The Economic Performance of Different Bargaining Institutions: A Survey of the Theoretical Literature

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1. Introduction

Until the 1970s, the effects of the structure of union organization and collective bargaining on economic performance attracted little attention outside of the field of industrial relations. While researchers puzzled over why some countries had higher rates of industrial conflict than others, or why union cooperation with voluntary incomes policies seemed easily achieved in some countries and impossible elsewhere, there were relatively few attempts to connect differences in labor market institutions with differences in aggregate economic performance (1). The reason was simple. In the halcyon days of the 1960s, there was little variation in economic performance to explain among advanced industrial societies. Full employment and real wage growth was achieved throughout Western Europe. From an economic point of view, the differences between the institutions of wage setting of different countries seemed relatively unimportant.

In the past two decades, the comparative study of wage setting practices and institutions in advanced industrial societies has become a growth industry within the disciplines of economics, political science and sociology. This increased attention to cross-national variations in labor market institutions reflects both the general decline and the greater variance of macroeconomic performance since the mid 1970s. In particular, a remarkable divergence between members of the European Community (EC) and members of the European Free Trade Association (EFTA) appeared. While average unemployment in the nine EC members since 1973 rose in two jumps, first to over 6 per cent in 1973–75 and then to

over 10 per cent in 1980–82, average unemployment in the five EFTA countries remained below 3.5 per cent throughout the 1970s and 1980s. Only in the recession that began in 1991 has unemployment in many of the EFTA countries reached levels similar to the rest of Western Europe.

According to conventional wisdom, the combination of rising oil prices, increased competition from the rapidly growing economies in the Pacific, and the slowdown in productivity growth all combined to reduce the scope for real wage increases. In countries with rigid nominal wages (a category that was often claimed to include the US and Canada), an increase in inflation was required before real wages could fall and employment increase again. In countries with rigid real wages (a category that was perceived to include many members of the EC), nothing would help other than a weakening of the unions.

Yet, it is unsatisfactory from an intellectual point of view and unhelpful from a policy point of view to simply label the problem as rigid wages. The wage level should be an endogenous variable in economic analysis. The failure of wages to fall sufficiently to maintain full employment requires explanation, a task that focuses attention on the mechanisms of wage-setting. Moreover, the existence of European countries with generally strong and often highly centralized unions that maintained virtually full employment during most of the period suggested that institutional features of collective bargaining might have important macroeconomic consequences.

The question of the comparative performance of different systems of wage formation proved to be highly controversial, in part because the debate is highly political. On one side, social democratic governments and trade unions encouraged the explicit coordination of wage setting across different industries and firms in the belief that economic growth is best achieved through cooperation and bargaining among highly centralized organizations of unions and employers. Social democrats argued that the benefits of wage moderation are public goods to an important extent. The wages received by the members of any singly union, it is claimed, have only a small effect on the aggregate wage level. Individual unions therefore rationally ignore the effects of their wage demands on macroeconomic performance. If the unions can be induced to negotiate jointly, however, the wage agreement affects wages throughout the economy with visible macroeconomic consequences. Thus, the centralization of wage setting may prevent individual unions from aggressively seeking to improve their own members' wages at the expense of workers who belong to other unions (or who belong to no union at all).

On the other side, conservative governments and employers' associations responded that labor markets require competition and wage flexibility, rather than coordination, if they are to function smoothly. Centralized wage setting, it is claimed, reduces the sensitivity of wages to conditions in the local labor market. In addition, employers have charged that centralized bargaining inhibits microeconomic adjustment by reducing their ability to use wage differentials to encourage workers to ob-

tain new skills and to accept new responsibilities. While social democrats view coordinated wage setting as cooperative behavior aimed at attaining the public goods of low inflation and full employment, conservative parties perceive the same institutions as collusive practices whose real purpose is to protect the unions' monopolistic position in the labor market.

Each side of this debate can point to empirical studies supporting its claims. The social democratic belief in the advantages of centralized or coordinated wage setting has been upheld in a large number of studies. McCallum (1983, 1986), Crouch (1985), Bruno and Sachs (1985), Bean, Layard and Nickell (1986), Tarantelli (1986), Newell and Symons (1987), Jackman (1990), Jackman, Pissarides and Savouri (1990), Soskice (1990) and Layard, Nickell and Jackman (1991) are just some of the empirical studies that have found evidence associating centralized or corporatist bargaining institutions with real and/or nominal wage restraint and superior macroeconomic performance.

