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PRODUCT MARKET COMPETITION, UNION ORGANIZING ACTIVITY, AND EMPLOYER RESISTANCE

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ABSTRACT

We develop and estimate a model of the union's optimal extent of organizing activity that accounts for the decision of employers regarding resistance to union organizing. The central exogenous variable in the analysis is the quantity of quasi-rents per worker available to be split between unions and employers.

We measure available quasi-rents per worker as the difference per worker between total industry revenues net of raw materials costs and labor costs evaluated at the opportunity cost of the workers. Using two-digit industry level data for thirty-five U.S. industries for the period 1955 through 1986, we find that both organizing activity and employer resistance to unionization are positively related to available quasi-rents per worker. However, there is still a strong negative trend in union organizing activity and a strong positive trend in employer resistance after controlling for quasi-rents per worker. Thus, the explanation for the decline in union organizing activity and the increase in employer resistance to unionization since the mid 1970's lies elsewhere.

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I. Introduction

The dramatic reduction in union organization through representation elections supervised by the National Labor Relations Board (NLRB) has been a major contributor to the sharp decline in the extent of unionization in the United States since the mid-1970's (Dickens and Leonard, 1985). According to information from the May Current Population Survey (CPS), the percentage of private nonagricultural workers who were union members fell from 25.6% in 1973 to 14.1% in 1985. Over the same period, the percentage of nonunion workers who were organized through NLRB representation elections fell from approximately 0.55% in 1973 to approximately 0.13% in 1983.[1] Employer resistance to union organizing has increased dramatically over a longer period with the number of unfair labor practice complaints filed by unions against employers alleging illegal activity in the course of a union organizing effort rising from 9 complaints per thousand workers eligible to vote in NLRB representation elections in 1955 to 33 complaints per thousand in 1973 to 87 complaints per thousand in in 1985.

We argue in this study that the decline in organization *and* the increase in employer resistance may result from increases in competitiveness that reduce the quasi-rents available to be split between firms and workers. We build a model of rent-maximizing union behavior with regard to the extent of unionization in an industry where the employers optimally select a level of resistance to union organization. We then link the decline in union organizing activity to a decline in the optimal extent of unionization for a rent-maximizing union. The model implies that (1) the optimal extent of

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[1] These figures overstate the level of effective new organization because of an increasingly common failure to negotiate a first contract following an election victory. An AFL-CIO survey suggests that unions only are able to negotiate first contracts in 63% of election victories (MacDonald, 1985).

unionization and, hence, the quantity of organizing activity and (2) employer resistance to unionization will both be related to the quantity of quasi-rents available to be split between unions and employers.

We use data aggregated to the two-digit industry level for 35 U.S. industries for the period 1955 through 1986 to investigate 1) the relationship between the change in available quasi-rents per worker and union organizing activity in the form of NLRB representation election activity and 2) the relationship between the level of quasi-rents per worker and employer resistance in the form of unfair-labor-practice charges filed with the NLRB. For our purposes, quasi-rents per worker are defined as the difference per worker between total industry revenues net of raw materials costs and labor costs evaluated at the opportunity wage of the workers. We find that both employer resistance and organizing activity are significantly positively related to the change in available quasi-rents per worker. However, even after controlling for changes in quasi-rents per worker, a strong negative trend in union organizing activity remains.

II. A Stylized View of the Modus-Operandi of American Labor Unions

In this section, we argue that unions in the United States are primarily organizations that extract quasi-rents from employers in particular industries. A reasonable objective for such a union is the maximization of its share of the quasi-rents.[2] The quasi-rents accruing to any particular union member are simply the difference between the worker's union wage rate

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[2]A variety of objective functions have been used in the analysis of union behavior. See, for example, Dunlop (1944), Farber (1978), Dertouzos and Pencavel (1980), Carruth and Oswald (1983), Pencavel (1984a, 1984b), and MaCurdy and Pencavel (1986). Farber (1986) presents a selective survey of this literature.

and the opportunity wage rate in the worker's next best employment alternative. More specifically, assume that there are N union members and that there are L workers employed at the union wage.[3] The N-L union members who are not employed at the union wage are employed at their opportunity wage. Assuming that all union workers are identical and noting that union members employed at their opportunity wage generate no quasi-rents, the total quasi-rents (R_L) accruing to union members are

$$(II.1) \qquad Q_L = L \cdot [W_u - W_a]$$

where W_u is the union wage, W_a is the opportunity wage. If the union maximizes this objective function, it will maximize the wealth available for distribution to the individual union members (including those not employed at the union wage).

We assume that quasi-rents are extracted from employers in a strongly efficient fashion so that unions and employers are involved in bargaining over the split of a pie of fixed size (a zero-sum game).[4] In other words, the quantity of quasi-rents available to be distributed between the union and the employers is not affected by the actions of the union regarding either its organizing decisions or its positions in bargaining. While strong

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[3]The determination of the relevant group of workers for a union to consider in making its decisions is a fundamental issue in the analysis of union objectives which has not been seriously addressed in the recent literature. See Dunlop (1944) and Farber (1986). In the context of this study, a sufficient condition for a union to value the gains that accrue to potential members is that the union be free to redistribute income within the union subject to the constraint that a worker would leave union employment rather than be made worse off than he would be in a nonunion job.

[4]Strong efficiency is defined by Brown and Ashenfelter (1986) as efficiency in the sense that employment will be set at the level where the value of marginal product of labor equals the opportunity wage of labor rather than the actual union wage. While they present evidence from one industry that labor contracts are not strongly efficient, Abowd (1989) presents evidence from a national sample of contracts that cannot reject strong efficiency.

efficiency is not strictly necessary to understand our approach to the determination of union organizing activity, it greatly simplifies the discussion and analysis because it implies that a measure of the *total* quasi-rents available in an industry can serve as an exogenous measure of the potential gain from unionization.

Quasi-rents in an industry may be derived from underlying imperfections in the product market such as a natural monopoly or oligopoly, from government regulation that erects an entry barrier, or from producer specific capital that prevents potential competitors from duplicating existing firms.[5] Quasi-rents also include the normal competitive return to the fixed assets in an industry. We abstract from the possibility that unions can organize competitive industries and act as an upstream monopolist, generating quasi-rents from the product market. Fundamentally, the process of organizing large numbers of competitive producers in order to create quasi-rents is bound to provide less benefit per dollar expended than organizing a small number of oligopolistic producers. Thus, unions are more likely to form where there are "ready-made" quasi-rents from noncompetitive industrial structures or where the nature of the assets in the industry limits the possibilities for employers to protect the normal return component of the quasi-rents by transferring the assets to other industries.

III. The Union Decision Process and the Optimal Level of Unionization

A major departure in this study from the earlier literature on the determination of the union status of workers is that the union, rather than the workers, is considered the central decision maker. The organizing costs

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[5]Rose (1985) analyzes the the existence and incidence of quasi-rents due to government regulation of the trucking industry prior to 1978.

for an existing union are smaller than the direct costs the workers face because of economies of scale in conducting numerous campaigns and the advantages of having a professional staff. In addition, the union will perceive general benefits from organizing currently nonunion jobs in the form of an improved bargaining position for the union because it has organized a larger share of the industry's workforce. Consequently, the union's net benefit from organization exceed the workers' private benefit and the union is making the relevant decision about which jobs to organize.

Formally, the union in industry j is attempting to maximize the total quasi-rents accruing to union labor in that industry (Q_{Lj}) net of the costs of organizing the the chosen number of workers:

$$V_{uj} = Q_{Lj} - C_j, \qquad \text{(III.1)}$$

where C_j represents the costs of organization.

The union appropriates quasi-rents through a quasi-rent extraction function, which relates the quantity of quasi-rents received by union labor to the quantity of quasi-rents available and the extent of unionization in the industry:

$$Q_{Lj} = Q_j \cdot h(U_j) , \qquad \text{(III.2)}$$

where Q_j represents the total quantity of quasi-rents in the industry, U_j represents the proportion of workers in the industry who are unionized, and $h(\cdot)$ is an increasing function with a nonpositive second derivative. If the function $h(U_j) = U_j$ then the union simply gets a share of the rents in the industry equal to its share of employment. In this case, the benefit of increased organization to the union is precisely the benefit that the workers generate themselves. The idea that the benefit of increased organization to the union exceeds the benefit to the workers directly involved is formalized by $\partial h(U_j)/\partial U_j > 1$.

