group is re-estimated separately in the hopes of improving upon the general model specification.

It is necessary to repeat here that the well-known problems caused by highly collinear data (large standard errors, extreme variations in parameter coefficients and standard errors resulting from the deletion or addition of a single variable) are particularly severe for the less aggregative individual group analysis than for the aggregate general model of Topic Two. This does not allow a great deal of confidence to be placed in inferences from the sub-group models; certainly they are not as robust as the general model.

The collinearity problem and its consequences for attempting to specify the individual employee group models in a systematic fashion are illustrated by experience with the variable Log MAJ-PARTY. It is difficult (if not impossible) to include this variable in the sub-group's

second equation without causing all of the variables, in virtually any combination, to be insignificant. Collinearity diagnostics indicate that it is severely collinear with the intercept, which clearly cannot be omitted. (This is not surprising, since the natural logarithm function serves to compress variation. However, the problem is only worsened by attempting to substitute the variable MAJ-PARTY and its square for the natural logarithm of MAJ-PARTY, in order to test the desired hypothesis of diminishing returns.)

The point is that many different specifications of each model were tested. The final models are the "best" which could be found given, as always, the inherent limitations of the model, data, and estimation procedure. Unfortunately, some variables with strong theoretical justifications could not be included due to collinearity problems and data problems.

Two final points: first, the chosen specification for each sub-group was tested on each of the other two groups as another test or check of the individual model specification procedure. In all cases, the original formulation for each employee group was superior. And second, despite numerous attempts, no other specification for police proved superior to the general model. Therefore, the following section contains only the employee groups teachers and firefighters.

### 3.7 Teachers: Refinements on the General Model-Simultaneous Estimation

#### 3.7.1 Equation One (Bargaining Coverage)

The single change in teachers' equation one is the addition of UNE (a state's unemployment rate), as shown in Table 3.7. UNE, which in cross-sectional data represents structural differences, is highly significant and negative.

There are two other consequences in equation one of changing the specification of equations one and two. SENTIMENT now becomes marginally positively significant (in the general model specification it is insignificant), and PRIOR-LEG loses significance.

#### 3.7.2 Equation Two (Sentiment Toward Bargaining Legislation)

The primary purpose of the modifications of the subgroup models is to improve equation two. This was accomplished for teachers by the deletion of NWLF and Log MAJ-PARTY.

With these changes in equations one and two, equation two now has three variables with explanatory power. The first is UNFAIR, which is marginally significant and of the hypothesized sign. The latter two are of greater interest in the context of the Heckman model. D2 is now significant and positive, joining the police general model specification in its suggestion that laws are capable of influencing

TABLE 3.7  
TEACHERS  
Modification of the General Model  
(asymptotic t-statistics in parenthesis)

| Explanatory Variables | Simultaneous Estimation<br>Equation One<br>Bargaining Coverage | Simultaneous Estimation<br>Equation Two<br>Sentiment |
|-----------------------|--|--|
| SENTIMENT             | 11.71 (1.39)   |  |
| GOVWAGE               | 0.02 (3.98)  | -0.00 (-1.43)  |
| EAG                   | -1.94 (-3.05)  |  |
| SOUTH                 | -35.28 (-7.50)   |  |
| PRIVATE UNION         | 0.10 (0.32)  | -0.00 (-0.17)  |
| PRIOR-LEG             | 0.10 (1.14)  |  |
| UNE                   | -3.64 (-3.20)  |  |
| OWN-UNIONIZATION      |  | -0.07 (2.07)   |
| UNFAIR                |  | -0.00 (-1.41)  |
| COPE                  |  | 0.00 (0.72)  |
| D2                    | -23.07 (-0.91)   | 50.06 (2.10)   |

attitudes. And surprisingly, the extent of bargaining coverage becomes significantly positive, matching the result on legislation generated by single equation binary probit estimation. (This is the only sub-group for which this particular reversal occurs.)

Obviously, as noted at the outset these changes cause one to doubt the reliability of the model for the individual employee groups. In fact, it became very clear early in the model specification process that none of the sub-group models was particularly robust. Again, one is strongly cautioned against viewing the final results of any sub-group specification with great confidence.

### 3.8 Firefighters: Refinements on the General Model-

#### Simultaneous Estimation

##### 3.8.1 Equation One (Bargaining Coverage)

The following two changes were made in the firefighters' bargaining coverage equation: PRIOR-LEG was deleted, and PCY (per capita income) added (see Table 3.8.).

