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MARKET STRUCTURE, STRIKE ACTIVITY, AND UNION WAGE SETTLEMENTS

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Abstract

We attempt a synthesis of the industrial relations market structure hypothesis with the modern asymmetric information theory of wage and strike outcomes. The industrial relations literature contains a variety of arguments indicating that wage settlements should be positively related to the degree of product market sales concentration and the degree of product market coverage by the union. An asymmetric information bargaining model is specified that relates these same variables to strike probabilities as well as wage settlements.

Our empirical analysis is conducted for the periods from 1970-1980 (strikes) and 1976-1980 (wages). We find that the relation between trade-adjusted sales concentration and wage settlements is positive at low levels of concentration but negative at high levels of concentration. The relation is always negative for strike probabilities. We also find that the relation between the trade-adjusted percent of the product market covered by the same union and the percentage covered by other union are positively related to both wage settlements and strike probabilities. Our empirical analysis includes a rich set of controls including unrestricted time and industry effects, which do not affect the major conclusions.

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I. Introduction

The market structure hypothesis in the industrial relations literature postulates that unions should have the greatest power when they are effectively organized in noncompetitive industries. According to this hypothesis, two key determinants of the level of union wages are the firm's "ability to pay" and the union's "ability to appropriate". In this paper we empirically test these predictions by incorporating measures of the market structure and the bargaining structure in both union wage settlement and strike equations. We also introduce a modern asymmetric information theory that predicts the effects of market and bargaining structure variables on strike probabilities and wage settlements. The information asymmetry model is used to resolve some of the anomalies in the estimated equations that are not consistent with the market structure hypothesis.

The market structure hypothesis can be traced back to John R. Commons' (1909) discussion of the American Shoemakers.[1] Commons argued that prior to the Civil War, the dynamics of the shoemaker's trade union movement was driven by market developments and not by technological developments (i.e. changes in the footwear production process itself). The modern formulation of the market structure hypothesis evolved out of two long standing empirical observations concerning union wage determination. Ross and Gardner (1950) and Segal (1961) demonstrated, using aggregate data, that union wage levels are increasing in the level of unionization and in the level of sales concentration in the industry. A theoretical literature developed that attempted to rationalize these empirical findings (See Garbarino (1950) and Schlesinger (1958)).

The hypothesis was not without its critics, however. Rees (1962) argued that the hypothesis had no clear theoretical foundation and that the empirical evidence in its support was inconclusive. While a noncompetitive market structure may increase the firm's ability to pay, Rees pointed out that it may also increase the firm's incentive to resist unionism. The fact that the oligopolistic industries were the last to be

[1] We are grateful to Peter Cappelli for this citation.

organized is consistent with this argument. Finally, Rees also claimed that the existing empirical studies failed to document an independent effect of concentration on union wages. These studies examined only the manufacturing sector where concentration and union coverage have a strong positive correlation. To be convincing, Rees felt that studies should also include the nonmanufacturing sector since the correlation between concentration and coverage is weaker in that sector. He concluded that "... in my judgement, data for the whole country would be much less likely than data for manufacturing alone to show strong association between unionization, enterprise monopoly, and wage increases." (1962, pp. 133) Further doubt was cast on the hypothesis by Lewis (1963), Weiss (1966), and Rosen (1969) who found a negative union wage coefficient on the interaction between coverage and concentration.

Rees' critique led to a series of papers that developed and refined the market structure hypothesis (See Livernash (1963), Segal (1964), and Levinson (1967)). However, few empirical tests of these newer models have been carried out (See Hendricks (1975), Kwoka (1983), and Mishel (1986)). This paper adds to this empirical literature in many important respects. A unique feature of our analysis is that we examine the effects of market and bargaining structure on both union wage settlements and strike activity. This is the first systematic empirical analysis of the effects of these variables on strikes. We have also expanded the typical specification to include several new variables. Union coverage rates are adjusted to reflect the nonunion labor component embodied in imported goods. Overall union coverage in the industry is disaggregated into coverage by the union representing the bargaining unit and coverage by all other unions. In addition, we disaggregate nonunion coverage into domestic and foreign components. Finally, the importance of a particular industry to the union's overall unionization pattern is measured by the percentage of the union's total membership that is in that industry.

Our findings are briefly summarized as follows. First, consider strike incidence rates at the time of contract expiration. There is a weak negative relation between

trade-adjusted industry four firm sales concentration ratios and strike incidence. There is a strong positive relation between the trade-adjusted coverage by the union involved in the negotiation and strike incidence and a weaker positive relation between the trade-adjusted coverage by other unions in the industry and strike incidence. Import penetration is associated with lower strike incidence rates. A Herfindahl index of the extent of competitive unionism in the industry is also negatively associated with strike incidence rates. There is a strong nonlinear relation between the percent of the union's total membership in the industry and strike incidence. Increases in this variable are associated with lower strike incidence at low levels and higher strike incidence at high levels. Bargaining units that are part of Association Agreements are less likely to strike. Otherwise, strike incidence rates are not very different among the various bargaining structures. The statistical precision of the estimated strike incidence effects is lower when unrestricted year and industry effects are included in the analysis; however, the qualitative pattern of the results is the same.

Second, consider wage settlements. Our findings here are consistent with the pattern of complicated nonlinear relations previously reported. Real wage settlements increase at a decreasing rate as the trade-adjusted four firm sales concentration increases; however the interaction of sales concentration with both measures of union coverage (own and other union) is negative. The sign of the marginal effect depends upon whether unrestricted industry effects are also estimated. Real wage settlements increase at decreasing rate as trade-adjusted coverage by the same union (or by other unions in the same industry) increases. The sign of the marginal effect does not depend upon specification. The marginal effect of increased import penetration on real wage settlements is specification dependent. Real wage settlements increase as the Herfindahl index of union concentration increases. There is also a nonlinear relation between the percent of a union's total membership in the industry and the

real wage settlements. The marginal effect of increases in this measure is positive at low levels and negative at high levels for all specifications.

II. The Market Structure Hypotheses

The reformulation of the market structure hypothesis in the 1960's is presented in a clear fashion in Craypo (1986). This summary draws heavily on that presentation. The central feature this reformulation is the emphasis given to the need for the union to be effectively organized so that it is in a position to appropriate some of the noncompetitive rents that may exist in the industry. The union's overall success in raising the level of wages for its members depends both on the ability of firms to pay as well as the ability of the union to make the firm pay. This addresses the thrust of Rees' theoretical critique of earlier formulations of the hypothesis.

The ability of the firm to pay wage premia to its employees is derived from its ability to pass on higher labor costs and its ability to offset higher labor costs through reductions in other production costs. The degree to which the firm can shift the incidence of wage premia to other agents in the economy is determined by four factors: the level of concentration in the industry; the extent of "spatial limitation" that exits in the product market; whether the firm is in a regulated industry; and the importance of government contracts and subsidies in the industry.

Firms that exercise considerable market power in an industry can finance wage premia out of the rents generated by nonmarginal cost pricing. In this case, the incidence of the wage premia can be thought of as being shifted in part onto consumers through higher prices. However, the wage premia may instead simply reflect a transfer of rents from the firm's equity holders to the union members with no significant change in the product price occurring. This would be the case if the union contract reflected a bargaining outcome on a vertical contract curve.[2] Empirical evidence

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[2]This is the "strong efficiency" bargaining outcome as described in Brown and Ashenfelter (1986). See Abowd (1987) for evidence that unexpected changes in the value of a union contract generate on average dollar for dollar

suggests that there is a nonlinear relation between concentration and profitability (See Scherer (1980)). Marginal increases in concentration do not lead to significant increases in profitability until the industry becomes highly concentrated. Consequently, we might expect that there will exist a nonlinear relation between concentration and union wages and between concentration and strike activity.

There are several problems in using the four firm sales concentration data as published in the **Census of Manufacturing**. First, only sales of domestically produced goods are included in the concentration calculation. Variations in the level of concentration across industries at a point in time or within an industry across time may not accurately reflect variations in market power due to cross-sectional and time-series variation in import penetration. Second, concentration figures may overstate the degree of market power in those industries characterized by a few large buyers of the industry's output.[3] In this situation, much of the noncompetitive rent may be appropriated by buyers of the product through price discounting. Finally, the unadjusted concentration figures do not take into account possible spatial limitations of the product market or patent protection for specific product lines.[4]

The Federal government has played an important role in collective bargaining in two respects. Government regulation of an industry may increase a firm's ability to pay wage premia by allowing the firm to pass through any increase in labor costs in the form of a rate increase. Regulation, then, helps to take the wage "out of competition". Examples include the trucking, railroad, airline, and telephone industries. Recent deregulation of many of these industries provides a natural test

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transfers between equity holders and union members.

[3]An example is the tire and tube industry.

[4]The newspaper industry is an example of an industry with spatially limited product markets. Within the industry, the degree of concentration is quite low, although within a city, the degree of concentration is typically quite high. The pharmaceutical industry is an example of an industry in which the level of concentration is low although firms may earn noncompetitive returns on individual patented drugs. Weiss (1966) developed an adjusted concentration series that incorporated these concerns.

of this model by generating a before and after regulation set of union wages. Rose (1987) provides a careful and detailed analysis of the total reduction in regulatory rents in the trucking industry and the distribution of this loss between trucking firms and the Teamster Union. Industries that do a significant amount of contract work for the Government may also be in a better position to finance wage premia. A "cost-plus" contract allows the firm to pass on to the government increases in overall labor costs. Examples include the aerospace industry.

In addition to rent-sharing or shifting the incidence of labor cost increases onto consumers or the government, firms can attempt to offset higher union wages through increases in labor productivity. This can take place through improvements in the capital stock and/or elimination of union work rules. Both lead to larger total rents, which can be used to finance the labor costs.