The costs of organizing workers will vary with the amount of resistance

by employers. In this context, the cost (C_j) of organizing L_j workers in industry j can be expressed as:

$$C_j = L_j \cdot g(U_j, S_j) \qquad \text{(III.3)}$$

where S_j is the amount of resistance to union organizing offered by employers in industry j. The function g is the average cost per worker of organization, which is assumed to be positively related to the extent of unionization and increasing in U_j so that $\partial g/\partial U_j > 0$. We also assume that the marginal cost of organization is increasing so that $\partial^2 g/\partial U_j^2 > 0$. This assumption is motivated by the necessity of organizing workers who are less favorably disposed toward unions and jobs that are less favorably situated for unionization (e.g., smaller establishments) as the existing degree of unionization increases. The average cost of organization is positively related to employer resistance so that $\partial g/\partial S_j > 0$. The effectiveness of employer resistance declines at the margin so that $\partial^2 g/\partial S_j^2 < 0$.

Substitution of the extraction and cost functions into equation (III.1) yields

$$V_{uj} = Q_j \cdot h(U_j) - N_j \cdot U_j \cdot g(U_j, S_j) \qquad \text{(III.4)}$$

as the objective function for the union noting that $L_j = N_j \cdot U_j$ where N_j is the level of total employment in industry j. The union's decision problem is to determine the extent of industrial unionization that maximizes this objective function. Assuming that employer resistance is set exogenously, the first order condition is:

$$0 = q_j \left(\frac{\partial h(U_j)}{\partial U_j} \right) - \left(g(U_j, S_j) + U_j \frac{\partial g(U_j, S_j)}{\partial U_j} \right), \qquad \text{(III.5)}$$

where q_j is quasi-rents per worker (Q_j/N_j). The first term represents the marginal benefit in increased quasi-rents per worker and the second term represents the marginal cost of increased unionization. The sufficient second order conditions for a maximum are that the marginal benefit of

unionization be decreasing in U_j ($\partial^2 h/\partial U_j^2 < 0$) and the marginal cost of unionization be increasing in U_j ($\partial^2 g/\partial U_j^2 > 0$).

Equation (III.5) implicitly determines the optimal extent of unionization (U_j^*) in industry j as:

(III.6) $$U_j^* = f(q_j, S_j),$$

where $\partial U_j^*/\partial q_j$ is positive. Thus, the optimal extent of unionization is increasing in the quantity of quasi-rents per worker available in the industry. Furthermore, $\partial U_j^*/\partial S_j < 0$ as long as the marginal cost of organization does not decrease with employer resistance.[6]

Suppose now that employer resistance is a (unspecified) function of quasi-rents per worker. Equation (III.6) can be rewritten as

(III.7) $$U_j^* = f(q_j, S_j(q_j)),$$

so that the total derivative of the optimal extent of unionization with respect to a change in quasi-rents per worker is

(III.8) $$dU_j^*/dq_j = \partial U_j^*/\partial q_j + \partial U_j^*/\partial S_j \cdot dS_j/dq_j.$$

The first term is positive (the optimal extent of unionization increases with quasi-rents holding resistance fixed). The first part of the second term is negative (the optimal extent of unionization decreases with employer resistance holding quasi-rents fixed) under fairly general conditions. The last term is crucial. Clearly, a sufficient condition for the optimal extent of unionization to increase with quasi-rents (dU_j^*/dq_j 0) is that employer resistance not increase with quasi-rents ($dS_j/dq_j \leq 0$). The optimal extent

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[6]This is a sufficient condition. The necessary and sufficient condition for $\partial U_j^*/\partial S_j < 0$ is that $[\partial g/\partial S_j + U_j \cdot \partial g^2(U_j, S_j)/\partial U_j \partial S_j] > 0$. The first term is positive by assumption. The cross-partial derivative in the second term is the change in the marginal cost of organization with employer resistance. It is reasonable that this is positive.

of unionization will increase with quasi-rents even when employer resistance increases with quasi-rents so long as employer resistance does not increase too sharply ($dS_j/dq_j < -\partial U_j^*/\partial q_j \; / \; \partial U_j^*/\partial S_j$).

IV. The Employer Decision Process and Optimal Employer Resistance

Consider a simple model of employer behavior where the firm gets the residual of the quasi-rents after the union has extracted labor's share net of the costs of resisting unionization. This is

$$V_{ej} = Q_j \cdot [1-h(U_j)] - S_j \tag{IV.1}$$

normalizing the price of a unit of resistance to unionization to one. The firm will choose the optimal resistance level so as to maximize V_{ej} subject to the constraint that the union will choose the extent of unionization optimally conditional on the resistance offered by the employer (equation III.6). The relevant constrained maximization is:

$$L_{ej} = \max Q_j \cdot [1-h(U_j)] - S_j + \lambda[U_j - f(q_j, S_j)] \tag{IV.2}$$

The first order conditions for a maximum are

$$\begin{aligned} 0 &= -Q_j \cdot \partial h(U_j)/\partial U_j + \lambda \\ 0 &= -1 - \lambda \partial f(q_j, S_j)/\partial S_j \\ 0 &= U_j - f(q_j, S_j). \end{aligned} \tag{IV.3}$$

The first condition defines λ as the shadow price to the firm of an increase in unionization. The second condition determines the optimal quantity of employer resistance as an equality between the marginal cost of resistance (normalized to one) and the marginal effect of resistance on the extent of unionization times the shadow price of unionization. The third condition is the constraint that the union chooses the extent of unionization optimally.

Since the optimal extent of unionization as chosen by the union (the f function) depends on first derivatives of the rent extraction function and the cost of organization function, the firm's optimal choice of resistance

depends on second derivatives of these functions (see the second of equations IV.3). Thus, any comparative statics regarding the firms decision (most centrally, $\partial S_j/\partial q_j$) will depend on third derivatives of the rent extraction and cost of organization functions. While me may know a bit about first derivatives and are willing to make assumptions about some second derivatives, it is unrealistic to pretend knowledge of third derivatives. Thus, we cannot make any predictions based on this model about how employer resistance will respond to a change in quasi-rents.

On the one hand, it may be the case that because an increase in quasi-rents makes unionization more costly (more dollars are lost at any level of U_j), employers will fight unionization harder. On the other hand, it may be that an increase in quasi-rents reduces the effectiveness of fighting unions because of the shape of the organization cost function so that employers will resist unionization less.

The conventional wisdom (e.g., Freeman 1985) seems to be that employers, in the face of economic threats and increased competition, resist unionization more strongly. While this outcome is consistent with the simple model laid out here, the general argument in support of the view that employer resistance increases with a decline in quasi-rents runs along different lines than our model. Essentially, it is argued that in a competitive environment firms cannot afford to live with unions. If a firm becomes unionized, it may not be able to continue operating. Thus, the management resists unions more strongly. Implicit in this argument is one or both of two possibilities. First, firms may share rents with unions more-or-less voluntarily when times are good (Akerlof, 1982). Second, managers of firms threatened with unionization in a time of increased competition may spend more resources fighting unions than is optimal from the shareholders' perspective in order to continue the firm in operation and/or

maintain their positions as managers.

The conclusion is that it is an empirical matter as to whether employer resistance increases or decreases with quasi-rents. This also makes it difficult to make an unambiguous prediction regarding how the optimal extent of unionization is related to quasi-rents. What we can say is that the optimal extent of unionization is positively related to quasi-rents unless employer resistance increases too rapidly. One unambiguous prediction is that if we find that employers resist unionization more strongly as quasi-rents decline ($\partial S_j/\partial q_j < 0$) then it is the case that the optimal extent of unionization is positively related to quasi-rents. At least one of the optimal responses to an increase in q_j must be positive.

V. Empirical Specifications: Union Organizing Activity and Employer Unfair Labor Practices

The system of equations in IV.3 determines a Nash equilibrium between the union and the employer that determinces the extent of unionization and quantity of employer resistance. The quantity of organizing activity is used to move the actual extent of unionization toward the optimal extent of unionization. In a simple adjustment model the quantity of organizing activity in period t is a function of the change in the optimal extent of unionization between period t-1 and period t. More formally, let

$$A_{jt} = A(U^*_{jt} - U^*_{jt-1}) \qquad (V.1)$$

where A_{jt} represents the quantity of organizing activity in industry j and year t. The function $A(\cdot)$ is an increasing function of the change in the optimal extent of unionization. This does not imply that there will be no organizing activity if the optimal extent of unionization is unchanged. There is likely to be a general "depreciation" of the stock of union jobs as nonunion firms enter an industry and older union firms shrink. Thus, we

expect that $A(0) > 0$.