Yet, those who believe in the benefits of greater decentralization and competition in the labor market can find at least partial support for their views as well. Calmfors and Driffill (1988) and Freeman (1988) present evidence that the relationship between centralization and economic performance is hump-shaped rather than monotonic. Both studies conclude that countries with both very decentralized wage setting and highly centralized wage setting achieve reasonably low levels of unemployment. The countries that experienced the worst unemployment, according to the hump-shaped hypothesis, are those with partially centralized wage-setting institutions. In a similar vein, Lange and Garrett (1985), Garrett and Lange (1986), Hicks (1988) and Alvarez, Garrett and Lange (1991) find that countries with decentralized unions and conservative governments, as well as countries with centralized unions and social democratic governments, have done relatively better than countries with one but not the other. Finally, there is the argument of revealed preference. Why, it might be asked, if centralized wage setting leads to greater wage moderation, are employers in many countries vigorously promoting greater decentralization of bargaining?

Given the small number of cases and the large number of factors that plausibly affect economic performance, the credibility of empirical evidence on the advantages or disadvantages of different wage setting institutions depends on the strength of the theory explaining the results. In this paper, we concentrate on what economic theory has contributed to the debate. Our purpose is to review the theoretical literature on the impact of different systems of collective bargaining on wages, unemployment and growth in a non-technical fashion (2). Although we follow the literature in organizing our discussion around the comparison of centralized and decentralized systems of wage-setting, it will become clear that this dichotomy is too simple to capture many important differences between countries. Centralization is a multidimensional concept, a fact that is just beginning to be acknowledged in theoretical and empirical work.

The structure of bargaining might influence economic performance by affecting the union's wage demands. This we discuss in Section 2. In Section 3, we briefly examine the other side and review how the level of bargaining may alter the optimal wage from the employers' point of view. Alternatively, the structure of bargaining may influence economic outcomes by altering the relationship between given wage demands and decisions regarding the pace of work, employment and investment. This is the topic of Section 4. Section 5 concludes the paper.

2. The Level of Bargaining and Union Wage Aspirations

The simplest framework for analyzing the effect of wage-setting institutions on wages and employment is to consider what would happen if unions could set wages unilaterally. Of course, neither unions nor employers get everything they want in collective bargaining. Yet, it is reasonable to suppose (and easy to capture in a model) that there is a straightforward relationship between the militancy of the unions' wage demands and the final wage settlements. For the purpose of examining the determinants of the unions' preferences over wage increases and other goals such as employment growth, the assumption that the union chooses the wage is a useful simplification.

There are two ways to capture the trade-off unions would continue to face if they were free to set wages as they choose. The approach followed by most authors is to assume that employers retain the choice over employment. In this framework, the union first sets the wage and employers subsequently adjust employment to its profit-maximizing level. Thus, the constraint faced by the union is given by the firms' demand for labor curve.

An alternative approach is to assume that the union chooses both the wage and the level of employment, subject to the constraint that profits must be sufficient for the firm to stay in operation (3). However, labor contracts rarely include specific employment levels, perhaps because firms have superior information regarding the demand for the firm's output. In theory, the union could induce firms to employ more workers than the firm would like at the prevailing wage by specifying manning requirements in the labor agreement. In practice, agreements covering manning requirements cannot be negotiated at the national level. Indeed, work rules must be negotiated at the plant level unless the industry is unusually homogeneous. Thus one way that decentralized bargaining can differ from centralized bargaining is in the scope of the labor agreement.

We return to this topic in section 4. Initially, however, we hold the coverage of union contracts constant in order to illuminate other differences among bargaining levels. Thus we assume throughout the following two sections that firms choose the level of employment unilaterally, whether the contract is negotiated locally or nationally.