As Rees pointed out, noncompetitive market structures are not a sufficient condition for high union wage levels. The union must also be "effectively organized" so as to be able to make the firm pay a wage premia. Three factors that govern the ability of the union to appropriate rents are the extent to which the union has organized the "relevant" work force; the absence of "competitive unionism" in the industry; and whether the union has put in place the "appropriate" bargaining structure.

Organization of the relevant work force allows the union to take the wage out of competition. What constitutes the "relevant" work force will vary by industry and occupation. Craft unions need to organize all skilled workers and try and regulate the acquisition of the skills by new workers. In contrast, industrial unions need to organize each production facility in order to prevent firms from shifting output among plants during strikes. Similarly, regional redistribution of production must be offset by new organization drives. The rise of the mini-mill steel companies in the South is an example of this problem.

Spatial considerations are also important for defining the relevant work force. If the product market is spatially limited or a key aspect of the production process is spatially limited, then, the union need not organize the entire work force. Levinson (1967) introduced the notion of spatial limitation.

> "Under this type of industrial structure, the union need only achieve a high degree of organizational strength within the limited strategic areas involved in order to be protected against the undermining effects of new nonunion entrants or of runaway shops, irrespective of how easy entry into the industry itself might be." (p. 202)

For example, longshoring unions need only organize a few seaports rather than the entire shipping process to be effectively organized. A second example is the construction industry where the relevant work force is defined at a local level.

In addition to organizing the relevant work force, effective unionism requires that the structure of the organization is not fragmented between competing unions. Craypo (1986) distinguishes between competitive unionism and "rival" unionism. Competitive unionism refers to two or more unions that work against each other in economic bargaining because they represent parts of the same relevant work force. In contrast, rival unionism refers to two or more unions that represent different relevant groups of workers within the same firm or industry.

An example of the problems inherent in a fragmented bargaining structure is the post-war experience of the electrical workers at General Electric (GE). In 1946 the United Electrical Workers (UE) union was involved in a two month strike with GE in an attempt to force GE to match wage increases that had been negotiated in the auto and steel industries. In response to this costly strike, GE adopted a take-it-or-leave-it bargaining philosophy that has since been named after its originator Lemuel Boulware. The firm marketed its "fair, firm" offer directly to its workers rather than going through the unions.

The practice met with considerable success during the 1950's in part due to the fragmentation that was taking place in the structure of the electrical workers union coverage. In 1949 UE ceased paying dues to the Congress of Industrial Unions (CIO)

because of a charge that its leadership was communist-dominated and because of the raiding of its bargaining units by other CIO unions. UE was later expelled from the CIO, which chartered the International Union of Electrical Workers (IUE) to replace UE. In addition, the American Federation of Labor (AFL) chartered the International Brotherhood of Electrical Workers (IBEW). These two competing unions as well as other unions were successful in winning GE bargaining units away from UE. The end result was that GE workers were represented by thirteen unions with over 60 contracts.

GE took full advantage of its nonintegrated production process as well as the degree of fragmentation in the union representation. The company would isolate the union that it felt was the most in need of a settlement and offer it a contract just marginally better than the "firm, fair" contract being offered in general. GE would pressure the union into a settlement by arguing that the union could not win a strike on its own. Once a settlement was reached, GE would present the settlement to all of the other unions as the best they could hope to negotiate. This tactic put the unions on the defensive and gave the bargaining initiative to GE. As a result, GE was successful in breaking away from general settlement patterns in other industries organized by the CIO. The average wage at GE fell from 98% of the average in durable manufacturing in 1947 to 91% in 1964. The end of GE's bargaining strategy came in 1969 when a Federal Appeals Court upheld an unfair labor practice charge against GE by finding that "Boulwareism" constituted a violation of the "duty to bargain in good faith".[5]

The third factor in determining the effectiveness of a union's organization is the bargaining structure used by the union. The appropriate bargaining structure will depend on the structure of the product market and/or production process. Ideally, the bargaining structure should be broad enough to cover all workers whose products are sold in competition. This does not require that a single contract cover all of these workers. Strong settlement patterns may serve as a substitute for a common contract

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[5] 418 F.2d 736 (2d Cir. 1969), cert. denied, 397 U.S. 965 (1970).

(See Livernash (1963)). There are two advantages that are derived by a union from having the appropriate structure.

> "Because the relevant work force includes workers producing goods or services that sell in competition, a union aim is to expand the bargaining structure or pattern to include them all to obtain the greatest union impact during strikes. Bargaining structures should be sufficiently centralized to ensure that economic terms and conditions affecting the relevant work force are negotiated at the same time. This structure removes the relevant work force from economic competition." (Craypo (1986), p. 34)

One counter balancing factor is that as the bargaining structure broadens, the union is faced with representing a more heterogeneous work force. This can make it more difficult for the union to obtain a consensus on priorities in bargaining and more difficult for the union to maintain cohesiveness during economic strikes.

III. Recent Empirical Evidence on the Market Structure Hypothesis.

The two most comprehensive empirical studies of the relation between market structure, bargaining structure, and union wages are Hendricks (1975) and Mishel (1986). Both studies use disaggregate data and control for a variety of measures of the level and structure of unionism. Hendrick's data consist of contract level observations for 450 firms. Contracts were included in the analysis if the contract listed the wages for specific occupational groups. The sample period is from 1970 to 1971. Mishel's data is gathered from the 1968, 1970, and 1972 Expenditure for Employee Compensation (EEC) Surveys. An establishment was included in the analysis if at least 50% of the workers were unionized. The wage data consist of the average total compensation for production workers at the establishment. Hendricks estimates an error components model allowing for a firm-specific, a year-specific, and an idiosyncratic error term. Mishel uses ordinary least squares in his estimation.

The degree of noncompetitiveness in the product market is proxied in each study by indicator variables for "medium" and "high" levels of sales concentration. The sales concentration figures have been adjusted to reflect spatial limitations in the

production process or the product market.[6] Hendricks interacts concentration with union coverage while Mishel interacts concentration (and a measure of barriers to entry) with bargaining structure variables. Both studies include additional controls for other features of the firm and/or product market. Hendricks includes a measure of the ratio of labor cost to total cost and a measure of firm size. Mishel includes a subjective barriers to entry measure, a measure of the industry price-cost margin, and the level and growth in the industry import penetration ratio.[7]

Hendricks finds a significant positive relation between concentration and wages for janitors, laborers, electricians, and painters. A negative and significant relation was found for mechanics. Across all occupation categories, the higher the ratio of labor costs to total costs the lower the observed wage level. As observed in individual worker data, the size of the firm had a significant and positive effect on wage levels. Mishel also finds a positive and nonlinear relation between concentration and wages. High concentration (60 - 100%) has nearly three times the effect as medium concentration (40 - 60%). Higher levels of import penetration in an industry significantly lower wages, although changes in the level of import activity had no effect. No stable pattern of effects for the barrier to entry measures or the price-cost measure were found. The discussion of the interactions with concentrations will be given below.

The ability of the union to make the firm pay is measured with a variety of variables in each study. This is the major contribution of the two studies. Previous research focused on a single dimension of unionism -- the level of coverage in the industry/region/occupation. Hendricks includes indicators for the type of bargaining structure for the contract being negotiated. Four different structures are identified

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[6] See Weiss (1966b) "Appendix to Concentration and Labor Earnings." mimeo.

[7] The price-cost margin is defined as (Value Added - Payroll expense)/(Value of Shipments) using data from the **Annual Survey of Manufactures**. Import penetration is defined as Imports/(Imports + Value of Shipments).

in the data: single firm/single plant; single firm/multiple plant; local multi-employer; and industry-wide. Since Mishel used establishment level instead of contract level data, he only controlled for the bargaining structure at the industry level. The two specifications used in the analysis are the percent of workers in each type of bargaining structure and the dominant mode of bargaining. Mishel also addresses the issue of the degree of competitive unionism in an industry. Both the number of unions in the industry, the percent organized by the largest union, and a Herfindahl index of coverage are incorporated into the specification. Each study allows the level of union coverage to have a nonlinear effect on wages.[8]

Consistent with earlier studies using aggregate data and micro data on individual workers, the level of union coverage has a significant and positive effect on wage rates. Mishel finds that the largest effect is in the range of coverage between 60 - 80%. There is no difference between the effect of coverage in the range 40 - 60% and the range 80 - 100%. Hendricks finds that increasing the level of concentration (holding constant the level of union coverage) raises wages only when a high level of coverage exists. With both moderate and low coverage levels the interaction is negative as found in previous aggregate studies. This provides supports for Rees' criticism that concentration per se need not lead to higher wages. Mishel finds that the composition of coverage is important as well as the level of coverage. Controlling for overall coverage, increasing the share of the dominant union leads to higher wages. Similar results were found when the Herfindahl index was substituted for the dominant union share. This evidence supports the claim that competitive unionism reduces the overall effectiveness of unions.

Contrasting results are found for the effect of centralization of bargaining. Hendricks finds for most occupation groups that local multi-employer bargaining is associated with the highest wage settlements. The second most effective structure is

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[8]Union coverage is defined as the percent of production workers in an industry organized by any union.

firm level bargaining. Single plant and industry-wide bargaining are associated with lower wages with the lowest settlements associated with industry-wide units. In contrast, Mishel finds that wages increase in general with centralization. Mishel also finds that union workers receive higher wages in more concentrated product markets regardless of the type of bargaining structure in place.