A first order approximation to the change in the optimal extent of unionization based on equation (III.6) is

$$(V.2) \qquad U^*_{jt} - U^*_{jt-1} = \beta_0 + \beta_1 \Delta q_{jt}$$

where Δq_{jt} is the change in total quasi-rents per worker in industry j between period t-1 and period t and β_0 and β_1 are parameters. Assuming a linear form for the function $A(\cdot)$ and an additive error yields

$$(V.3) \qquad A_{jt} = \alpha_0 + \beta_0 + \alpha_1[\beta_1 \Delta q_{jt}] + \epsilon_{jt},$$

where α_0 and α_1 are positive parameters and ϵ_{jt} is the random component. Given a measure of organizing activity and data on changes in total rents per worker, the parameters of this model can be estimated with standard linear techniques. Note that it is not possible to identify both the α's and the β's. A normalized version of (IV.3) is

$$(V.4) \qquad A_{jt} = \gamma_0 + \gamma_1 \Delta q_{jt} + \epsilon_{jt}.$$

where the γ's are the parameters to be estimated.

The central measure of organization activity used in our analysis is the fraction of the currently unorganized workforce that are involved in representation elections--E_{jt}/M_{jt}, where E_{jt} represents the number of workers in potential bargaining units where elections were held in industry j in year t and M_{jt} is the quantity of *nonunion* employment in industry j and year t.[7] We call our measure the organization effort rate (OER) because it is the relative quantity of election activity undertaken. One problem with our measure that we cannot address is that it misses organization activity that does not progress to the point of an election.

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[7]Dickens and Leonard (1985) consider this measure in their analysis of the decline of unionization. Voos (1983) uses data on direct union expenditures on organization to analyze union organizing activity.

In our empirical analysis we use the logit transformation of the organization effort rate as the key dependent variable. The resulting regression is

$$\text{(V.5)} \qquad \text{logit}(E_{jt}/M_{jt}) = X_{jt}\gamma_0 + \gamma_1 \Delta q_{jt} + \epsilon_{jt}$$

where X_{jt} is a vector of variables affecting the organization effort rate and γ_0 is a vector of related coefficients. The vector X_{jt} includes such variables as a time trend, the rate of change of real GNP, and industry effects. The key parameter of interest in the model is γ_1.

We cannot make an unambiguous prediction for the sign of γ_1 unless quasi-rents and employer resistance to unionization negatively related. In this case γ_1 would be positive. However, if quasi-rents and employer resistance to unionization are positively related, then γ_1 could be positive or negative according to our theoretical model.

Employer resistance to unionization takes many forms that are very difficult to measure. Some examples are (1) higher wages, (2) creation of union-like grievance, job posting, and promotion mechanisms, (3) legal discouragement of worker interest in unions, and (4) illegal discouragement of worker interest in unions. We focus on the last of these techniques as measured by the number of unfair labor practice claims filed by unions alleging illegal activities by employers in the course of organization campaigns. The particular measure we use is the number of claims filed (F_{jt}) per eligible voter (E_{jt}). This ratio (F_{jt}/E_{jt}), while it measures only a part of employer resistance, captures the intensity of overt employer resistance of a certain type and at a certain stage of the organization process. We call our employer resistance measure the unfair labor practice rate (UFLPR).

In the empirical analysis we use the logarithm of the number of unfair labor practices per eligible worker. The resulting regression is

$$(V.6) \qquad \log(F_{jt}/E_{jt}) = X_{jt}\delta_0 + \delta_1 r_{jt} + \mu_{jt}$$

where X_{jt} is a vector of variables affecting the resistance level and δ_0 is a vector of related coefficients. The vector X_{jt} includes such variables as a time trend, the rate of change of real GNP, and industry effects. The key parameter of interest in this regression is δ_1. Note that this specification uses the *level* of quasi-rents per worker rather than the *change*. This is because the theory in section IV suggests that employer resistance to unionization is a function of the level of quasi-rents because the loss to the employer from unionization is related to the level of quasi-rents. In contrast, organization activity is a measure of the change in the optimal extent of unionization, so it is a function of the change in quasi-rents.

Once again, we cannot make an unambiguous theoretical prediction regarding the sign of δ_1. However, determining its sign empirically is central to understanding how union organizing and the optimal extent of unionization are related to quasi-rents.

VI. The Data and Measurement of Key Variables

The model is implemented using data from 1955 through 1986 for thirty-five industries at approximately the two-digit (SIC) industry group level of aggregation. The industry groups are listed in Table 1. They include all of the manufacturing sector, wholesale and retail trade, selected transportation industries, communication, utilities, mining, and selected service industries. Parts of the transportation sector (air and rail) were not included because they are not covered by the National Labor Relations Act. Parts of the service sector were not included because there was insufficient information to compute organizing effort, unfair labor practice rates, or quasi-rents per worker.

Table 1:

Industries Included in Analysis and Opportunity Wage Index

Name	SIC Industries	Wage Index
Food and Tobacco	20, 21	1.044
Textile Mills	22	0.880
Apparel	23	0.791
Lumber and Wood Products	24	1.032
Furniture	25	0.961
Paper	26	1.126
Printing and Publishing	27	0.996
Chemicals	28	1.164
Petroleum Products	29	1.296
Rubber and Plastic	30	1.026
Leather	31	0.833
Stone, Clay, and Glass	32	1.105
Primary Metals	33	1.194
Ferrous Metals	34	1.136
Machinery, exc. Electrical	35	1.176
Electrical Equipment	36	1.088
Aircraft	372	1.214
Transport. Equip. (exc. air)	37 (except 372)	1.214
Instruments	38	1.137
Misc. Manufacturing	39	0.965
Mining, exc. Fuels	10, 14	1.121
Coal Mining	12	1.154
Wholesale Trade	50	1.104
Retail Trade	52-59	0.829
Finance, Insurance, and Real Estate	60-65	0.994
Highway Freight and Warehousing	42	1.146
Other Transport. (exc. rail, auto, air)	41, 44, 46, 47	1.086
Communications	48	1.061
Utilities	49	1.209
Oil and Gas Extraction	13	1.174
Hotel Services	70	0.744
Amusement Services	79	0.784
Health Services	80	0.825
Business Services	73	0.968
Motion Pictures	78	1.001

A. *Organization Effort Rate*

The numerator of the organization effort rate, the number of workers eligible to vote in representation elections by industry and year, is available for cases closed by the NLRB in each industry in each year from the annual reports of the NLRB. The denominator of the organization effort rate, nonunion employment by industry and year, is more difficult to measure. Average annual employment by industry was extracted from the National Income and Product Accounts tables for two-digit industry. To overcome the absence of published data on union coverage by industry prior to 1973 we developed the imputation procedure described below.

Data on the union status of workers by industry are available from the May Current Population Surveys from 1973 through 1985 (with the exception of 1982). Prior to 1973 there is no industry breakdown of union status. The Bureau of Labor Statistics (1980) published an annual time series on union membership for the private nonagricultural labor force for the period from 1955 through 1978. An industry-level times series on unionization was computed for the 1955 through 1978 period by a two step procedure: 1) We assumed that the inter-industry mix of unionization was unchanged over this period and had the values computed from the May 1973-75 CPS's and 2) We adjusted the extent of unionization in each industry every year so that the employment weighted average extent of unionization across industries matched the total reported by the BLS for that year.[8] After 1978 we used fractions

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[8]The assumption of unchanging mix of unionization across industries is troublesome for a study that is focused on industry level explanations for the decline in unionization. However, we are using our constructed series only to normalize the level of organizing activity and not as a central variable to be explained. Our series is not adequate to serve as the key dependent variable, but it is adequate to scale the level of organizing activity.

unionized computed as three year averages from the May CPS's.[9] Specifically, we used the average of the current year and the first two lags of the fraction unionized by industry in order to reduce measurement error caused by relatively small sample sizes in some industry cells.

Figure 1 contains a graph for each industry of the organization effort rate by year. These graphs illustrate (1) the dramatic decline in organization activity since the mid-1970's and (2) that this decline seems to be present in almost all industries. One word of caution in interpreting these graphs (and the graphs in the figures that follow) is that the y-axes all have different scales so that comparisons of magnitudes across industries are not meaningful. As a benchmark, we ran a simple regression weighted by nonunion employment of the logit transformation of the organization effort rate on a time trend (T), (RT) an additional (splined) trend after 1973 (RT), and a complete set of industry effects.[10] The trend coefficients from this regression are:

$$\text{logit(OER)} = X\beta + \underset{(.0042)}{.0183T} - \underset{(.0081)}{.110RT} ,$$

where the numbers in parentheses are standard errors and the R^2 from the regression was .812. What we find is a positive trend through 1973 and a sharp decline after 1973. One important test of the role of product market competition is the extent to which controlling for changes in quasi-rents can account for the post-1973 decline in the organization effort rate.