The basic model of the unions' wage aspirations, as presented by Oswald (1985) for example, goes as follows. Suppose union leaders accurately represent the interests of their members in collective bargaining and that union members are concerned with the real consumer wage, w/q (the nominal wage w deflated by the consumer price index q) and employment L (4). Assume, in addition, that there is a fixed number of firms in the economy, each with the same labor demand function $L\,(w/p)$ where w/p is the real product price (the wage deflated by the cost of output p) with $L'\,(w/p) < 0$. The union's problem, then, is to choose the wage rate w that maximizes some function

$$u\,(w/q,\ L) \text{ with } \frac{\partial u}{\partial\,(w/q)} > 0 \text{ and } \frac{\partial u}{\partial L} > 0 \qquad [1]$$

subject to the constraint that $L = L\,(w/p)$.

Consider the simplest possible case where workers are homogeneous and product prices are exogenous, i. e. given by the world market. If we choose units such that the price of output for all firms is the same, then $p = q$. Then the union's optimal wage is given by the condition that the union members' marginal rate of substitution between real wages and employment is equal to the marginal loss of employment produced by an increase in the real wage, or

$$\frac{\partial u/\partial\,(w/q)}{\partial u/\partial L} = -L'\,(w/p). \qquad [2]$$

If the firms are assumed to be identical and prices are assumed to be exogenous, the labor demand function reflects the trade-off between wages and employment for the aggregate economy as well as any subsector of the economy. Under these circumstances, the unions' optimal wage demand is independent of the degree of centralization.

2.1. Endogenous Product Prices

The assumption that wages have no effect on product prices may be accurate for many industries in small open economies, but not for all. Where wage increases are passed on to prices to some extent, the impact of a wage increase on the real consumer wage (which union members care about) and on the real product wage (which determines the level of employment chosen by profit-maximizing firms) may diverge, depending on the level of bargaining.

To analyze the case with endogenous prices in the simplest possible setting, consider a closed economy in which each product price can be written in reduced form as a function of the wages throughout the economy: $p = p\,(w, w^*)$ where w is the wage in the same industry and w^* is

the wage (or vector of wages) in other industries. We denote the elasticity of the price with respect to wage in the same industry by $\eta \equiv (\partial p/\partial w)\ (w/p)$ where $0 \leq \eta < 1$. Let the elasticity of the price with respect to wages in other industries be $\eta^* \equiv (\partial p/\partial w^*)\ (w^*/p)$ with $\eta^* \leq \eta$. While η must be greater than or equal to zero, η^* may be either positive or negative depending on whether the goods produced in other sectors are substitutes or complements. In addition, let the elasticity of the consumer price index with respect to each product price be denoted by $\theta \equiv (\partial q/\partial p)\ (q/p)$ with $0 < \theta \leq 1$. Now, the solution to the union's maximization problem is given by the condition that its marginal rate of substitution between higher wages and higher employment is equal to a fraction of the marginal loss of employment:

$$\frac{\partial u/\partial\ (w/q)}{\partial u/\partial L} = -hL'\ (w/p) \qquad [3]$$

where

$$h = \frac{1-\eta}{1-(\theta\eta + [1-\theta]\eta^*)} \leq 1.$$

Observe that the fraction h is the ratio of two elasticities. The numerator is the elasticity of the real product wage with respect to the nominal wage chosen by the union. The denominator is the corresponding elasticity of the real consumer wage. If the two elasticities are the same, then $h = 1$ and the wage implied by equation [3] is the same as the wage implied by equation [2]. If the elasticity of the real consumer wage is greater than the elasticity of the real product wage, however, then $h < 1$ and the union gives less weight to employment loss than it would if prices were exogenous. Thus, the lower is h, the higher the union's preferred wage.

The weight given to employment loss, h, may be a non-monotonic function of the level at which wages are set. Consider, first, the case with perfectly competitive firms. If wages are set at the plant or firm level, the wage in any single unit has a negligible effect on product prices, or $\eta = \eta^* = 0$ which implies that $h = 1$. With firm-level bargaining in a competitive product market, prices are exogenous from the bargainers' point of view.

To consider the opposite end of the spectrum, suppose wages are set at the national level. Then all prices will increase as the wage increases and $\theta = 1$ which again implies that $h = 1$. With fully centralized bargaining, as with firm-level bargaining, both the real consumer wage and the real product wage will be increased in the same proportion. The trade-off between a higher real consumer wage and employment remains the same. Thus, the unions' optimal wage with national-level bargaining is identical to the unions' optimal wage with local bargaining. In both cases, the unions bear the full consequences of a higher nominal wage.