Interpretation of these empirical findings regarding the effects of bargaining structures on wage outcomes is made difficult by the fact that bargaining structures are both an outcome of the bargaining process as well as a determinant of the bargaining process. Unions and firms may value particular bargaining structures independent of their effect on future wage settlements. For example, more centralized structures provide scale economies in the costs of contract negotiation and administration while decentralized structures provide more local autonomy. The wage effects discussed above could be interpreted as compensating differentials for different bargaining structures.

A few empirical studies have examined the role of bargaining structures as outcomes of the bargaining process. Deaton and Beaumont (1980) examine the determinants of bargaining structure using British data while Hendricks and Kahn (1982) use U.S. data. Several of the variables used in our wage specifications (i.e. sales concentration) were found to be important predictors of bargaining structure. This may make it difficult for the data precisely to determine independent effects of bargaining structure and variables such as sales concentration on wages. However, there is no necessary statistical bias in the coefficient estimates themselves.

The situation that would lead to statistical bias occurs when the error in the wage (or strike) equation is correlated with the bargaining structure variables. For example, if "strong" unions (or firms) can negotiate both their desired bargaining structure and more favorable compensation terms, then our bargaining structure coefficients would no longer measure the independent effect of bargaining structure on wages. Correcting for this excluded variable bias would require using predicted

rather than actual measures of the bargaining structure. However, there seems to be no proclivity as to which direction this bias would take. Livernash (1963) writes "On the other hand, single-employer bargaining may prevail because of union inability to organize the total product market. Inability to organize has in recent years essentially destroyed both multiemployer bargaining and unionism in hoisery and textiles. Single-employer bargaining also exists as a deliberate union choice were pattern-setting and -following add to union strength in negotiating with a relatively small number of large employers. Single-employer bargaining thus appears both as a sign of union weakness (inability to organize) and as a sign of union strength" (p. 13).

Given that there is no definite direction of the potential bias, we will follow the previous empirical literature and include actual rather than predicted measures of bargaining structure in the wage and strike equations. This will facilitate comparisons of our results with this literature.

IV. Introducing Strikes into the Market Structure Hypothesis

The final problem to consider before the empirical analysis is the role of strikes in the market structure hypothesis. Modern strike models rely on an information asymmetry or signalling structure in order to accommodate disputes as part of an economically rational bargaining process.[9] To model the implications of the market structure hypothesis for strikes we consider a very simple asymmetric information model in which the employer has perfect information about quasi-rents per worker, which are defined as the difference between net revenues and the alternative wage rate of union labor, but the union only knows the distribution of these quasi-rents. In the appendix we derive the implications of a single round bargaining problem for wage settlements and strike probabilities. These conclusions can be

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[9] See Tracy (1987) and references therein for a summary of these models and a test of their implications of for strike incidence and duration.

summarized as follows. There are three types of parametric information to vary: the expected level of net revenues per worker, the dispersion in net revenues per worker, and the alternative wage rate.[10] Increasing expected net revenues per worker, holding the dispersion of net revenues per worker and the alternative wage rate constant, increases the wage settlement (there is more to divide) and decreases the strike probability (there is a greater cost to disagreement). Increasing the dispersion in net revenues per worker, holding the expected value and alternative wage rate constant, increases the wage settlement (the optimal offer increases) and increases the strike probability (the higher offer is less likely to be accepted by the firm). Finally, increasing the alternative wage rate, holding the distribution of net revenues constant, increases wage settlements and strike probabilities (because labor market opportunities outside of the bargaining unit are better).

In order to integrate the market structure hypothesis into this simple asymmetric information model we must relate the key market structure variables (sales concentration, union coverage, and bargaining structure) to the parametric information in the model. All of the arguments in the literature suggest that increased sales concentration is intended as a proxy for increased quasi-rents per worker. This implies that increases in sales concentration should be associated with increased wage settlements and decreased strike incidence. The arguments in the literature also suggest that the increased product market coverage by the union is associated with an increased opportunity cost of time for the members of the bargaining unit. This implies that increases in product market coverage by the union involved in the negotiation should be associated with increased wage settlements and increased strike

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[10] Quasi-rents, in this model, are defined as the difference between revenues net of all variable costs except labor and labor costs evaluated at the alternative wage rate. Therefore, quasi-rents per worker are uncertain from the union viewpoint (because of the uncertainty about net revenues per worker) but are fully known from the firm viewpoint. When the alternative wage rate is held constant, variation in the parametric distribution of net revenues is equivalent to variation in the parametric distribution of quasi-rents per worker.

incidence. The literature contains diverse arguments about the role of product market coverage by other unions and bargaining structure variables. It is clear that most researchers regard these measures as related to the labor market alternatives of the union workers; however, the direction of that relation is unclear. This implies that changes in product market coverage by other unions (and other competitive or rival union measures) should affect the wage settlement and strike incidence rates in the same direction.

Finally, the literature is not replete with arguments that relate market structure variables to measures of uncertainty about quasi-rents per worker. We will develop some of our own. Increases in uncertainty should increase wage settlements and strike incidence rates.

It is important to note that while the information asymmetry or signalling model of strikes is the only economically rational model of both strikes and wage settlements in current use, it does make some strong predictions that are potentially refutable. In the context of the present paper, however, we use this model only to help interpret the strike probability and wage settlement estimates produced by market structure and union coverage variables. Hence, variables that have the same effect on both the wage settlement and strike probability equations may be interpreted as affecting either quasi-rent uncertainty or alternative wage rates in the direction required to produce the common effect. Variables that have opposite effects on the wage settlement equation and the strike equation must be interpreted as affecting the expected size of quasi-rents per worker in the appropriate direction. No direct evidence of the relations among the market structure, union coverage, bargaining structure, quasi-rents per worker or alternative wage rates is presented.

V. Data Sources and Empirical Specifications Used in This Analysis

This paper contributes to the empirical literature on the market structure hypothesis in several dimensions. First, we analyze the role of the market and

bargaining structure on both wage settlements and strike activity. The theoretical development of the market structure hypothesis emphasized that many variables should raise union wages by increasing the union's ability to inflict economic damages on the firm during a strike. To our knowledge, however, no systematic evidence exists on the effect of these variables on the level of strike activity. Second, we develop several new measures for the structure of union coverage. These new variables further refine our understanding of the market structure hypothesis. Finally, we estimate our specifications using a broader sample of firms over a larger number of years than the samples used in previous studies.

Many of our additional measures of the structure of union coverage are derived from a large panel data set of union negotiations that has been collected by the authors in conjunction with David Card and Sheena McConnell. This data set consists of all contract expirations from 1970 to present that were listed in issues of the Bureau of Labor Statistics (BLS) **Bargaining Calendar**.[11] The BLS supplies an identification number, which provides a panel structure to the data, making it possible to follow a bargaining pair through each successive negotiation. The firm and union name, the number of workers covered by the contract, the two-digit industry classification, and a bargaining structure variable are provided. From unpublished BLS contract listings we were able to obtain the four-digit industry classification. The bargaining structure variable indicates if the bargaining unit consists of a single firm/single plant, single firm/multiple plant, association agreement, or industry/area agreement. The BLS stopped reporting the employer unit variable in 1984.[12]

The following methodology was used to create union coverage and bargaining structure measures for the years used in our analysis. Details are provided in Abowd

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[11] Prior to 1979 the publication was called the **Wage Calendar**.

[12] The unpublished BLS contract listings still indicate the employer unit classification. We are in the process of gathering these data for contracts expiring from 1984 to 1987.

and Tracy (1987). The employment number associated with each contract expiration is meant to reflect the number of workers covered as of the beginning of the contract. We linearly interpolated between these employment figures for each negotiation by a given bargaining pair in our data. This gives us month by month estimates of the employment associated by each contract in the sample. Union coverage measures were constructed by first obtaining total monthly employment counts for each union/industry pair in the data. These monthly sums were then used to construct annual averages. The total union coverage in an industry for a particular year can then be calculated as the sum of the individual union annual averages divided by the total industry employment. For any particular contract negotiation in our sample, we can decompose the total union coverage into the percent covered by the union involved in the negotiations and the percent covered by other unions. In a similar manner, we can calculate for each industry and year the distribution of union membership by type of bargaining structure.

The strike sample consists of contract negotiations in manufacturing that occurred between 1970 and 1980. Although it would be desireable to follow up on Rees' suggestion and analyze both manufacturing and nonmanufacturing industries, nonmanufacturing contracts were dropped from the sample since no sales concentration data are available. While the employer unit data is available through 1983, the estimates of the distribution of union membership by type of bargaining structure begin to reflect the missing data as early as 1981. For a three year contract expiring in 1984, employment figures would be incorporated into our calculations from 1981 to 1984. To minimize the effect of the missing data on estimates of the distribution of union membership by type of bargaining structure, the years from 1981 to 1983 were dropped from the analysis.

Three sources of data were used to infer if a negotiation involved a strike. The BLS publication **Industrial Relations Facts** provides a weekly summary of strikes in progress using information gathered from a variety of public sources. The BLS Work

Stoppage file, which is compiled from confidential surveys sent to firms and unions, was used although some care is required since the public use version available to researchers deletes the names of the firm and union. The third source is a listing of strikes compiled by the Bureau of National Affairs, Inc. (BNA).[13] The process used to merge this strike information into the contract data is detailed in Tracy (1986).[14]

The wage settlement analysis was based on a sample of collective bargains reported by the BNA in **Collective Bargaining Negotiations and Contracts**. These reports were published between January 1976 and December 1980.[15] The BNA data report the wage rate,[16] scheduled deferred changes, and contingent COLA information. We used a measure of the wage settlement that summarizes the expected annual rate of growth of the contract wage rate from the last day of the old contract until the last day of the new contract. This measure is based upon the deferred scheduled increases and the

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[13]These data are called the **Work Stoppage Data** by the BNA. They are compiled by a group of reporters from a variety of public sources and interviews. The data were provided by Harriet Berlin of the BNA.