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[9]We obtained 1982 values for unionization by industry as a straight average of the 1981 and 1983 values. Recall that the CPS did not contain any information on union status in 1982.

[10]The time trend equals zero in 1954, one in 1955, etc. The additional time trend equals zero before 1974, one in 1974, two in 1975, etc.

B. *Unfair Labor Practice Rate*

The unfair labor practice rate is defined as the number of unfair labor practice charges per worker eligible to vote in NLRB supervised representation elections. The number of unfair labor practice charges is available for cases received by the NLRB in each industry in each year from the annual reports of the NLRB. The number of workers eligible to vote in representation elections is the same number used in the numerator of the organization effort rate.[11]

Figure 2 contains a graph for each industry of the unfair labor practice rate by year. These graphs illustrate the general increase (at an increasing rate) in the rate of unfair labor practices. There seems to be an unusual spike in unfair labor practice charges evident in a number of industries in 1983 and/or 1984.[12] As a benchmark we ran a simple regression weighted by the number of eligible voters of the log of the unfair labor practice rate on a time trend (T), an additional (splined) trend after 1973 (RT), and complete set of industry effects:[13]

$$\log(\text{UFLPR}) = X\beta + \underset{(.0025)}{.0636}T + \underset{(.0060)}{.0318}RT \ ,$$

where the numbers in parentheses are standard errors and the R^2 from the regression was .815. We find a strong positive trend through 1973 that

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[11]The unfair labor practice charges are not perfectly temporally linked to the elections with which they are associated. There can be substantial lags between when election cases are closed and when the associated unfair labor practice charges are resolved. Given limitations in the way the data are reported, our most sensible option in computing the ratio is to use the number of unfair labor practice charges received for the numerator and the number of workers eligible to vote in elections in cases closed for the denominator.

[12]We rechecked the data and could find no problems.

[13]These trends are defined in the previous note.

increases by about fifty percent after 1973. Rerunning this regression omitting years after 1982 (and the unusual spikes) actually results in a larger estimated increase in the trend after 1973:

$$\log(\text{UFLPR}) = X\beta + \underset{(.0026)}{.0619}T + \underset{(.0078)}{.0402}RT \ ,$$

where the R^2 was .804. Thus, the increase in the trend after 1973 is not due to the spikes in the unfair labor practice rate after 1982. Another important test of the role of product market competition is the extent to which controlling for quasi-rents can account for the increase over time in the unfair labor practice rate.

C. *Quasi-Rents per Worker*

The definition of total quasi-rents (Q_{jt}) in industry j and year t is revenues (REV_{jt}) less raw materials costs MAT_{jt} less labor costs evaluated at the opportunity wage of the workers (W^*_{jt}):

$$(VI.1) \qquad Q_{jt} = REV_{jt} - MAT_{jt} - W^*_{jt}N_{jt} \ ,$$

where N_{jt} is total employment.[14] The measure was developed at the firm level and aggregated to the industry level using a procedure described below.

The firm level data on revenues (from 1955 to 1986) were computed from the universe of 6,300 firms contained in the Standard and Poor's COMPUSTAT Annual Industrial File, Annual Research File, and the supplemental historical data files available from Standard and Poor's that contain information for fiscal years prior to 1967. The firms were assigned to two-digit SIC industries by Standard and Poor's on the basis of product line information from the 10K reports. Revenues were defined as net sales--the amount of actual billings to customers for regular sales completed during the period

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[14]Note that this measure of quasi-rents does not subtract out the opportunity cost of capital. Thus, we are implicitly assuming that all existing capital is fixed and that its return is potentially appropriable by the union.

reduced by cash discounts, trade discounts, returned sales, and allowances for which credit is given to customers.

Since the firms in the COMPUSTAT universe are only a subset of the firms in the industry, a measure of total quasi-rents in the industry cannot be derived directly from these data. However, we are interested in quasi-rents *per worker* so that the quasi-rents per worker in each firm i in industry j in year t (Q_{ijt}) can be measured as

$$(VI.2) \qquad Q_{ijt}/N_{ijt} = \left(REV_{ijt} - MAT_{ijt} - W^{e}_{ijt} N_{ijt}\right)/N_{ijt} ,$$

where variables subscripted ijt are the firm level analogs of the industry level data. The industry average quasi-rents per worker were computed as the employment weighted average of the firm level quasi-rents per worker. More formally, this is

$$(VI.3) \qquad Q_{jt}/N_{jt} = \sum_{i} \omega_{ijt} \cdot \left(Q_{ijt}/N_{ijt}\right)$$

where ω_{ijt} is the employment weight computed as

$$(VI.4) \qquad \omega_{ijt} = N_{ijt}/\sum_{i} N_{ijt}$$

where the summation is over the i firms in industry j in year t that are contained in the COMPUSTAT sample.

Since our analysis is conducted at the industry level, some alternative measures of quasi-rents per worker were available from the National Income and Product Accounts (NIPAs). We developed our measures from COMPUSTAT firm level data because Standard and Poor's sampling frame is more appropriate for our model than the NIPA sampling frame. COMPUSTAT includes current and historical information on successful firms. By combining the current, research and historical data files, we constructed samples of successful firms in operation during the years 1955 to 1986. The NIPA's include information from all establishments that operated during the year in the particular industry. Establishments are sampled at different rates but the

NIPA totals are designed to be representative of the industry and not just the successful firms in the industry. Clearly, only ongoing (i.e. successful) businesses can be organized. It is important from out perspective to use quasi-rent measures based upon firms at risk to face representation elections, and COMPUSTAT firms meet this criterion.

Because of U.S. accounting conventions, only data on revenues are available consistently at the firm level. We assume that raw materials costs and opportunity wages show only industry and time variation. Thus, we can suppress the i subscripts on these variables so that

$$(VI.5) \qquad q_{jt} = \sum_{i} \omega_{ijt} \cdot \left(REV_{ijt} - MAT_{jt} \right) / N_{ijt} - W^{a}_{jt}.$$

Raw materials costs were computed using the direct requirements per dollar of gross output tables by industry from the Input-Output Tables of the United States for 1958, 1963, 1967, 1972, 1977, and 1982.[15] These tables provide information on the fraction of gross output in each industry that comes from other industries. Let v_j represent the fraction of gross output in industry j that comes from other industries. The total raw materials costs in industry j were then computed as

$$(VI.6) \qquad MAT_{jt} = v_{jt} REV_{jt}$$

which is the share of net revenues that flow to other industries as purchases of intermediate goods.

Note that $1-v_j$ is the fraction of gross output in industry j that is value added. The definition of quasi-rents per worker can be rewritten as

$$(VI.7) \qquad q_{jt} = (1-v_{jt}) \cdot \left(\sum_{i} \omega_{ijt} \cdot REV_{ijt} / N_{ijt} \right) - W^{a}_{jt}.$$

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[15] The data for years 1955 to 1957 were taken from the 1958 Input-Output tables. The data for 1983 to 1986 were taken from the 1982 Input-Output tables. The data for other years for which no table is available were based on linearly interpolated values between the two closest tables.

which is value added per worker less the opportunity wage of the workers. The weights (ω_{ijt}), revenues (REV_{ijt}), and employment (N_{ijt}) are derived from the COMPUSTAT data. The value added share ($1-v_{jt}$) is derived from the input-output tables. All that remains is computation of the opportunity wage.

The industry opportunity wage is the average wage that workers in the industry could earn in their best alternative jobs. As such, it has two key sources of variation. First, there is inter-industry variation in the skill levels and demographic characteristics of workers that are related to wages. Second, there is time series variation in the level of wages. It is not possible to get detailed data on earnings by worker characteristics for the entire time period needed, so a two step procedure was used to compute the opportunity wage.

In the first stage, an industry wage index was computed for the 1973-1975 period. Data on earnings and other characteristics of private-sector workers from the May 1973, May 1974, and May 1975 Current Population Surveys was pooled. An earnings function of the standard form,

$$\text{(VI.8)} \qquad \ln W_{ij} = X_{ij}\beta + \epsilon_{ij},$$

for workers i in industry j was estimated using this sample. The X vector contains measures of sex, race, marital status, the interaction of sex and marital status, education, potential experience, the interaction of sex and potential experience, nine-category region, and one-digit occupation. No measures of union status or industry were included in this regression so that the predicted wages derived using this sample would be representative of what a worker with a given set of observable characteristics could earn elsewhere in the economy.[16] For the same reason, the CPS sample includes workers in all

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[16]Implicit in this treatment is the assumption that union and inter-industry

industries and not simply those in the thirty-five industries used directly in the analysis.