Interestingly, PCY is significantly positive; this tends to support the hypothesis that the income effect dominates for the normal good fire protection services, which tends to support the demand for firefighter unionization. After the modifications, GOVWAGE is significantly negative, changing from insignificant in the general model. No other significant changes occur in

TABLE 3.8  
FIREFIGHTERS  
Modifications of the General Model  
(asymptotic t-statistics in parenthesis)

| Explanatory<br>Variables | Simultaneous Estimation<br>Equation One<br>Bargaining Coverage | Simultaneous Estimation<br>Equation Two<br>Sentiment |
|--------------------------|--|--|
| SENTIMENT                | -8.66 (-0.90)  |  |
| GOVWAGE                  | -0.01 (-2.04)  |  |
| EAG                      | 0.10 (0.22)  |  |
| SOUTH                    | -24.78 (-3.89)   |  |
| PRIVATE UNION            | 0.94 (3.06)  | 0.13 (1.07)  |
| PCY                      | 0.01 (2.51)  |  |
| RESIDPOLICE              | 0.54 (7.28)  | 0.03 (1.15)  |
| OWN-UNIONIZATION         |  | -0.06 (-1.14)  |
| UNFAIR                   |  | -0.00 (-0.81)  |
| PRIOR-LEG                |  | 2.02 (1.09)  |
| POPD                     |  | -0.00 (-0.70)  |
| D2                       | 75.72 (1.46)   | 90.65 (1.76)   |



equation one.

### 3.8.2 Equation Two (Sentiment Toward Bargaining Legislation)

As with the teacher model, no variable from the general model specification on firefighters was significant. Numerous changes were made to this equation to try to improve its performance. The "best" model is reported in Table 3.8. Four variables were deleted: GOVWAGE, NWLF, COPE, and Log MAJ-PARTY. Two variables, POPD and PRIOR-LEG, were added. Unfortunately, these changes resulted in the addition of just one variable to significance: D2. The one consistent result of the sub-group equations explaining SENTIMENT is the significant and positive effect of favorable bargaining laws on peoples' attitudes toward public employee group bargaining rights, or more generally, public sector unionism.

### 3.9 Summary

Based on the "best" models for each of the three individual employee groups, a number of core variables may be identified as having explanatory power across disaggregated functions, abstracting from their significance or insignificance in the aggregate general model. These variables have implications concerning the correct model specification for the determination of union legislation and

union outcomes, the usefulness of the Heckman procedure in simultaneous estimation in particular, and the economic theory of regulation.

### 3.9.1 Core Variables Across the Three Sub-Groups: Equation One

The process of specifying a model with explanatory power across groups was much easier for the equation on bargaining coverage than for the equation determining legislative sentiment. Several core variables may be identified which systematically affect bargaining coverage across at least two of the three groups.

GOVWAGE, with a two-sided hypothesis, is significant in all three sub-group models although it is negative for firefighters and positive for the other two groups. PRIVATE UNION could also be called a core variable, since it is strongly, significantly positive for two of the three groups, proxying the strength of organized labor in a state. Also, SOUTH and EAG are each strongly and significantly negative two out of three times. Finally, for police and firefighters RESIDFIRE and RESIDPOLICE respectively are very strongly significant and positive. This may indicate the presence of bargaining spillovers, or simply unobservable factors affecting both the police and firefighter bargaining processes.

The effect of bargaining legislation on coverage was

significant for one group, firefighters. This indicates the importance of simultaneous estimation of bargaining legislation and bargaining coverage, for identifying similarities and differences across employee groups and over time periods. Finally, by explicitly purging sentiment from the legal dummy variable via Heckman's procedure, the uncertainty surrounding the true interpretation of legislation variables within a single equation context is avoided.

### 3.9.2 Core Variables Across the Three Sub-Groups: Equation Two

Identifying a pattern of core explanatory variables for the sentiment toward legislation equation was very difficult; in fact the attempt was a failure. The problem is not simply that almost none of the variables are significant; more importantly, the second equation illustrates the lack of robustness of the disaggregated employee group models.

The only common significant variable among the three groups was D2, the legislative shift variable. At the very least, however, this result provides an incentive to improve the type of data employed in order to exploit this unique feature of Heckman's simultaneous estimation procedure.