[14]As might be expected, the three sources did not always classify a negotiation in the same manner. In 90% of the cases, all three sources provided the same classification. The incidence of strikes in the sample varies considerably depending on the level of agreement we require among the three sources. If we code a strike when any sources indicates a strike, then the strike incidence rate is 16.53%. If we code a strike when any two sources indicate a strike, then the strike incidence rate falls to 11.62%. Finally, if we code a strike only when all three sources indicate, then the strike incidence rate falls to 6.64%. The greatest degree of classification divergence is between the BNA data and the two BLS data sources. The robustness of the strike results to the particular definition of a strike used is discussed below.

[15]The computerized version of the BNA wage settlement data are available through 1987, however, the time period from 1976 to 1980 is the maximum overlap with measures developed from our current **Bargaining Calendar** files.

[16]The actual wage rate reported depends upon the contract and the reporter who records the information at the BNA. For about two-thirds of the contracts the wage rate reported is either the last wage rate in the previous contract or the first wage rate in the new contract for a representative member of the bargaining unit (e.g. journeymen operatives in the automobile pacts). For the other third of the contracts the wage rate is taken from published BLS data for the industry.

expected COLA increases given information available on the date of settlement.[17] Wage settlements were linked to the industry, union and state data using the same codes that were used for the contract expiration sample.

Import penetration data were developed by Abowd (1987) and are discussed in Abowd and Freeman (1987). The data were based on the BLS Trade Monitoring System four-digit Import Standard Industrial Classification method.[18] BLS data are available for the period 1972 to 1981. Abowd's series run from 1958 to 1984. The import penetration ratio is defined as the import SIC based value of imports divided by the comparable value of domestic product shipments (product class coded) plus value of imports. The measure corrects the value of domestic product shipments so that only the group of products most comparable to the products included in the import SIC based value of imports are used.

Conditions in the industry and local labor markets may exert important influences on the wages written into new contracts and on the difficulty encountered in negotiating them. We include variables that control for the employment growth, current conditions, and level of uncertainty for each labor market. These variables were derived from the time series regression on industry and state quarterly employment, not seasonally adjusted.[19]

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[17] See Abowd (1987) for a complete description of these data and the methods used to summarize the expected wage changes.

[18] See Schoepfle (1982) for methods. Original sources for these data are Bureau of the Census publications **U.S. Commodity Exports and Imports as Related to Output** and **Annual Survey of Manufactures: Value of Product Shipments**.

[19] The input time series data were extracted from BLS computer tapes **Employment and Earnings: National** and **Employment and Earnings: State and Area**.

$$(1)\quad \ln E_{it} = \beta_{i0} + \beta_{i1}T + \beta_{i2}T^2 + \sum_{j=1}^{4} d_{ij}D_j + U_{it}$$

$$U_{it} = \rho_1 U_{it-1} + \rho_2 U_{it-2} + e_{it}$$

Data from 1958 to 1987 were used when available. Otherwise, equation (1) was estimated using data from 1972 to 1987.[20] The employment growth rate is calculated using estimates for β_{i1} and β_{i2}. The current condition in the labor market is calculated to reflect both the seasonal employment effect as well as the predicted component of the current employment residual. Finally, the overall level of employment uncertainty in each labor market is proxied by the mean square error from equation (1).[21]

An important feature of our study is the detail used to describe the extent and nature of unionism in the industry. A criticism of many empirical studies of union wage determination is that the extent of unionism is controlled with a single overall coverage variable. The two studies reviewed in the previous section made some important advances. Hendricks (1975) adjusted coverage to reflect spatial limitations in the labor market. In addition, Hendricks distinguished between industry and regional labor market coverage. Mishel (1986) decomposed the overall coverage into the percent covered by the major union and the percent covered by all other unions. This yielded qualitatively similar results as using overall coverage and a Herfindahl index of coverage concentration. We introduce several new variables into the analysis. These variables are meant more fully to reflect whether the union has organized the relevant work force and the extent to which competitive unionism is a problem.

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[20] Series that begin in 1972 were analyzed using only a linear trend.

[21] Tracy (1987) tests current game theoretic bargaining models of strikes by including a firm-specific measure of uncertainty calculated as the standard deviation of the "excess" stock returns over a one year period preceding the expiration of the existing collective bargain. This restricts the sample to firms that are traded on a major exchange and eliminates all bargaining pairs that use association agreements. For this reason, we have chosen to use the industry level measure of uncertainty discussed in the text.

A limitation with all current measures of union coverage is that they ignore the labor content of imported goods, which is by definition outside the scope of American labor law protection of the union's ability to organize. While Mishel (1986) included an import penetration ratio (IPR) in his analysis, he did not attempt to adjust the union coverage numbers to reflect import competition. If we are willing to assume that domestic union workers (L_{DU}), domestic nonunion (L_{DN}), and foreign workers (L_F) are equally productive, then we can adjust the conventional coverage numbers in a simple manner. Let k denote the common average productivity of labor. Recall that the import penetration ratio is defined as:

$$(2) \quad IPR = \frac{M}{S + M}$$

where S = Value of domestic shipments, and

M = Value of imports.

Let C denote the conventional union coverage measure and $\hat{C}$ the trade-adjusted union coverage measure.

$$(3) \quad C = \frac{L_{DU}}{L_{DU} + L_{DN}}$$

$$(4) \quad \hat{C} = \frac{L_{DU}}{L_{DU} + L_{DN} + L_F}$$

The relation between the two coverage measures can be seen by expressing the numerator and denominator of the IPR in terms of the implied labor content. Ignoring exports, we have $M = k(L_F)$ and $S + M = k(L_{DU} + L_{DN} + L_F)$, which implies:

$$(5) \quad IPR = \frac{L_F}{L_{DU} + L_{DN} + L_F}$$

Combining expressions (3) through (5) gives that $\hat{C} = (1 - IPR)C$. The same technique was used to adjust the sales concentration figures to account for imports.

Since we know the union(s) involved in any particular negotiation in our samples, a natural question to ask is whether the union coverage measure should reflect the

percent of the industry employment organized by any union or organized by the particular union(s) in question. We disaggregate the total coverage into these two components. Finally, controlling for the level and composition of the union coverage implicitly assumes that only the level and not the composition of the uncovered work force is important. Recall that the uncovered work force consists of domestic nonunion workers and foreign nonunion workers. Since the threat of unionization will only apply to the first category of nonunion workers, the composition of the nonunion work force may be important. To allow for this possibility, we include the IPR as a separate variable as well as interacting (1 - IPR) with the coverage measures.[22]

Mishel (1986) proxied the degree of industrial competitiveness with the percent of the industry workers organized by the largest union. Since we have decomposed overall coverage into a union-specific and a general component, we will use a Herfindahl index of union coverage to proxy for the degree of fragmentation. In addition, we also include a variable that measures the relative weight that a particular industry has in the distribution of a union's overall membership. Specifically, we control for the percent of the union's total membership that is organized in the industry in question. Holding the level and concentration of coverage constant, we expect that unions exert more influence in their primary industries.

The BLS contract data allow us to calculate the distribution of union workers in an industry over four types of bargaining structures: single firm/single plant, single firm/multiple plant, association agreement, and industry/area agreement. In the strike analysis we also know the specific structure of the contract that is being renegotiated. This additional information was incorporated in the analysis in several forms. The most straight forward manner is to include indicators for each type of

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[22]Mishel (1986) included the IPR in his specification on the grounds that the variable helps to control for the competitive pricing pressures put on firms that operate in industries with significant import activity. The coefficient on the IPR will reflect both this effect and the composition effect discussed in the text.

contract-specific structure. The allows us to ascertain if the contract-specific structure is important holding constant measures of the industry-specific structure. An alternative specification is to code an indicator variable for the case when the contract-specific structure is the same as the dominant structure observed in the industry. If the dominant structure reflects the most appropriate structure for that industry, then there may be gains to a union from being able to adopt that particular structure in its bargaining.

VI. Empirical Results for Strike Activity

The analysis of strike activity focuses on 3,575 contract expirations in the manufacturing industries over the period 1970 to 1980. We model the incidence rate of strikes at contract negotiations. Other sources of strike activity, such as organization drive strikes and strikes during the life of an existing agreement, are not included in this study.[23] Table 1 presents summary statistics for the bargaining units in our strike activity sample. These statistics are simple averages of bargaining units. Overall there is a 17.85% strike incidence rate in the sample.

We conducted a logistic regression analysis of the strike incidence rate controlling for the variables listed in Table 1. The specification was varied by removing (column 1) and including unrestricted year effects (columns 2 and 4) and unrestricted two-digit industry effects (columns 3 and 4). The results are reported in Table 2. Rather than display logistic regression coefficients, which are inherently difficult to interpret due to the nonlinearity of the logistic regression function, we report the marginal effect of each control variable on the probability of a strike, holding all other variables at their mean values. These marginal effects can be interpreted like standardized regression coefficients--the effect of a one standard deviation change in the control variable on the probability of a strike.

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[23] See Tracy (1986) for a detailed discussion of the focus on strike incidence at contract negotiation.

Table 2 shows that the estimated logistic regressions are remarkably insensitive to whether or not we include year effects and industry effects. Hence, we interpret only column (1), which includes neither. Increases in the trade-adjusted four firm concentration ratio are weakly associated with lower strike rates. Increases in the trade-adjusted coverage by the same union have a strong positive effect on strike rates. Increases in the trade-adjusted coverage by other unions has only a weak positive effect. Increases in import penetration have a weak negative effect on strike rates. As the Herfindahl index of union coverage increases the strike rate goes down. Similarly, as the percent of the union's total membership that is in the industry increases the strike rate goes down. The percent of an industry's workers in association agreements is related to lower strike rates. The other bargaining structures are not different from the reference structure--single firm/single plant. The effect of having the same bargaining structure as the industry dominant one is negative, but statistically imprecise. The growth rate of industry employment and the current industry employment residual are both associated with increased strike activity. State employment growth and residual effects are not statistically precise or economically large. Industry employment root mean square is associated with a higher strike probability, while state employment root mean square error is not important.