If wages are set at the level of an industry, however, then $\eta > \eta^*$ and $\theta < 1$ which implies that $h < 1$. In this case, each union knows that an increase in its nominal wage will increase its product price to a greater extent than it will raise the cost of living. The union is less sensitive to employment loss than with either purely local wage setting or fully centralized wage setting.

The important difference here between different degrees of centralization is the ability of each union to increase its real consumption wage without an equivalent increase in the real product wage in its sector. At intermediate levels of centralization, each union is able to pass some of the cost of a wage increase on to others through a higher product price, rather than bearing all of the cost itself in the form of lower employment.

Since the cost of a wage increase is reduced at intermediate levels of centralization, unions choose higher wages. However, one union's product price increase is another union's consumer price increase. When all unions raise nominal wages, all prices rise and the result is higher real wages (whether in terms of the price of output or of consumption) and lower employment than would result from either purely local bargaining or wage bargaining that was centralized at the national level. The central result is that the relationship between wages and bargaining level is hump-shaped with both very decentralized and highly centralized bargaining systems producing greater wage restraint and lower unemployment than bargaining systems in between (5).

According to the model presented so far, either extreme of very decentralized or completely centralized wage setting is equally good. If the assumption of a completely closed economy is relaxed, however, then even perfectly centralized bargaining produces less wage restraint than local bargaining (6). The reason is that the purest form of centralization within national borders is still incomplete in an open economy. A wage increase in all sectors of an open economy can raise the real exchange rate (i. e., the relative price of non-traded goods) thereby raising the real consumer wage more than the real product wage in the non-traded goods sector. This dampens the employment loss that results from a wage increase at the national level. In an open economy, purely local bargaining results in lower wage demands than complete centralization.

In contrast, if the assumption of perfect competition is relaxed, then highly centralized bargaining produces greater wage restraint than purely local bargaining. If individual firms have market power, then increased wage costs will be passed on to prices to some extent even with firm-level bargaining (7). Thus, in open economies in which some firms are imperfectly competitive, the ranking of local and national bargaining in terms of wage militancy is no longer clear. What remains is the conclusion that unions' wage demands are highest at the level of wage setting that corresponds to the level of maximum divergence between the effect of a wage increase on the real consumer wage-which the union wants to increase-and on the real product wage-which the union wants to prevent from rising.

2.2. Heterogeneous Workers

A second way in which the simple model is unrealistic is in the assumption that each product is made with the labor of a single union. Final products, in general, depend on many different types of labor that are often represented by different unions. In many countries, firms may negotiate with more than one union. This is particularly true in industries and countries where blue-collar workers are organized in craft unions or in competing industrial unions. In large metalworking firms in Britain, for example, it is not unusual for the labor force to be represented by 15–20 unions (8). Even in countries like Norway and Sweden where noncompeting industrial unions are the rule, there are separate unions for blue-collar, white-collar and professional workers.

In addition, firms depend on the labor of workers they do not directly employ. Payments for goods and services bought from other domestic producers may comprise a substantial part of a firm's production costs. The manufacturing sector depends on the outputs of workers in utilities and transportation. The cost of new investment depends on the price of capital goods and new construction. The cost of government services depends on wages in the public sector. According to the comment by Nickell (9), labor costs average only 20 per cent of revenues at the firm level in Great Britain yet wages and salaries constitute 70 per cent of value added at the national level.