In summary, a reasonably clear pattern of core explanatory variables was discerned for the first equation

explaining bargaining coverage. The absence of such a pattern in equation two, explaining sentiment toward bargaining legislation, could simply result from the greater difficulty in identifying factors affecting sentiment for any group; that is, the problem of unobservable variables may be particularly acute. On the other hand, it is possible that the differences among these three employee groups elicit systematically varying public perceptions of them; these, in turn, affect the intensity of favorable or unfavorable sentiment toward bargaining rights.

A general pattern may not exist in explaining the determinants of sentiment toward disparate public sector employee groups. Future research attempting to distinguish between these two possibilities may have some success by using municipal level data. It may be that there is a pattern for explaining sentiment toward locally-organized unions, but that it can only be discovered through the use of local or SMSA level data.

## CONCLUSION

The three topics of this dissertation have used the economic theory of regulation to model simultaneously the determinants and effects of public sector bargaining laws for a general model of public employees plus four individual employee groups. To begin the analysis, Topic One derived a single-equation general model of bargaining legislation across states and over time. Topic Two then added to this the "effects" equation describing the extent of public employee unionization, and estimated this general model simultaneously. Finally Topic Three, employing fundamentally the same methodology as in the previous topic, disaggregated the general model into three individual employee groups (teachers, firefighters, and police), and estimated them separately. The final two topics each contrasted the single versus simultaneous equation results, providing general support for both the models' theoretical foundation and for the simultaneous specification of unionization and the legal environment regulating it.

The empirical results from each Topic reaffirm the importance of the major contribution of this dissertation: modelling the process surrounding the regulation of union

outcomes in a simultaneous framework. That is, the determinants of public sector bargaining legislation and the effects of such legislation on bargaining coverage are properly treated as joint outcomes of the same process. Due to the econometric difficulties associated with estimating one discrete endogenous variable (the legislative index) and one continuous endogenous variable (the extent of bargaining coverage), most studies continue to focus on single equation estimation of either union outcomes or union regulation.

As the empirical results of this dissertation indicate, the inferences from model estimation differ significantly according to whether legislation and unionization are treated as endogenous or not. Results from the general model of Topic Two clearly indicate that causality is two-way. Further, results from the estimation of individual employee group models suggest that simultaneous estimation is necessary to identify similarities and differences across functions. The law may exert an independent influence on bargaining coverage for different employee groups over different spans of time; that is, during the periods of the fastest growth in union organizing activity, or the greatest activity in legislative changes for a particular group. The only way to find out is through simultaneous estimation; single equation estimation is not sufficient.

#### 4.1 Summary of the General Model Results

#### 4.1.1 Equation One

First, several variables support the demand for union services, as derived from the direct application of the theory of consumer choice to the union membership decision. Among them is GOVWAGE, the negative sign of which suggests that workers at the lower end of the intra-firm wage distribution have the greatest probability of supporting a union. PRIVATE UNION supports the hypothesis that private sector labor organizations have an interest in and support public sector labor gains.

PRIOR-LEG is a demand side variable, which appears to indicate that more permissive bargaining laws in surrounding states increase demands for bargaining and unionization among workers through demonstration effects. Two taste variables, EAG and SOUTH, also strongly and negatively influence public sector unionization in their capacity as proxies for systematic and unobservable factors affecting the perceptions of the costs and benefits of union membership.

Finally, on the supply side, the role of the law per se independently influences union membership: prohibitive laws depress membership or bargaining coverage. (Although our model cannot distinguish between them, it should be repeated that the effect of bargaining laws is as likely to affect the equilibrium level of unionization through the demand side as through the supply side.)

#### 4.1.2 Equation Two

The economic theory of regulation provides the foundation for the sentiment toward bargaining laws equation, and it receives strong support from the results of the general model. On the demand side, both PUBLIC UNION and GOVWAGE support the Chicago School's interest group hypothesis. The rationale for the former variable is obvious. For the latter, assuming public sector union services are normal goods, an increase in the income level of government employees causes demand for these services to increase, which in turn supports the demand for favorable public sector labor legislation.

Another Chicago School hypothesis, support from interested third party groups, is represented by PRIVATE UNION. This hypothesis is two-sided, and in the general model does not attain significance. PRIVATE UNION will be positive if the identification of private sector union members with their public sector counterparts outweighs the perceived tax burden on private sector membership consequent upon greater bargaining activity by government employees. Possibly these two effects simply offset one another.