To check for the sensitivity of our results to the definition of a strike used, we re-estimated the basic strike specification for each possible definition. Recall that we have three separate sources of strike information: Industrial Relations Facts (IRF), Current Wage Developments (CWD), and Work Stoppages (WS). When strikes are coded based on the IRF data alone, the industry employment mean square error and the IPR lose their significance. When strikes are coded based on the CWD data alone, the industry employment growth rate is no longer significant and the industry/area and single firm/multiple plant bargaining structures have significantly lower strike incidence. When strikes are coded based on the WS data alone, the sales concentration

loses its significance and the effect of coverage by other unions is doubled in magnitude. Finally, when strikes are coded based on agreement between at least two data sources, then the industry employment mean square error and the sales concentration variables lose their significance. In addition, single firm/multiple plant bargaining structures have a significant negative effect.

There are important nonlinearities in the strike incidence rate equations. The negative marginal effect of the trade-adjusted four firm concentration ratio declines in magnitude as the concentration rises. Table 3 displays this relation by evaluating the marginal effects at various levels the concentration ratio. The marginal effect of the percent of the union's total membership in the same industry as the bargaining unit is negative for low levels of the variable but positive for high levels. Again, Table 3 displays this relation.

VII. Empirical Results for Wage Settlements

The analysis of wage settlements focuses on 3,485 contract settlements in the manufacturing industries over the period 1976 to 1980. The measure of wage settlement used is the expected average real wage rate over the life of the new contract. This measure is defined as the nominal wage rate expected to hold during each year of the contract inclusive of scheduled deferred increases and expected COLA payments divided by the expected Consumer Price Index during that year.[24] We model the natural logarithm of the expected real wage rate.[25] Table 4 presents summary statistics for

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[24] See Abowd (1987, Appendix) for a detailed description of the methods. The expected inflation rate used to calculate the expected COLA payments is the rate that prevailed during the twelve months that preceded the wage settlement. The expected COLA payments are based on industry and year specific linear COLA formulas and only apply to contracts known to contain contingent COLA agreements.

[25] The logarithm has been multiplied by 100 and all proportions have been entered as percentages to simplify the display of regression coefficients and marginal effects. Estimated coefficients retain the interpretation of elasticities.

the bargaining units in our wage settlement sample. These statistics are employment weighted averages of the bargaining units.

The regression analysis of wage settlements is shown in Table 5. As in our strike models, we estimated equations that included no unrestricted effects (column 1), unrestricted year effects (column 2), unrestricted two-digit industry effects (column 3), and both sets of unrestricted effects (column 4). Regression coefficients or marginal effects that are unaffected by the removal or inclusion of these unrestricted effects may be interpreted unambiguously. Regression coefficients that change depending upon which sets of unrestricted effects are included require more cautious interpretation because we cannot distinguish these effects from general time or industry patterns. All equations were estimated using weighted least squares with bargaining unit weight proportional to bargaining unit size. This technique allows one to interpret the coefficients as the average over all bargaining units for the representative worker.[26] The specification displayed in Table 5 is quadratic in most of the interesting market structure variables with trade-adjusted four firm sales concentration interacted with the main union coverage variables. Because this specification is very nonlinear, Table 6 presents estimated marginal effects at varying levels of the control variables. The marginal effects in Table 6 have the same interpretation as linear regression coefficients--namely, they are the partial derivatives of the regression surface evaluated at the indicated points. The discussion of our results will reference Tables 5 and 6 together.

Wage settlements increase as the trade-adjusted four firm concentration ratio increases at low levels of sales concentration. The reverse is true at high levels of

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[26] If the regression included only an intercept, then the employment weighted estimated intercept would be the average increase for all unionized workers and not for all bargaining units regardless of size. This technique allows for all the effects to vary across bargaining units. The regression coefficients are the employment weighted averages of these bargaining unit specific coefficients. The weighted regression induces heteroscedasticity on the model. Standard errors were corrected using the White technique. Standard errors have not been corrected for coefficient heterogeneity.

concentration. The cross-over sales concentration level is sensitive to which sets of unrestricted effects are included in the model. Table 5 shows that trade-adjusted four firm sales concentration has a positive linear coefficient, negative quadratic coefficient, negative interaction with same union coverage, negative interaction with other union coverage (except specification 1), and positive interaction with import penetration. All of these estimated effects are consistent with existing empirical studies. Table 6 shows; however, that the marginal effects of increased sales concentration in our specifications are positive at low sales concentration levels and negative at high concentration levels, which calls into question the direct interpretation of the sales concentration ratio as a measure of quasi-rents per worker.

The marginal effect of increases in trade-adjusted coverage by the same union on wage settlements is positive at all levels of union coverage (the only exception is in Table 6 is specification 2 at 67.9% coverage and the effect is imprecisely estimated). This conclusion is unaffected by the specification or the level at which the coverage variable is evaluated. The marginal effect of increases in trade-adjusted coverage by other unions in the same industry is also always positive and insensitive to specification. The marginal effect of increases in import penetration is negative when industry effects are omitted (specifications 1 and 2) but it is positive when these effects are included (specifications 3 and 4). Since the model is only estimated using data from the period 1976 to 1980, most of the large swings in import penetration do not occur during the sample period. Therefore, it is not surprising that import penetration effects cannot be distinguished from other industry specific patterns.[27]

Increases in the Herfindahl index of union coverage concentration are associated with increased wage settlements. The magnitude of this effect, but not its sign, is

[27] Mishel (1986) did not include industry effects in his equations, so the robustness of his results to this type of specification check cannot be evaluated.

affected by the specification. The marginal effect of the percent of total union membership in the industry is positive for low levels of the variable and negative for high levels, which is the opposite of its effect on strike probabilities. The result is not sensitive to specification.

Workers in industries where a large percentage of the unionized workers are covered by association agreements have somewhat lower wage settlements with the magnitude of the difference depending upon the specification. In particular, inclusion of unrestricted industry effects substantially reduces the estimated magnitude. Workers in industries where a large percentage of the unionized workers are covered by industry/area agreements have wage settlements whose relation to the reference single firm/single plant group is ambiguous (negative for specifications without industry effects, positive otherwise). Finally, workers in industries where a large percentage of the unionized workers are covered by single firm/multiple plant agreements have larger wage settlements regardless of the specification. All of these comparisons use the single firm/single plant agreement as a reference. Industry employment growth is negatively related to wage settlements. The estimated effect of state employment growth is positive when unrestricted industry effects are estimated (specifications 3 and 4) and negative otherwise. The predictable transitory component of industry employment growth (industry employment residual) is generally positively related to wage settlements (except specification 3). The predictable transitory component of state employment growth is always positively related to wage settlements. The estimated effect of industry employment growth uncertainty (industry employment root mean square error) is imprecise and inconsistent across specifications. The effects of state employment growth uncertainty are always positive.

Consider next the consistency of the estimated results with the asymmetric information synthesis of the effects of market structure and union coverage variables on wage settlements and strike probabilities. The primary market structure variable--trade-adjusted four firm sales concentration--may be consistently

interpreted as proxying increased quasi-rents per worker at low levels of sales concentration. This is because at low levels of sales concentration the marginal effect of an increase in the concentration measure is to increase wage settlements and decrease strike probabilities. This configuration of results is only consistent with a quasi-rent per worker interpretation. At high levels of sales concentration the effect of an increase in concentration is to decrease both wage settlements and strike probabilities. This configuration of results is inconsistent with the quasi-rents per worker interpretation.

The primary union coverage variable--trade-adjusted coverage by the same union--may be consistently interpreted as proxying increased alternative wage rates for the union workers. This is because at all levels increases in coverage by the same union are associated with higher wage settlements and strike probabilities. Trade-adjusted coverage by other unions in the same industry may also be consistently interpreted as proxying increased alternative wage rates for union workers. The pattern of its marginal effects is the same as the pattern for own union coverage in both the wage settlement and strike probability estimates.

The effects of increased import penetration cannot be given a consistent interpretation because of the specification sensitivity in the wage settlement equations.

Increases in the Herfindahl index of union concentration cannot be consistently interpreted as proxying increases in the opportunity wage rate of union workers. This is because increases in the Herfindahl union concentration index are associated with higher wage settlements and lower strike probabilities. The higher wage settlements were predicted by the industrial relations theorists; however, the only economically consistent way to explain the strike probability result is to argue that this index proxies expected quasi-rents per worker, which could be true if union organizing activity is targeted at high quasi-rent per worker industries or firms.[28] The same

[28]See Abowd and Farber (1987) for an analysis of this model.

interpretation must be given to the percent of total union membership in this industry. This variable has opposite marginal effects on wage settlements and strike probabilities, and these effects change signs at roughly the same level of the variable in the two analyses.

Our direct measures of bargaining structure, industry employment opportunities and uncertainty, and state employment opportunities and uncertainty generally produced results that were too imprecise to interpret in the context of the asymmetric information model. Only the positive effect of the predictable transitory component of industry employment growth was precisely estimated in both equations. This is consistent with the interpretation that this variable proxies increases in the opportunity wage rate of union workers. The effect of the industry employment growth rate, although relatively precise, was negative in the wage settlement equation and positive in the strike probability equation. This is only consistent with an interpretation that the long run employment growth rate is positively related to expected quasi-rents per worker.