The estimated coefficients of this regression were then used to compute an average opportunity wage for workers in each industry as

$$(VI.9) \qquad E(W_j) = \exp(\bar{X}_j\hat{\beta} + .5\hat{\sigma}^2)$$

where $\bar{X}_j$ is the average value of the X_{ij} in industry j and $\hat{\sigma}^2$ is the estimated residual variance from the regression. This is converted to an index value for each industry (I_j) by dividing $E(W_j)$ by the employment weighted average of the predicted wage across all industries. The last column of Table 1 contains values of this index for the thirty-five industries used in our analysis.

In the second stage of the procedure our measure of the industry annual opportunity wage for industry j in year t is computed as the product of our wage index, average hourly earnings for private non-agricultural workers (AHE_t), and average annual hours measured as average weekly hours for private nonagricultural workers (AWH_t) times 52. This is

$$(VI.10) \qquad W^*_{jt} = 52(I_j \cdot AHE_t \cdot AWH_t).$$

Thus, our measure of the opportunity wage has cross-section variation based only on 1973-1975 differences in worker characteristics, and there is no industry-specific time series variation. However, as long as the industry skill mix and the returns to skill are not changing very rapidly, our measure will capture important inter-industry and time-series variation in the opportunity wage of workers.

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wage differentials do not reflect unmeasured individual skills. To the extent that they do reflect unmeasured individual skills, the correct procedure would be to include them in the regressions and in the predictions. See Murphy and Topel (1987), Dickens and Katz (1987), and Gibbons and Katz (1989).

It is useful to examine the time series by industry of real quasi-rents per worker and its components. Recall from equation VI.7 that quasi-rents per worker was computed as the difference between value added per worker and the opportunity wage. Figures 3 and 4 contain graphs by year for each industry of the sum of the first three lags of real value added per worker and the sum of the first three lags of the real opportunity wage. The sum of three lags is used here and in all computations regarding quasi-rents and its components in order to smooth the data intertemporally. Figure 3 shows that there is quite a bit of variation in the time patterns of real value added per worker across industries though many industries show a period of increase through the 1970's. Figure 4 makes clear the fact that there is only aggregate time series variation in the real opportunity wage. Every industry shows the same time series pattern which reflects movements in average hourly earnings in private nonagricultural employment. Essentially, aggregate real wages were rising until the mid-1970's and falling thereafter. The levels vary due to differences in skill across industries.

Figure 5 presents a graph for each industry of the sum of the first three lags of real quasi-rents per worker by year. Similarly, figure 6 presents a graph for each industry of the sum of the first three lags of the change in real quasi-rents per worker by year. While both figures show a large amount of variation in the time patterns across industries, it is not clear how these relate to the organization effort rates in figure 1 or to the unfair labor practice rates in figure 2. This is a focus of the econometric analysis in the next section.

D. *Other Measures*

Aside from the splined time trend variables and a set of industry dummy variables, only one other variable is used in the analysis. This is the rate of change of real GNP computed as the first difference of log GNP in 1982

dollars, and it is included in the econometric analysis in the next section to capture aggregate cyclical time series factors.

VII. Estimation of the Organization Effort Rate Model

Table 2 contains an ordinary least squares (OLS) analysis of the organization effort rate. The analysis uses 911 observations on industry-years with complete data on the variables needed for the analysis. This covers some or all of the years 1959-1986 for the thirty-five industries listed in table 1.[17] The first column of the table contains means and standard deviations of the variables. The dependent variable is the logit transformation of the organization effort rate. All models include industry fixed effects, and all estimations are weighted by non-union employment.

The second and third columns of the table contain benchmark estimates of the model. The model in column 2 includes the rate of change in real GNP plus a splined (at 1973) time trend. This model illustrates the average modest rate of growth of organization effort through the early 1970's and the sharp decline thereafter. The model in column 3 includes a complete set of year fixed effects in place of the three time-series variables (the splined trend and the GNP variable). This model fits the data somewhat better than the more parsimonious specification in column 2 (p-value <.0001).

The model in column four introduces the change in real quasi-rents per worker. The change in real quasi-rents and the organization effort rate are

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[17]The year 1959 is the first year for which three lags on the change in real quasi-rents are available given that quasi-rent data are not available prior to 1955. There were complete data from 1959 through 1986 for thirty of the thirty-five industries. Data were not available to compute the organization effort rate in some early years for the other five industries. The missing observations are: 1) hotel services, 1959-1971; 2) amusement services, 1959-1975; 3) health services, 1959-1963; 4) business services, 1959-1971; 5) motion pictures, 1959-1974.

TABLE 2
Models of the Effect of the Change in Industry Quasi-rents per Worker on the Organization Effort Rate
(35 Industries from 1959 to 1986)

Dependent Variable
logit(Eligible to Vote in Election per Nonunion Worker)

Independent Var	(1) Mean (St.Dev.)	(2) Coeff. (t-stat)	(3) Coeff. (t-stat)	(4) Coeff. (t-stat)	(5) Coeff. (t-stat)	(6) Coeff. (t-stat)
Change in real quasi rents/worker, $000, sum of 1st 3 lags	.3462 (2.448)			.0433 (4.97)	.0409 (4.62)	
Change in real value adder/worker, $000, sum of 1st 3 lags	.3458 (2.475)					.0432 (4.97)
Change in real opp. wage, $000, sum of 1st 3 lags	-.000469 (.2578)					-.150 (1.56)
Trend (1954 = 0)		.0222 (3.68)		.0235 (3.95)		.0218 (3.54)
Recent Trend (1974=1) (=0 before 1973)		-.116 (11.6)		-.116 (11.7)		-.116 (11.8)
Change in log real GNP	0.030 (0.024)	-1.89 (2.22)		-1.499 (1.78)		-1.35 (1.58)
Industry controls		Yes	Yes	Yes	Yes	Yes
Year controls		No	Yes	No	Yes	No
Root MSE		.586	.562	.578	.555	.578
R-squared		.805	.826	.810	.830	.811
Residual Deg. Freedom		873	849	872	848	871

Notes

a. All means, standard deviations, and estimates are derived weighted by nonunion employment. All regressions include a constant.
b. Mean of dependent variable weighted by nonunion employment = -5.17 (standard deviation 1.30).
c. The overall sample size is 911 industry-years.

significantly positively related. The estimates suggest that a one thousand dollar increase in the change in quasi-rents per worker implies a 4.3 percent increase in the odds that a nonunion worker will be involved in an election. Because the weighted average organization effort rate in the sample is so low (.0119), the estimates also imply that a one thousand dollar increase in the change in quasi-rents per worker is related to a 4.3 percent increase (from 1.19 percent to 1.24 percent) in the probability that a nonunion worker will be involved in an election.

Despite the statistical significance of the change in quasi-rents in explaining the organization effort rate, results clearly show that the decline in the organization effort rate since the early 1970's cannot be explained by changes in quasi-rents. The estimates in column four show as large a negative trend after 1973 as the estimates that do not include the measure of change in quasi-rents.

The estimates in columns five and six investigate how robust the finding of a significant positive relationship between the organization effort rate and the change in quasi-rents is to variations in specification. The specification in column five uses year fixed effects in place of the three aggregate time series variables. While the more parsimonious model in column 4 can be rejected (p-value <.0001), the estimate of the coefficient of changes in real quasi-rents in virtually unchanged and is still significantly greater than zero.

The specification is column six breaks the change in quasi-rents into its two major components and allows each to have its own coefficient. The estimates are consistent with the model in that the change in real value-added per worker has a significant positive coefficient while the change in the real opportunity wage has a (marginally) significant negative effect of somewhat greater magnitude. The hypothesis that the change in

quasi-rents is the appropriate variable cannot be rejected at conventional levels (p-value=.266).

VIII. Estimation of the Unfair Labor Practice Rate Model

Table 3, which has the same structure as table 2, contains an ordinary least squares (OLS) analysis of the unfair labor practice rate. The analysis uses 966 observations on industry-years with complete data on the variables needed for the analysis. This covers some or all of the years 1958-1986 for the thirty-five industries listed in table 1.[18] The first column of the table contains means and standard deviations of the variables. The dependent variable is the natural logarithm of the unfair labor practice rate. All models include industry fixed effects, and all estimates are weighted by the number of eligible voters.

The second and third columns of the table contain benchmark estimates of the model. The model in column 2 includes the rate of change in real GNP plus a splined (at 1973) time trend. This model illustrates the steady rate of growth of the unfair labor practice rate through the early 1970's and the sharp increase since that period. The model in column 3 includes a complete set of year fixed effects in place of the three time-series variables. This model fits the data somewhat better than the more parsimonious specification in column 2 (p-value <.0001).