When products are produced by workers divided into multiple unions, one union's wage affects other unions' wage and employment possibilities (10). In this case, the unions' wage demands depend on the level of centralization even when final product prices are fixed in world markets. Suppose, for example, that there are k unions whose labor is used in the production of a final good. The interdependence of the k unions can be represented by letting the demand for labor for each union be a function of all k wages (11): $L_i = L_i\,(w_1, \ldots w_k)$. We will assume that the unions have identical preferences and face identical demand curves for their labor. If the k unions act independently, each union will choose the wage given by the condition

$$\frac{\partial u_i/\partial w_i}{\partial u_i/\partial L_i} = -\frac{\partial L_i}{\partial w_i}. \qquad [4]$$

In contrast, a union confederation that maximized some welfare function $V\,(u_1, \ldots, u_k)$ and treated its affiliates equally in the sense that $\partial V/\partial u_i = \partial V/\partial u_j$ would choose the wage given by the condition that (12)

$$\frac{\partial u_i/\partial w_i}{\partial u_i/\partial L_i} = -\sum_{j=1}^{k} \frac{\partial L_i}{\partial w_i}. \qquad [5]$$

While the individual union leadership only considers the impact of a wage increase on the employment of its members, the central leadership takes into account the impact of a wage increase on the employment of all categories of workers within the confederation who are affected.

It is obvious from equation [5] that the difference between centralized wage setting and decentralized wage setting depends on the sign of $\Sigma \partial L_j/\partial w_i$ for all $j \neq i$. If $(\partial L_j/\partial w_j) > 0$, the two unions are *substitutes* in production. A higher wage for union i increases the demand for labor of members of union j. An example would be members of local unions in plants producing similar goods. A wage increase in one plant would induce employers to shift production to the lower cost plants. A centralized wage setter that internalized this benefit would want to raise wages above the decentralized equilibrium.

If, in contrast, $(\partial L_j/\partial w_j) < 0$, the two unions are *complements* in production. The two unions are supplying complementary labor in the sense that the productivity of each is enhanced by the presence of the other. An example might be blue-collar and white-collar unions within the same industry, or unions located at different stages of a common process of production. In this case, one union's wage increase reduces the demand for the labor supplied by other unions. Under these circumstances, centralized wage setting would reduce wage demands below the equilibrium wage demanded by unions acting independently.

One can view this model as another way to derive the hump-shaped hypothesis of the previous section. The centralization of plant-level unions into industry-level unions is likely to entail the joining of substitutes, thus leading to more militant wage demands. The centralization of industrial unions into a national confederation is more likely to entail the amalgamation of complements, which results in less militant wage demands.

A more important implication of the model with heterogeneous workers is to highlight a different dimension of centralization. There are, at least, two dimensions of centralization that ought to be distinguished in empirical work but seldom are. The first dimension is whether wages are set at the level of the plant, enterprise, industry or nation. The second dimension is whether workers in different types of jobs bargain jointly or separately. Putting the two together, one obtains something like Table 1. As one moves vertically down the table, the relationship between wage demands and centralization is likely to be hump-shaped according to both the model with endogenous final prices and the model with different types of labor. But as one moves horizontally across the table, the relationship between the militancy of wage demands and centralization is monotonically declining as workers in different types of jobs are typically complements in production.

Table 1:

Dimension of Centralization

Level of Wage Setting	Each Type Bargains Separately	All Types Bargain Jointly
Plant	Complete Decentralization	
Enterprise		Company Unions
Industry	Craft Unions	Industrial Unions
Nation		Complete Centralization

2.3. The Insider-Outsider-Model

Let us return to the union's objectives, as formulated in equation [1]. Unions' concerns for higher wages and higher employment may not be as symmetrical as equation [1] implies. It is clear that union members would always like a higher wage, holding other things constant. It is not equally clear that union members always care about the level of employment. Union officials may care about total union membership, which depends on total employment, but union members care about employment security. When employment is shrinking and union members are threatened with layoffs, concern with employment security implies a concern with the level of employment. But when the demand for labor is greater than or equal to union membership, an expansion of employment will only help outsiders. Thus, one might presume that unions do not really care much about employment except when employment threatens to fall below the level of current union membership.

The line between insiders and outsiders, however, may depend on the level of bargaining. For the local union, the distinction seems clear. Insiders are current members of the local union. If, after some time, unemployed union members leave the local and new employees do not join the local immediately (or are not considered full members by the union at first), then the local's current membership is given by past employment in the plant. When this is the case there is hysteresis in unemployment: the current equilibrium unemployment level depends on the past level of unemployment (13). An unforeseen decline in demand that causes layoffs reduces union membership and thus reduces the threshold employment level above which the union only cares about wages. An un-

foreseen increase in demand has the opposite effect of increasing union membership and raising the unions' sensitivity to unemployment.