VIII. Conclusions

How important is the market structure hypothesis for explaining strike and wage settlement outcomes? Our statistical analysis has shown that over the decade of the 1970's (late 1970's for wage settlements) trade-adjusted increases in the four firm sales concentration ratio were associated with higher wage settlements at low sales concentration levels, lower wage settlements at high sales concentration levels, and lower strike probabilities at all sales concentration levels. These results are inconsistent with the original market structure hypothesis. However, the simple asymmetric information model of wage settlements and strike probabilities suggests that the inconsistency may be due to quasi-rents per worker (ability to pay) not varying monotonically with sales concentration. Scherer (1980) summarizes the many reasons that industrial organization theorists have advanced to suggest that this

explanation is at least plausible. Of course, a direct estimate of the relation between quasi-rents per worker and trade-adjusted sales concentration could offer a more complete explanation.

Trade-adjusted coverage by the union involved in the negotiation fares considerably better. This variable is always positively related to both wage settlements and strike probabilities. This result was predicted by the industrial relations theorists and is consistent with the economic interpretation the increased product market coverage by the union increases the alternative wage rate faced by that union's workers.

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Appendix

A.I. A Simple Asymmetric Information Model of Wages and Strikes

In this appendix we present a simple one-period bargaining model that illustrates the effect of a set of variables on strike and wage outcomes. For simplicity we assume that negotiations consist of a single "take-it-or-leave-it" wage demand by the union. If the firm rejects the union wage demand, then the bargaining pair dissolves and the quasi-rents associated with the pair are lost. That is, the firm receives a competitive return on its capital while the union receives the alternative wage for its labor services.

At the time of the negotiations, the firm knows its net revenues (i.e. net of all contractual costs other than labor) for the next contract period while the union faces some uncertainty over the firm's net revenue. We will ignore issues involving wage/employment tradeoffs by assuming a fixed employment rule with bargaining only over the contract wage. Define the following terms:

W_a = Alternative wage rate

W = Contract wage

P = Revenues net of nonlabor costs per union member

We assume that the union enters into bargaining with the belief that the firm's profitability is uniformly distributed over the interval from P_l to P_h, i.e. $P \sim U[P_l, P_h]$.

What is the union's optimal wage demand? Assuming that the union is risk-neutral, then, it is straight forward to write down the union's decision problem. Faced with any wage demand W, the firm's optimal response given the one-round nature of the bargaining is to accept W if W is less than or equal to P and to reject otherwise. Given the union's prior beliefs about P, the expected value from any contract demand W is given by

$$V(W) = ([P_h - W]/[P_h - P_l])\, W + ([W - P_l]/[P_h - P_l])\, W_a$$

Maximizing V(W) over choices of W leads to an optimal wage demand function given by

$$W = \text{Max} \{ P_l, 1/2 [P_h + W_a] \}$$

We will focus on the case where $P_l < 1/2 [P_h + W_a]$, since this is the case which leads to the possibility of a strike. If we denote the maximum quasi-rent as $Q = P_h - W_a$, then, the optimal wage demand can be rewritten as

$$W = W_a + 1/2\ Q$$

That is, the union demands a contract wage which is equal to the alternative wage plus a fifty percent share of the maximum potential wage. This implies that the union's share of the actual rent will exceed fifty percent if it successfully negotiates a contract with the firm.

Define the probability of a strike as the probability that the firm rejects the union's wage demand. This probability can be expressed in terms of the parameters of the bargaining model by substituting for the union's optimal wage demand.

$$Pr = (1/2\ P_h - P_l + 1/2\ W_a)/(P_h - P_l)$$

We are now ready to consider the effects of changes in the bargaining environment on the probability of a strike and the observed contract wage. First, consider the effect of increasing the union's uncertainty over the firm's profitability holding constant the expected size of the quasi-rents. This involves taking a mean-preserving spread of the union's prior beliefs about P. Let e be a spread parameter (i.e. we will shift up P_h by e and shift down P_l by e). The contract wage and strike probability as a function of e are as follows.

$$W(e) = 1/2\ (P_h + e + W_a)$$

$$Pr(e) = [1/2\ P_h - P_l + 1/2\ W_a + 3/2\ e] \ /\ [P_h - P_l + 2e]$$

Evaluating the derivatives with respect to the spread parameter at the point e=0 yields the following results.

$$dW(e) \ /\ de = 1/2 > 0$$

$$dPr(e) \ /\ de = (1/2\ P_h + 1/2\ P_l - W_a)/(P_h - P_l)^2 > 0$$

Increasing the level of uncertainty over profitability, holding constant expected quasi-rents, leads to a higher strike incidence and contract wages. Next, consider the effect of an increase in the expected size of the quasi-rents holding constant the uncertainty over the quasi-rents and the alternative wage rate. This can be investigated using a shift parameter s (i.e. we shift up P_h by s and we shift up P_l by s).

$$W(s) = 1/2\ (P_h + W_a + s)$$

$$Pr(s) = (1/2\ P_h - P_l + 1/2\ W_a - 1/2\ s)/(P_h - P_l)$$

The derivatives with respect to s (evaluated at s=0) are

$$dW(s) \ /\ ds = 1/2 > 0$$

$$dPr(s) \ /\ ds = -\ 1\ /\ (2\ [P_h - P_l]) < 0$$

Increasing the average size of the quasi-rents holding constant the uncertainty leads to lower strike incidence and higher contract wages.

Finally, consider the effect of increasing the alternative wage holding constant both the mean and variance of P. The derivatives with respect to W_a are

$$dW / dW_a = 1/2 > 0$$

$$dPr / dW_a = 1/(2 [P_h - P_l]) > 0$$

Improvement in labor market conditions relative to the firm's profitability leads to higher strike incidence and contract wages.

A.II. Summary Statistics for Bargaining Structure Variables

Some descriptive information concerning the distribution of bargaining structures is presented in Tables A1 through A3. In Table 1 shows the percent of union workers in manufacturing who were covered by each type of bargaining structure. Separate figures are given for the years from 1970 to 1980. Industry/Area agreements account for the smallest proportion of workers although bargaining units using this structure are large in size. Comparing across years shows that there was a decline in the use of plant level bargaining in the early to mid-seventies although this type of structure regained its lost market share by 1980. Table A2 shows the distribution of bargaining structures by two-digit industry classification. The figures reflect the overall average for the industry over the sample period. Distinct industry patterns exist. For example, while Association agreements are the least used type of structure in general, they are the dominant structure used in Food, Apparel, and Printing. The Chemical industry is atypical in its heavy use of Plant level bargaining. Because of the panel structure of our contract data, we can detect bargaining units that changed

their bargaining structure during our sample period. In total, 21.8% of our bargaining units changed structures. The three industries with the least stability were Instruments (36.7%), Petroleum (34.5%), and Rubber (34.4%). The three industries with the most stability were Apparel (10.9%), Stone, Clay, and Glass (12.7%), and Printing (13.2%). Table A3 shows the empirical transition matrix among the types of bargaining structures. Centralized bargaining structures displayed the most stability over the period. There was very little movement between Single Company structures and more centralized structures. Most of the switches occurred between Single Plant and Multiple Plant structures.

Table 1

Summary Statistics for the Strike Sample

Variable	Mean	Standard Deviation
Strike Indicator	17.85%	38.30
Industry Employment Growth Rate (annual)	-1.20%	2.04
State Employment Growth Rate (annual)	1.56%	1.00
Industry Employment Residual (annual rate)	-3.76%	29.24
State Employment Residual (annual rate)	-0.32%	7.00
Industry Employment Root Mean Square Error (annual rate)	4.84%	1.84
State Employment Root Mean Square Error (annual rate)	4.12%	0.20
Industry Union Workers in Association Agreement	17.52%	28.06
Industry Union Workers in Industry/Area Agreement	4.18%	10.25
Industry Union Workers in Single Firm/Multiple Plant	42.22%	27.89
Contract Specific Structure Same as Dominant Structure	55.94%	49.65
Trade-Adjusted Four Firm Sales Concentration Ratio	37.59%	15.78
Trade-Adjusted Coverage By Same Union	16.30%	23.35
Trade-Adjusted Coverage By Other Unions	16.17%	19.42
Import Penetration Ratio	6.90%	6.44
Herfindahl Index of Coverage Concentration	51.52	25.12
Total Union Membership in This Industry	22.23%	28.15
N = 3,575		

Source: Authors' analysis of BLS **Bargaining Calendar** data. Authors' analysis of BLS and BNA work stoppage data. Sample period is contract expirations occurring from January 1970 to December 1980.