The model in column four introduces the level of real quasi-rents per

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[18]The year 1958 is the first year for which three lags on real quasi-rents are available given that quasi-rent data are not available prior to 1955. There were complete data from 1959 through 1986 for thirty of the thirty-five industries. Data were not available to compute the unfair labor practice rate in some early years for the other five industries. The missing observations are: 1) hotel services, 1958-1963; 2) amusement services, 1958-1963; 3) health services, 1958-1963; 4) business services, 1958-1971; 5) motion pictures, 1958-1974.

TABLE 3
Models of the Effect of the Change in Industry Quasi-rents per Worker on the Unfair Labor Practice Rate
(35 Industries from 1959 to 1986)

Dependent Variable
log(Unfair Labor Practices per Eligible Voter)

Independent Variable	(1) Mean (St.Dev.)	(2) Coeff. (t-stat)	(3) Coeff. (t-stat)	(4) Coeff. (t-stat)	(5) Coeff. (t-stat)	(6) Coeff. (t-stat)
Real quasi-rents per worker, $000, sum of 1st 3 lags	18.364 (18.890)			.0127 (5.56)	.0116 (5.22)	
Real value added per worker, $000, sum of 1st 3 lags	34.645) (19.060)					.0133 (5.80)
Real Opportunity wage, $000, sum of 1st 3 lags	16.281 (2.444)					-.126 (2.50)
Trend (1954 = 0)		.0465 (15.3)		.0408 (12.9)		.0684 (5.40)
Recent Trend (1974=1) (=0 before 1973)		.0579 (9.29)		.0569 (9.27)		.00880 (0.396)
Change in log real GNP	0.30 (0.023)	.972 (1.84)		1.03 (1.97)		.642 (1.17)
Industry controls		Yes	Yes	Yes	Yes	Yes
Year controls		No	Yes	No	Yes	No
Root MSE		.371	.355	.365	.350	.364
R-squared		.808	.830	.815	.835	.816
Residual Deg. Freedom		928	903	927	902	926

Notes

a. All means, standard deviations, and estimates are derived weighted by the number of eligible voters. All regressions include a constant.
b. Mean of dependent variable weighted by the number of eligible voters = -3.78 (standard deviation 0.831).
c. The overall sample size is 966 industry-years.

worker. There is a significant positive relation between real quasi-rents and employer resistance as measured by the unfair labor practice rate. The estimates suggest that a one thousand dollar increase in real quasi-rents per worker implies a 1.27 percent increase in the number of unfair labor practices per eligible voter. At the mean of the sample (3.3 unfair labor practice charges per 100 eligible voters), a one thousand dollar increase in quasi-rents per worker implies approximately an additional one unfair labor practice per 1000 eligible voters.

Once again, despite the statistical significance of quasi-rents in explaining the unfair labor practice rate, the results clearly show that neither the steady increase in the unfair labor practice rate throughout the sample nor the sharp increase since the early 1970's can be explained by quasi-rents. The estimates in column four show as large a positive trend both before and after 1973 as the estimates that do not include the measure quasi-rents.

The estimates in columns five and six investigate how robust the finding of a significant positive relation between the unfair labor practice rate and real quasi-rents is to variations in specification. The specification in column five uses year fixed effects in place of the three aggregate time series variables. While the more parsimonious model in column 4 can be rejected (p-value $<.0001$), the estimate of the coefficient of changes in real quasi-rents falls only slightly and is still significantly greater than zero.

The specification is column six breaks the change in quasi-rents into its two major components and allows each to have its own coefficient. The estimates are consistent with the model in that the real value-added per worker has a significant positive coefficient and the real opportunity wage has a significantly negative effect. The hypothesis that real quasi-rents is

the appropriate variable can be rejected at conventional levels (p-value=.025). This is due to the finding that the negative coefficient of the real opportunity wage is significantly larger than the positive coefficient of real value-added per worker. The point estimates suggest (1) that a one thousand increase in real value-added per worker implies a 1.3 percent increase in unfair labor practices per eligible voter while (2) the same one thousand dollar increase in the real (annual) opportunity wage implies an approximately 13 percent decrease in unfair labor practices per eligible voter.

One interpretation of our finding is that quasi-rents matter in the determination of employer resistance, but there is a negative relationship between the opportunity wage of the workers and employer resistance even after accounting for quasi-rents. This suggests that employers resist unionization by low skilled workers more than unionization by high skilled workers. This may be because resistance is more effective among low skilled workers or unionization is more costly (in terms of the rents extracted) among low skilled workers.

IX. Concluding Remarks

The evidence presented here is consistent with the view that changes in the total quasi-rents per worker in an industry play an important role in unions' decisions regarding organizing activity. When quasi-rents per worker increase, unions want to increase the extent of unionization, and the result is more organizing activity.

We also find a significant positive relationship between the level of quasi-rents per worker and employer resistance in the form of unfair labor practices. The theory we developed was ambiguous on this point, and the finding of a positive relationship also makes the theory ambiguous with

regard to how union organizing activity is related to quasi-rents. Nonetheless, as an empirical matter, we find positive relationships between quasi-rents and both union organizing activity and employer resistance.

Although the results are in accord with our model--quasi-rents are an important determinant of union organizing activity and employer resistance--the results are also disappointing because changes in the quasi-rents available to split between workers and firms do not seem to account for more than a small part of (1) the decline of union organizing activity since the mid 1970's or (2) the dramatic increase in employer resistance to unionization since the mid-1970's. A complete understanding of the decline of unionization in the United States lies elsewhere.