The distinction between insiders and outsiders is less clear at the national level. According to Hersoug, Kjær and Rødseth (1986), the central Norwegian trade union confederation (LO) has no statistics on unemployed members and no way of deriving such statistics from official sources. Thus it is the national unemployment rate that enters in the LO's calculations of the employment consequences of its wage demands.

More generally, we can distinguish between the current union membership, older workers who have not been employed in the recent periods and new workers who have just entered the work force. Union leaders at the local level are elected, in most countries, by employed union members. Electoral considerations pressure local leaders to represent the current union membership alone. In the Nordic countries, in contrast, the national union confederations care equally about unemployment among members and non-members, if only because the central confederations cannot distinguish between the two groups. The central confederations also seem to care, to a lesser extent, about new entrants in the labor market, perhaps because of the political ties between the leadership of the blue-collar union confederations and the social democratic party. Thus centralized bargainers appear to have a broader definition of insiders than local bargainers. A broader definition of insiders, in turn, leads directly to a greater willingness to reduce wage demands for greater employment.

2.4. Other Externalities

There are a number of other externalities in the wage setting process that might induce a central wage setter to choose differently than decentralized wage setters. For example, union members may care about relative wages. It is standard practice to assume that union members only care about their consumption possibilities as determined by their real consumer wage and their security of employment. Yet observers of industrial relations have long claimed that workers care about wage differentials as well as wage levels. Workers may strive for status as well as income, and status may depend on relative income (14). Or workers may be concerned with notions of fairness that are derived from comparisons with what others are paid (15).

Suppose, for whatever reason, that union members care about how much they are paid relative to other workers in addition to the standard concerns with wage levels and employment security. If all unions try to increase their wage relative to the wage of others, none will change position provided their relative bargaining strength has not changed. Wages will increase, however, and unemployment will rise. According to this reasoning, centralized wage setting reduces wages by inhibiting the fruitless struggle of each group to raise its wage more than the others.

In addition, there are externalities associated with unemployment. Every job searcher reduces the likelihood that other job seekers will find work (16). Every increase in unemployment results in higher present or future taxes to pay for the increased government expenditures on unemployment benefits (17). In either case the relationship between wages and aggregate unemployment constitutes an externality in wage-setting that may be internalized or not depending on the level at which wages are set. With local wage setting, the marginal effect of a higher wage on aggregate employment is close to zero and there is no internalization of the external effect. As the coverage of the labor agreement expands, however, the effect of a higher wage on aggregate unemployment is no longer small.

The externality in wage setting may also be political. Union members might care about the party in power to the extent that social democratic governments are more likely than bourgeois governments to adopt policies that favor union members. Union leaders may care about the party in power because they have close personal links with the social democratic party leadership. According to this argument, it is the government, not the unions, that takes responsibility for aggregate unemployment. The unions, however, care about the survival of a pro-union government. In this case, centralized wage setting reduces wage demands relative to decentralized wage setting under social democratic governments but not under bourgeois governments, as argued by Lange and Garrett (1985), Garrett and Lange (1986), Hicks (1988) and Alvarez, Garrett and Lange (1991).

In fact, most of the arguments in this section can be put in terms of externalities in wage setting. Subsection 2.1. concerned the externality that stems from the effect of wage increases on consumer prices. In subsection 2.2. we examined the externality due to the mutual dependence of different types of labor in production. In subsection 2.3., we have discussed the externalities that arise from relative wage concerns, job search, the financing of unemployment benefits and the desire to aid pro-labor governments. Of course, it is unrealistic to think that a centralized union confederation has the capacity to accurately assess all of the externalities in wage setting and choose the optimal national wage scale. If all of the externalities point in the same direction, however, centralized union negotiators may be satisfied with lower wage levels than would be the outcome of decentralized wage setting.

3. Wage-Setting by Employers

So far, our attention has been focused exclusively on the unions' wage demands. The implicit assumption in most of the literature is that employers only benefit from centralized wage setting to the extent that centralization moderates union wage demands. If unions lost their influence over wages, it is usually thought that all rationales for centralized wa-

ge setting disappear. Recent work, however, on decentralized and centralized wage setting incorporating the effect of wages on productivity by Rødseth (1990) suggests that the centralization of wage setting might reduce wage levels and increase employment even if wages were unilaterally set by employers instead of unions.