Table 2

Logistic Marginal Effects for Strike Analysis

Variable	Model (1)	(2)	(3)	(4)
Industry Employment Growth Rate	0.0243	0.0243	0.0159	0.0112
	(0.0067)	(0.0069)	(0.0088)	(0.0076)
State Employment Growth Rate	-0.0033	0.0041	0.0051	0.0074
	(0.0068)	(0.0070)	(0.0090)	(0.0077)
Industry Employment Residual	0.0178	0.0143	0.0158	0.0118
	(0.0059)	(0.0061)	(0.0071)	(0.0062)
State Employment Residual	-0.0013	-0.0023	-0.0045	-0.0035
	(0.0057)	(0.0055)	(0.0072)	(0.0058)
Industry Employment Root Mean Square Error	0.0102	0.0064	-0.0003	-0.0034
	(0.0067)	(0.0065)	(0.0099)	(0.0081)
State Employment Root Mean Square Error	0.0010	-0.0023	-0.0006	-0.0018
	(0.0065)	(0.0065)	(0.0086)	(0.0071)
% Industry Union Workers in Association Agreements	-0.0293	-0.0304	-0.0090	-0.0122
	(0.0094)	(0.0090)	(0.0147)	(0.0118)
% Industry Union Workers in Industry/Area Agreements	-0.0080	-0.0071	-0.0005	-0.0013
	(0.0077)	(0.0074)	(0.0106)	(0.0085)
% Industry Union Workers in Single Firm/Multiple Plant	-0.0074	-0.0071	0.0025	-0.0016
	(0.0087)	(0.0085)	(0.0113)	(0.0094)
Contract Specific Structure Same as Dominant Structure	-0.0178	-0.0145	-0.0103	-0.0075
	(0.0106)	(0.0218)	(0.0247)	(0.0274)
Trade-Adjusted Four Firm Sales Concentration Ratio	-0.0098	-0.0104	-0.0158	-0.0115
	(0.0085)	(0.0082)	(0.0119)	(0.0094)
Trade-Adjusted Coverage By Same Union	0.0583	0.0573	0.0435	0.0329
	(0.0090)	(0.0088)	(0.0123)	(0.0103)
Trade-Adjusted Coverage By Other Unions	0.0191	0.0177	0.0081	0.0033
	(0.0066)	(0.0064)	(0.0093)	(0.0078)

(continued)

Table 2 (continued)

Logistic Marginal Effects For Strike Analysis

Variable	Model (1)	(2)	(3)	(4)
Import Penetration Ratio	-0.0137 (0.0067)	-0.0146 (0.0064)	-0.0103 (0.0089)	-0.0083 (0.0070)
Herfindahl Index of Union Coverage Concentration	-0.0326 (0.0083)	-0.0328 (0.0080)	-0.0331 (0.0114)	-0.0278 (0.0091)
% Of Total Union Membership In This Industry	-0.0467 (0.0106)	-0.0500 (0.0100)	-0.0410 (0.0152)	-0.0380 (0.0117)
Year Effects Included (degrees of freedom=9)	No	Yes	No	Yes
Industry Effects Included (degrees of freedom=19)	No	No	Yes	Yes
Log Likelihood	-1,611.64	-1,586.56	-1,552.44	-1,529.72
N = 3,575				

Note: Marginal effects for all continuous variables reflect the change in the probability of a strike resulting from a one standard deviation change in the variable. Marginal effects for qualitative variables reflect the change in the probability of a strike resulting from a change of the variable from a value of zero to one. All marginal effects are evaluated at sample means of the data. Standard errors are given in parentheses.

Table 3

Logistic Marginal Effects for Variables With Linear and Quadratic Terms in Strike Analysis

Variable	Percentile	Level	Model (1)	(2)	(3)	(4)
Trade-Adjusted Four Firm Concentration Ratio	10	18.0%	-0.0305	-0.0340	-0.0014	-0.0054
			(0.0205)	(0.0200)	(0.0227)	(0.0217)
	25	26.4%	-0.0207	-0.0227	-0.0067	-0.0082
			(0.0141)	(0.0136)	(0.0162)	(0.0154)
	50	35.9%	-0.0113	-0.0122	-0.0123	-0.0110
			(0.0091)	(0.0088)	(0.0105)	(0.0100)
	75	37.5%	-0.0022	-0.0022	-0.0176	-0.0136
			(0.0078)	(0.0075)	(0.0095)	(0.0090)
	90	59.8%	0.0094	0.0106	-0.0225	-0.0162
			(0.0130)	(0.0125)	(0.0147)	(0.0142)
% of Total Union Membership in This Industry	10	0.5%	-0.1332	-0.1488	-0.1020	-0.1151
			(0.0269)	(0.0266)	(0.0290)	(0.0284)
	25	1.8%	-0.1261	-0.1404	-0.0967	-0.1088
			(0.0255)	(0.0251)	(0.0276)	(0.0269)
	50	8.0%	-0.0966	-0.1061	-0.0741	-0.0826
			(0.0196)	(0.0190)	(0.0218)	(0.0209)
	75	40.2%	-0.0040	-0.0046	0.0033	0.0019
			(0.0065)	(0.0061)	(0.0082)	(0.0076)
	90	77.5%	0.1029	0.1111	0.1059	0.1127
			(0.0239)	(0.0234)	(0.0293)	(0.0283)
Year Effects Included			No	Yes	No	Yes
Industry Effects Included			No	No	Yes	Yes

Note: Marginal effects reflect the change in the probability of a strike resulting from a one standard deviation change in the variable indicated. All other variables are evaluated at sample means. Standard errors are given in parentheses.

Table 4

Summary Statistics for the Wage Settlement Sample

Variable	Mean	Standard Deviation
Natural logarithm of average real wage (x 100)	119.59	26.47
Industry Employment Growth Rate (annual)	-1.56%	1.82
State Employment Growth Rate (annual)	1.41%	0.79
Industry Employment Residual (annual rate)	9.36%	29.38
State Employment Residual (annual rate)	2.82%	7.52
Industry Employment Root Mean Square Error (annual rate)	1.70%	1.74
State Employment Root Mean Square Error (annual rate)	4.15%	0.25
Industry Union Workers in Association Agreement	7.84%	20.38
Industry Union Workers in Industry/Area Agreement	7.89%	21.53
Industry Union Workers in Single Firm/Multiple Plant	53.77%	30.68
Trade-Adjusted Four Firm Concentration Ratio	44.61%	18.90
Trade-Adjusted Coverage by Same Union	29.82%	30.29
Trade-Adjusted Coverage by Other Unions	17.69%	16.55
Import Penetration Ratio	9.76%	4.36
Herfindahl Index of Coverage Concentration	52.79	26.78
Total Union Membership in This Industry	54.40%	34.30
N = 3,485		

Source: Authors' calculations based on BNA **Collective Bargaining Negotiations** and Contracts data. Authors' calculations based on BLS **Bargaining Calendar** data. The contracts reported in the table were settled between January 1976 and December 1980. Statistics are weighted by the size of the bargaining unit.

Table 5

Regression Coefficients for Wage Settlement Equation Using Quadratic Model with Interactions

Variable	Model (1)	(2)	(3)	(4)
Industry Employment Growth Rate	-1.3918	-1.1726	-0.9526	-2.0678
	(0.5046)	(0.4743)	(0.6292)	(0.6184)
State Employment Growth Rate	-0.9197	-0.7702	1.1907	0.7782
	(0.5174)	(0.5235)	(0.4557)	(0.4637)
Industry Employment Residual	0.0325	0.1358	-0.0476	0.0301
	(0.0139)	(0.0196)	(0.0148)	(0.0194)
State Employment Residual	0.2485	0.2796	0.1580	0.1851
	(0.0526)	(0.0499)	(0.0454)	(0.0440)
Industry Employment Root Mean Square Error	0.0300	-0.4098	0.4533	-0.1714
	(0.2841)	(0.2729)	(0.2691)	(0.2615)
State Employment Root Mean Square Error	9.1151	9.1268	0.7437	2.2992
	(1.5680)	(1.5785)	(1.6011)	(1.5805)
% Industry Union Workers in Association Agreements	-0.3261	-0.2146	-0.0527	-0.0052
	(0.0269)	(0.0286)	(0.0316)	(0.0326)
% Industry Union Workers in Industry/Area Agreements	-0.2176	-0.3051	0.1283	0.0271
	(0.0246)	(0.0231)	(0.0289)	(0.0293)
% Industry Union Workers in Single Firm/Multiple Plant	0.1412	0.1240	0.0921	0.0714
	(0.0161)	(0.0153)	(0.0178)	(0.0173)
Trade-Adjusted Four Firm Sales Concentration Ratio	0.8058	0.9446	0.2444	0.3132
	(0.2723)	(0.2529)	(0.2837)	(0.2914)
Sales Concentration Ratio Squared	-0.0185	-0.0176	-0.0045	-0.0030
	(0.0029)	(0.0026)	(0.0031)	(0.0030)
Trade-Adjusted Coverage by Same Union	0.6399	0.5391	0.7059	0.5361
	(0.1018)	(0.0944)	(0.0840)	(0.0874)
Coverage by Same Union Squared	-0.0009	-0.0033	0.0002	-0.0014
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Coverage by Same Union times Concentration Ratio	-0.0048	-0.0023	-0.0095	-0.0072
	(0.0019)	(0.0018)	(0.0017)	(0.0016)

(continued)

Table 5 (continued)

Regression Coefficients for Wage Settlement Equation Using Quadratic Model with Interactions

Variable	Model (1)	(2)	(3)	(4)
Trade-Adjusted Coverage by Other Unions	0.0975	0.0671	0.4267	0.3208
	(0.1382)	(0.1240)	(0.1324)	(0.1317)
Coverage by Other Unions Squared	-0.0059	-0.0035	-0.0033	-0.0007
	(0.0013)	(0.0012)	(0.0010)	(0.0010)
Coverage by Other Unions times Concentration Ratio	0.0102	-0.0051	-0.0013	-0.0057
	(0.0033)	(0.0030)	(0.0029)	(0.0027)
Import Penetration Ratio	-5.9236	-5.2129	-0.8135	0.2953
	(0.5679)	(0.5108)	(0.5843)	(0.6352)
Import Penetration Ratio Squared	0.0618	0.0449	-0.0097	-0.0233
	(0.0129)	(0.0087)	(0.0132)	(0.0167)
Import Penetration Ratio times Concentration Ratio	0.0933	0.0919	0.0328	0.0186
	(0.0105)	(0.0099)	(0.0093)	(0.0096)
Herfindahl Index of Union Coverage Concentration	0.1076	0.1366	0.0140	0.0531
	(0.0283)	(0.0278)	(0.0363)	(0.0376)
% of Total Union Membership In This Industry	0.2659	0.2046	0.1734	0.1342
	(0.0611)	(0.0585)	(0.0535)	(0.0521)
% Union Membership in Industry Squared	-0.0025	-0.0017	-0.0014	-0.0010
	(0.0006)	(0.0005)	(0.0005)	(0.0005)
Year Effects Included (degrees of freedom=4)	No	Yes	No	Yes
Industry Effects Included (degrees of freedom=19)	No	No	Yes	Yes
Standard Error of Equation	15.0426	14.2929	11.9448	11.4792
Adjusted R-squared	0.6770	0.7084	0.7963	0.8119
Error degrees of freedom	3461	3457	3442	3438

N = 3,485

Note: (a) The remaining variables in all models are identical to the ones used in Table 8.
(b) The equations were estimated using weighted least squares with weights proportional to the size of the bargaining unit. Standard errors (in parentheses) have been corrected for the heteroscedasticity induced by the weighting.
(c) The standard error of the equation and the adjusted R-squared are based on conventional least squares formulas.