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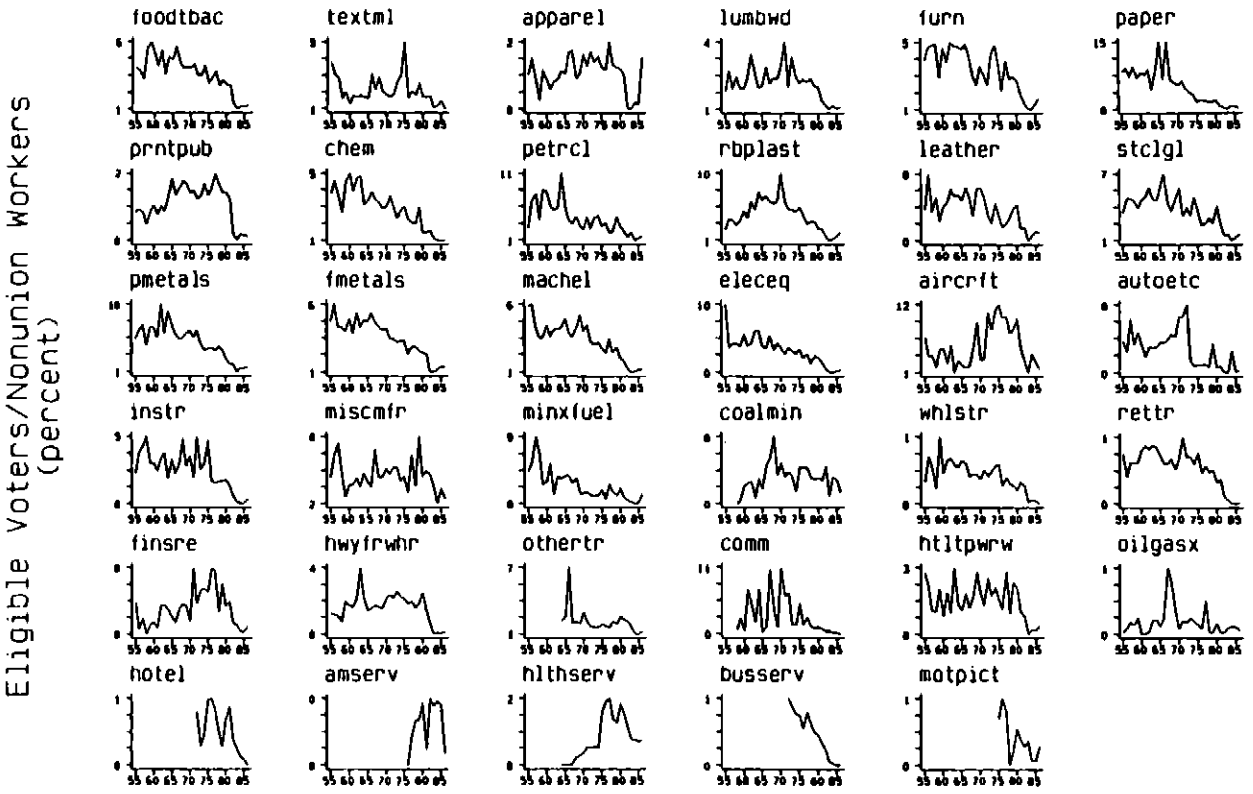
Figure 1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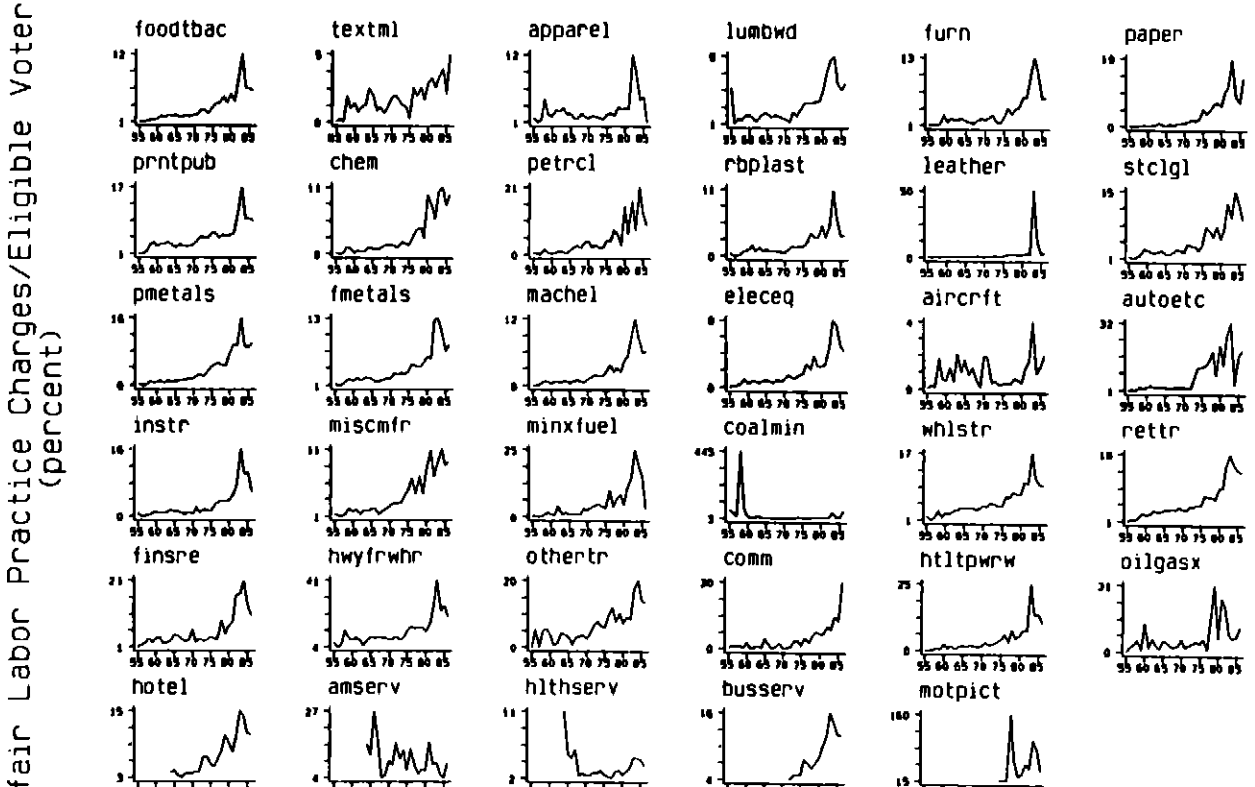
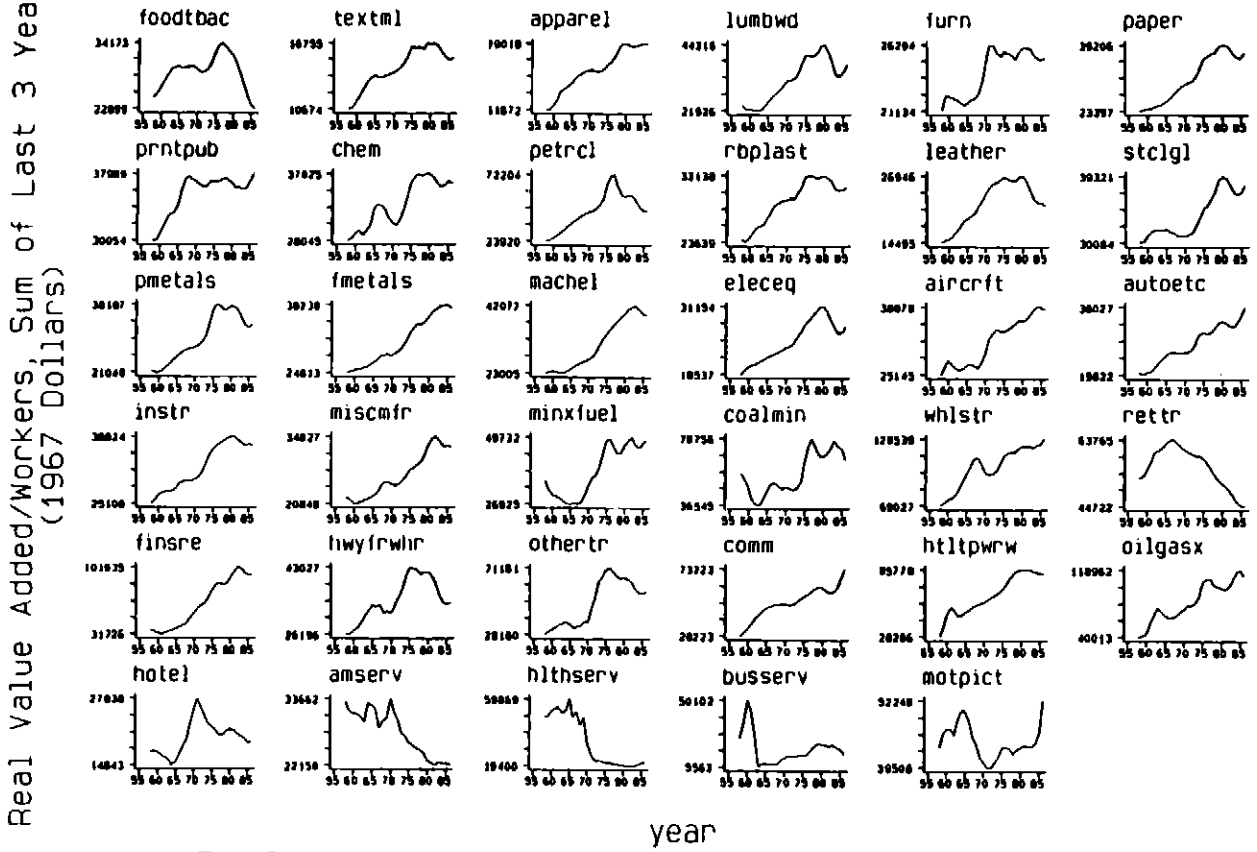
Eligible Voters/Nonunion Workers (percent)
year
Organization Effort Rate by Industry