Finally, the inclusion of a proxy for an opposition group is motivated by the Chicago School. UNFAIR, as expected, represents a negative shift in the demand function as a proxy for management opposition to union bargaining



gains. The final demand variable represents a taste factor. NWLF has a significantly positive effect on SENTIMENT, confirming the common result of previous research.

Turning to the supply side, the Public Choice School is represented by COPE. This factor accounts for the active role of constituents and politicians in determining the equilibrium level of special interest legislation. As expected, COPE, for which greater values represent lower political costs of enacting regulation, is positive though significant only at the .10 level.

Finally, the economic costs of legislation are accounted for by the Economics of Legislatures School. This School derives hypotheses concerning legislative output and costs by applying the standard theory of the firm to legislatures. The variable Log MAJ-PARTY is motivated by this analysis, though it has other opposing motivations. According to the Economics of Legislatures School, greater legislative majorities serve to decrease costs associated with the production of legislative output; in other words, the costs of reaching collective decisions is lessened.

On the other hand, the application of standard monopoly theory yields the prediction of smaller output levels: if greater majorities serve as effective entry barriers to legislative seats, then this monopolistic "firm" should produce less output at a higher price. As it turns out, the significant, negative coefficient on Log MAJ-PARTY in the

general model supports the monopoly theory hypothesis.

Lastly, the Heckman legislative shift variables in this trichotomous model are insignificant determinants of SENTIMENT. However, one of the dummy variables representing the pure effect of the law just misses significance at the .10 level. One might be led to believe that estimation of other employee group models, perhaps during time frames notable for greater bargaining law activity, may possibly lead to significant law effects.

The following three sections will merely outline the major results in terms of significant variables for the three individual employee groups. These sections on the sub-groups are abbreviated for two reasons. First, the implications of these results in terms of the economic theory of regulation should be obvious from the preceding discussion of the general model. And second, the extremely poor results of the bargaining legislation equation for the sub-groups indicate that a different approach to model specification must be undertaken in order to derive any reasonable inferences from these individual employee groups.

#### 4.2 Summary of the Teacher Results

##### 4.2.1 Equation One

The best model for teachers is a modification of the general model: UNE is added and is significantly negative. The most important result for comparison purposes is that

the effect of legislation on teacher bargaining coverage is not significant; additionally, GOVWAGE is significantly positive, and PRIVATE UNION insignificant.

#### 4.2.2 Equation Two

The best teacher legislation equation resulted from the deletion of NWLF and Log MAJ-PARTY from the general model specification. The most important results are that the law has a positive and significant effect for teachers, and that the extent of teacher bargaining coverage is significantly positive. In addition, neither GOVWAGE nor PRIVUN is significant, although UNFAIR attains marginal significance.

### 4.3 Summary of the Firefighter Results

#### 4.3.1 Equation One

To obtain the best possible model, PRIOR-LEG was deleted and PCY added to the bargaining coverage equation. The latter variable is positive and significant. Again, the major result for comparison purposes is that the law has a significant influence on firefighter bargaining. In addition, PRIVATE UNION is positive and significant, and GOVWAGE negative and significant. RESIDPOLICE, also, is very strongly significant and positive.

#### 4.3.2 Equation Two

The best bargaining legislation equation was obtained by deleting GOVWAGE, NWLF, COPE, and Log MAJ-PARTY, and

adding POPD and PRIOR-LEG (although both turn out to be insignificant). These changes, and those in equation one, cause D2 to exhibit a significant and positive influence on SENTIMENT. No other variable attains significance.

#### 4.4 Summary of the Police Results

##### 4.4.1 Equation One

The best possible model is the general model specification. D2 is insignificant, while PRIVATE UNION and GOVWAGE are both significant and positive. Also, RESIDFIRE is strongly significant and positive.

##### 4.4.2 Equation Two

The only variable attaining significance is D2, the effect of the law per se on SENTIMENT.

#### 4.5 Implications of the Four Models

Clearly, the sub-group models require substantial, independent re-specification if they are to prove useful in drawing inferences on the determinants and effects of bargaining legislation. Although the bargaining coverage equation holds up reasonably well across groups, the SENTIMENT equation does not.

In sum, the economic theory of regulation is largely supported by the general model results; whether or not the sub-group models reinforce this result cannot be inferred

due to their extremely poor data specification. Without a doubt, however, the results of all the models emphasize the importance of simultaneous estimation of public sector union bargaining regulations and the union activities or outcomes to which these laws pertain. Clearly, there are costs attached to relying on inferences drawn from incorrectly specified single equation models of unionization or legislation.

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