Table 6

Marginal Effects for Variables that Enter the Wage Settlement Equation In Nonlinear Form, Based on a Quadratic Model with Interaction Terms

Variable	Percentile	Value	Model (1)	(2)	(3)	(4)
Trade-Adjusted Four Firm Concentration Ratio	mean	44.6%	0.1036 (0.0439)	0.2864 (0.0435)	-0.1415 (0.0629)	-0.0911 (0.0637)
	10	21.1%	0.9697 (0.1588)	1.1124 (0.1471)	0.0677 (0.1805)	0.0509 (0.1805)
	25	31.8%	0.5755 (0.1003)	0.7365 (0.0942)	-0.0275 (0.1196)	-0.0137 (0.1209)
	50	39.1%	0.3065 (0.0639)	0.4799 (0.0616)	-0.0925 (0.0829)	-0.0578 (0.0845)
	75	63.1%	-0.5822 (0.0978)	-0.3675 (0.0884)	-0.3072 (0.1060)	-0.2034 (0.0999)
	90	70.8%	-0.8672 (0.1397)	-0.6393 (0.1261)	-0.3761 (0.1485)	-0.2501 (0.1409)
Trade-Adjusted Coverage by Same Union in This Industry	mean	29.8%	0.3744 (0.0397)	0.2405 (0.0397)	0.2978 (0.0376)	0.1355 (0.0453)
	10	0.3%	0.4275 (0.0597)	0.4343 (0.0569)	0.2844 (0.0640)	0.2156 (0.0682)
	25	3.4%	0.4218 (0.0568)	0.4134 (0.0544)	0.2859 (0.0607)	0.2069 (0.0653)
	50	18.8%	0.3942 (0.0449)	0.3126 (0.0440)	0.2928 (0.0461)	0.1653 (0.0524)
	75	44.3%	0.3485 (0.0392)	0.1458 (0.0395)	0.3043 (0.0313)	0.0964 (0.0403)
	90	67.9%	0.3061 (0.0527)	-0.0093 (0.0518)	0.3150 (0.0391)	0.0324 (0.0461)

(continued)

Table 6 (continued)

Marginal Effects for Variables that Enter the Wage Settlement Equation In Nonlinear Form, Based on a Quadratic Model with Interaction Terms

Variable	Percentile	Value	Model (1)	(2)	(3)	(4)
Trade-Adjusted Coverage by Other Unions in This Industry	mean	17.7%	0.3424 (0.0564)	0.1695 (0.0540)	0.2507 (0.0540)	0.0408 (0.0585)
	10	4.2%	0.5022 (0.0817)	0.2633 (0.0782)	0.3389 (0.0686)	0.0610 (0.0708)
	25	7.6%	0.4624 (0.0747)	0.2400 (0.0715)	0.3170 (0.0641)	0.0559 (0.0669)
	50	14.9%	0.3754 (0.0608)	0.1889 (0.0583)	0.2689 (0.0562)	0.0450 (0.0603)
	75	23.0%	0.2795 (0.0497)	0.1327 (0.0477)	0.2160 (0.0514)	0.0329 (0.0564)
	90	31.9%	0.1742 (0.0463)	0.0709 (0.0442)	0.1578 (0.0524)	0.0196 (0.0572)
Import Penetration Ratio	mean	9.8%	-0.5631 (0.1384)	-0.2472 (0.1371)	0.4575 (0.1510)	0.6700 (0.1570)
	10	3.9%	-1.2837 (0.2179)	-0.7703 (0.1747)	0.5702 (0.2580)	0.9415 (0.2949)
	25	6.3%	-0.9815 (0.1736)	-0.5510 (0.1520)	0.5230 (0.2061)	0.8277 (0.2273)
	50	11.0%	-0.4051 (0.1377)	-0.1325 (0.1378)	0.4328 (0.1396)	0.6104 (0.1452)
	75	12.2%	-0.2534 (0.1442)	-0.0224 (0.1417)	0.4091 (0.1358)	0.5532 (0.1452)
	90	13.2%	-0.1331 (0.1538)	0.0649 (0.1470)	0.3903 (0.1382)	0.5079 (0.1531)

(continued)

Table 6 (continued)

Marginal Effects for Variables that Enter the Wage Settlement Equation In Nonlinear Form, Based on a Quadratic Model with Interaction Terms

Variable	Percentile	Value	Model (1)	(2)	(3)	(4)
% of Total Union Membership In This Industry	mean	54.3%	-0.0013	0.0218	0.0204	0.0284
			(0.0157)	(0.0151)	(0.0145)	(0.0141)
	10	1.1%	0.2603	0.2008	0.1702	0.1320
			(0.0599)	(0.0573)	(0.0524)	(0.0510)
	25	20.2%	0.1666	0.1367	0.1165	0.0949
			(0.0392)	(0.0375)	(0.0344)	(0.0335)
	50	66.2%	-0.0602	-0.0184	-0.0133	0.0051
			(0.0228)	(0.0219)	(0.0206)	(0.0200)
	75	78.9%	-0.1227	-0.0612	-0.0491	-0.0197
			(0.0350)	(0.0335)	(0.0311)	(0.0303)
	90	90.6%	-0.1801	-0.1004	-0.0820	-0.0424
			(0.0473)	(0.0454)	(0.0418)	(0.0408)
Year Effects Included			No	Yes	No	Yes
Industry Effects Included			No	No	Yes	Yes

Note: Marginal effects are partial derivatives of the estimated regression equation evaluated at the values of the variables indicated in the "Value" column and at the average values of all other variables. The estimation results are reported in Table 5. Standard errors (in parentheses) have been corrected for the heterscedasticity induced by the weighting.

Table A1

Annual Distribution of Union Membership
In Manufacturing Industries
By Type of Bargaining Structure

Year	Single Company/ Single Plant	Single Company/ Multiple Plant	Association Agreement	Industry/Area Agreement	Number of Workers (MM)
1970	31.34%	47.14%	18.78%	2.74%	4.26
1971	26.37	53.39	17.18	3.06	4.28
1972	23.26	55.76	17.80	3.18	4.27
1973	22.14	57.33	17.08	3.46	4.40
1974	24.12	55.49	17.26	3.12	4.41
1975	24.31	55.19	17.13	3.36	4.32
1976	26.37	51.38	17.80	4.44	4.18
1977	29.02	49.26	17.57	4.15	3.94
1978	30.93	48.17	16.76	4.14	3.78
1979	32.51	47.07	16.33	4.10	3.67
1980	32.98	47.56	16.18	3.27	3.74

Note: Figures do not include contracts with missing bargaining structure information.

Table A2

Industry Distribution of Union Membership
By Type of Bargaining Structure

Industry	Single Company/ Single Plant	Single Company/ Multiple Plant	Association Agreement	Industry/Area Agreement
Food	19.35%	25.65%	43.34%	11.66%
Tobacco	46.37	52.89	0.73	0.00
Textile	35.75	22.54	23.03	18.67
Apparel	1.82	12.71	76.82	8.65
Lumber	15.57	38.86	28.48	17.09
Furniture	31.74	37.49	29.42	1.34
Paper	46.11	41.10	6.97	5.82
Printing	15.48	6.42	72.19	5.90
Chemicals	66.77	33.12	0.11	0.00
Petroleum	39.54	60.45	0.00	0.00
Rubber	22.68	73.72	3.60	0.00
Leather	25.92	33.42	29.66	11.00
Stone, Clay, Glass	19.02	63.67	12.56	4.74
Primary Steel	20.49	76.90	1.40	1.22
Fabricated Steel	43.72	43.40	11.04	1.84
Machinery Ex Elec	42.90	54.53	2.29	0.28
Electrical Equipment	41.85	55.69	1.16	1.30
Transportation Equipment	26.94	69.77	2.71	0.59
Instruments	48.78	51.22	0.00	0.00
Misc. Mfg.	29.18	31.77	31.05	7.99

Note: Figures do not include contracts with missing bargaining structure information.

Table A3

Bargaining Structure Transition Matrix
For Manufacturing Industries

Initial Bargaining Structure	Subsequent Bargaining Structure: Single Company/ Single Plant	Single Company/ Multiple Plant	Association Agreement	Industry/Area Agreement	All
Single Company/ Single Plant	655 (76.97)	182 (21.39)	11 (1.29)	3 (0.35)	851
Single Company/ Multiple Plant	104 (22.71)	338 (73.80)	9 (1.97)	7 (1.53)	458
Association Agreement	9 (3.81)	5 (2.12)	210 (88.98)	12 (5.08)	236
Industry/Area Agreement	5 (7.14)	0 (0.00)	5 (7.14)	60 (85.71)	70
All Types of Agreements	773	525	235	82	1,615

Note: The unit of observation is a bargaining pair. The numbers in parentheses are percents of row totals.