Figure 2



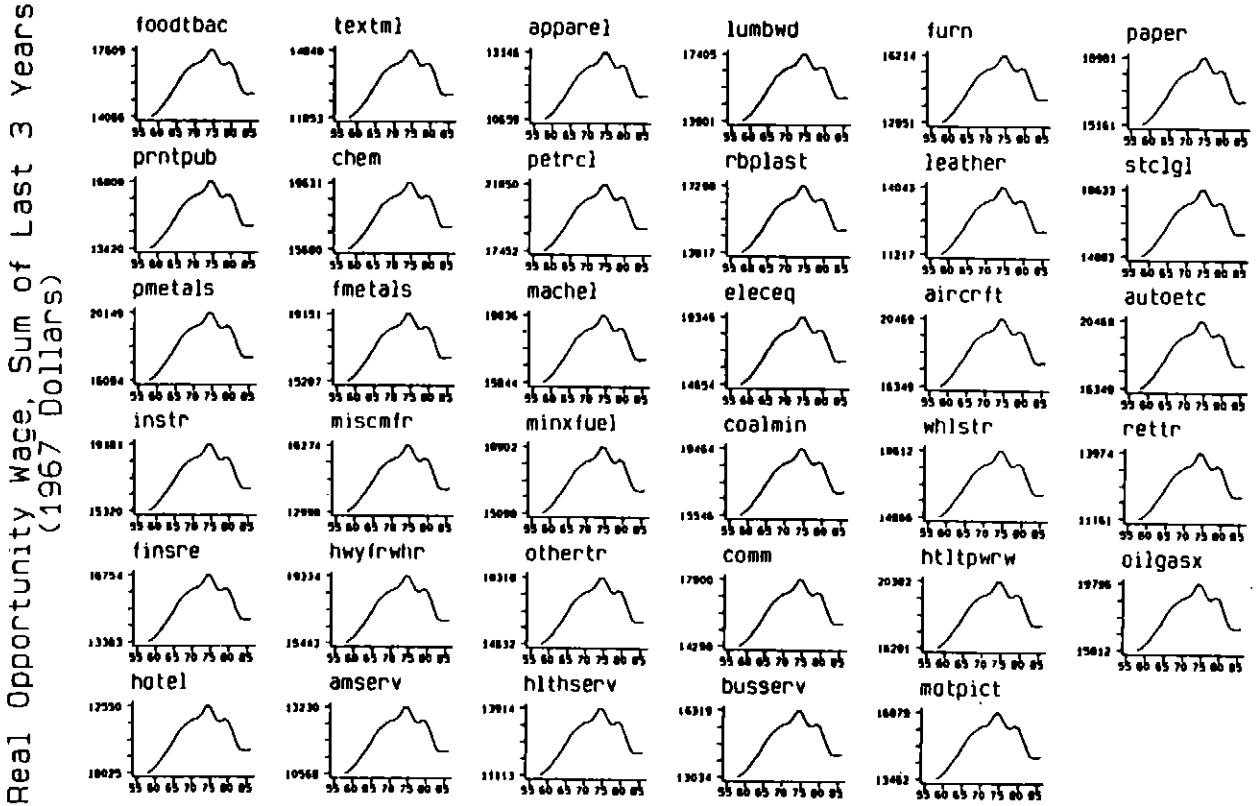
Unfair Labor Practice Rate by Industry

Figure 3



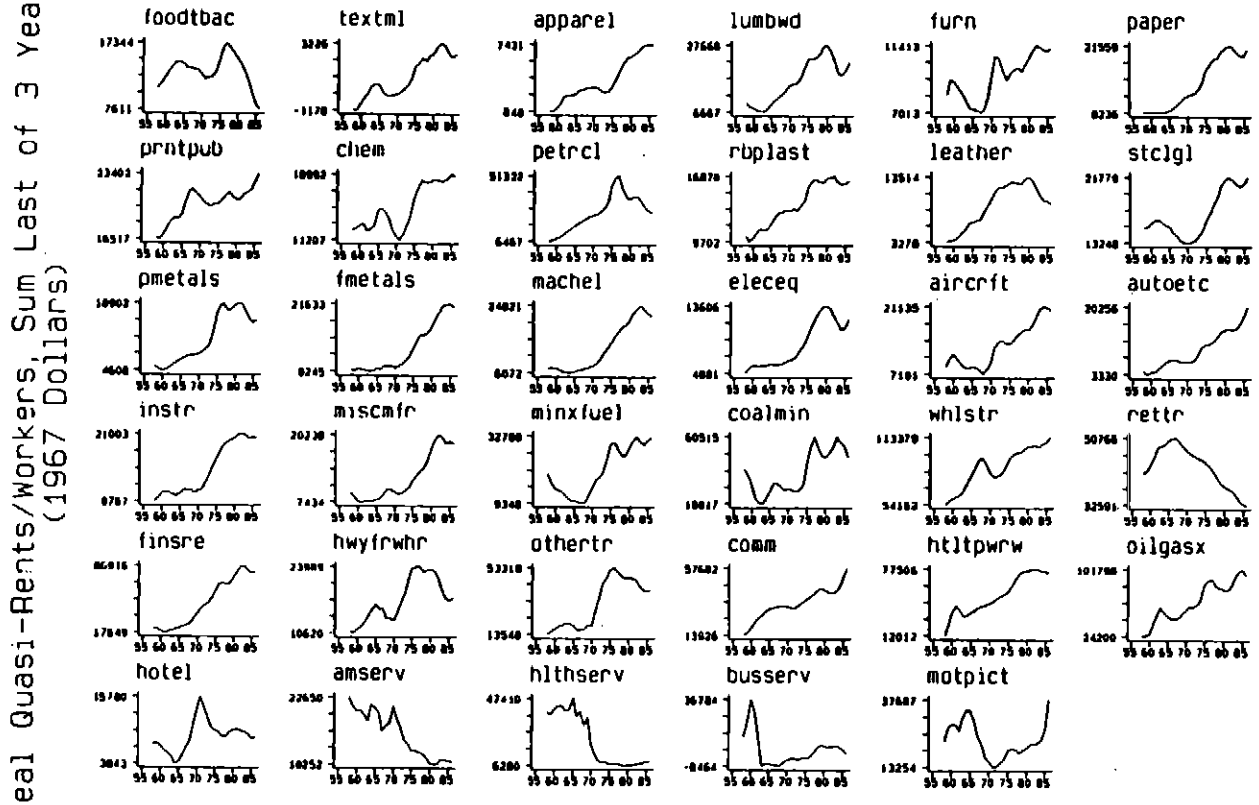
Real Value Added per Worker by Industry

Figure 4



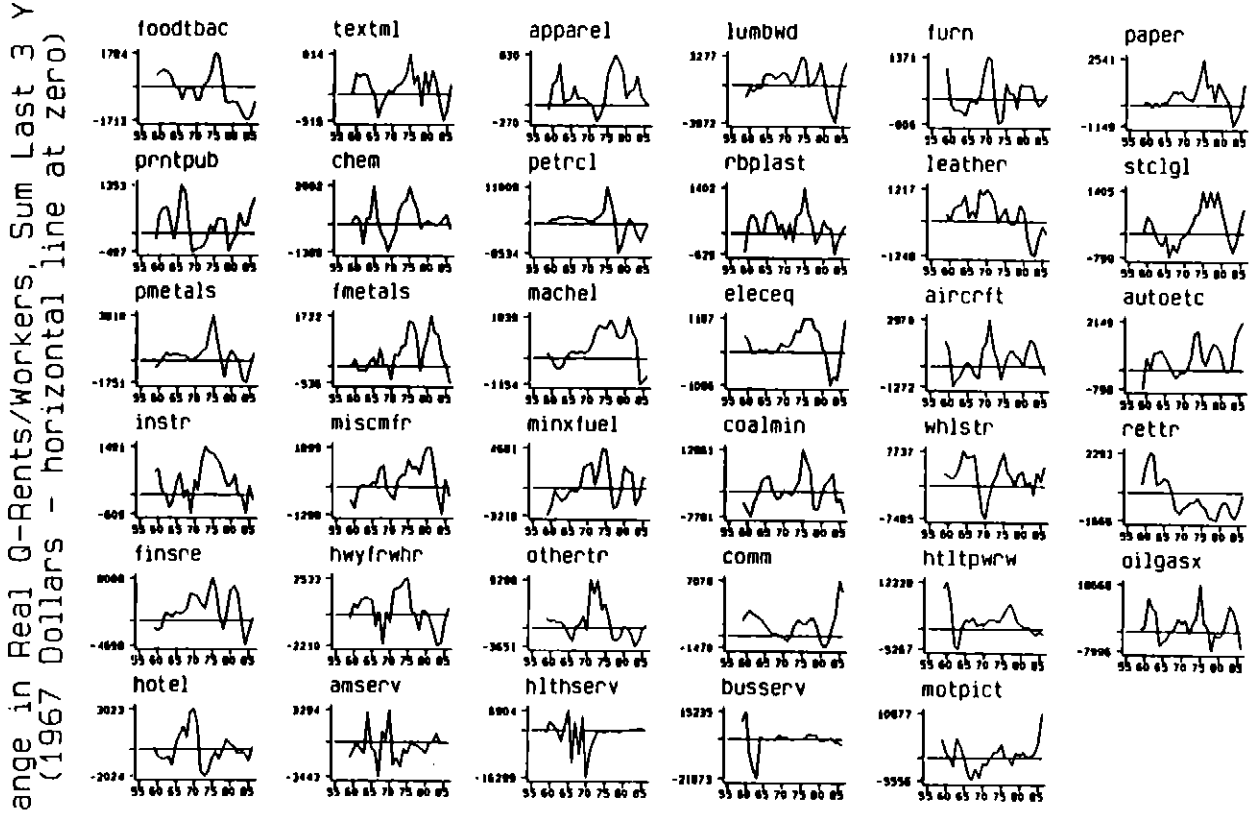
Real Opportunity Wage by Industry

Figure 5



Real Quasi-Rents per Worker by Industry

Figure 6



Change in Real Quasi-Rents per Worker by Industry