The basic premise of a wide class of efficiency wage models is that workers' efficiency is a positive function of their wage relative to wages and employment possibilities elsewhere. There are many possible reasons why effort might depend on wage level (18). For example, a higher relative wage might lower turnover and thus reduce the costs associated with finding and training new workers (19). Or a higher relative wage increases the loss associated with being fired and thus may reduce shirking on the job (20). In each case, what matters for workers' productivity is the difference between the worker's current wage and what the worker would receive if he or she quit or was fired. The greater the differential between a worker's current wage and what could be earned elsewhere, the less likely the worker is to quit or shirk on the job. What a worker could earn elsewhere depends, in turn, on wages elsewhere in the economy as well as the aggregate rate of unemployment and possibly the unemployment benefit.

Workers' outside opportunities are exogenous from the point of view of each employer. Thus each individual employer may attempt to pay more than the others. If productivity goes up sufficiently as the relative wage increases, a unilateral wage increase is profitable. As each employer tries to raise wages relative to others, none succeed but the aggregate wage level and rate of unemployment both go up.

With centralized wage setting, all wages must be raised together. Thus each firm is prevented from trying to raise its wages above those paid by other employers. At the same time, a national employers' confederation might take into account the negative effect of lower unemployment on productivity. As Kalecki (1943) argued, employers benefit from higher unemployment to the extent that it increases the „threat of the sack". Nevertheless, Rødseth (1990) and Moene, Wallerstein and Hoel (1993) show that a centralized employers' confederation would choose a lower wage than would be chosen by each employer acting independently. The direct gain to employers of avoiding the attempt by each to raise wages above wages elsewhere outweighs the indirect loss of decreased discipline due to lower unemployment. As a result, total profits increase with centralization.

Again, the basic cause of the divergence between centralized and decentralized wage setting is the existence of an externality that centralized wage setters can internalize. In this case, the wage setter is assumed to be the firm and the externality is the negative effect of one employer's wage increases on the productivity of employees in other firms. Yet the basic argument is the same. Centralized employers may be less willing to accept wage increases while centralized unions are more willing to accept wage restraint.

4. Bargaining over Wages

In reality, it is rare for either unions or employers of unionized workers to set wages unilaterally. The labor contract is the result of a bargaining process in which the two sides must reach an agreement. In the two previous sections we studied the effect of different levels of bargaining on the optimal wage from the point of view of both sides. In contrast, the next section is devoted to exploring the impact of the bargaining level on the relationship between the wage agreement and other economic decisions, holding the bargaining goals of both sides constant. To keep our exposition as clear as possible, we will assume in this section that the union only cares about the welfare of employed union members. As we will show, the level of bargaining has important consequences that are independent of the unions' willingness to exchange lower wages for higher employment.

The basic problem in collective bargaining is how the quasi-rents that are inherent in the employment relationship should be divided between workers and employers. Quasi-rents exist even in the absence of unions. Since hiring and training workers is costly for employers and searching for another job is costly for workers, both parties are typically receiving benefits from the employment relationship that exceed their next best offer (21). Unionization may increase the quasi-rents, and thus the importance of bargaining, by increasing the cost to employers of failing to reach an agreement.

The basic bargaining model begins by specifying the payoffs to the two sides in the event of an agreement and in the event of conflict. Consider first bargaining at the local level. Let $R\ (e, L, K)$ be the revenue earned by the firm when the plant is in operation, which is a positive function of workers' effort e, employment L, and physical capital K. Let w be the wage as before, and let $C\ (K)$ be the firm's fixed capital costs. Assuming that the plant is shut down in the event of a conflict, and that the firm receives no strike benefits from the employers' association, the payoffs to the firm can be written as

$$\pi = \begin{cases} R\ (e, L, K) - wL - C\ (K) & \text{if there is an agreement,} \\ -\ C\ (K) & \text{if there is a strike.} \end{cases} \qquad [6]$$

The local union is assumed to care only about the utility of its employed members. If there is a labor agreement, union members' income is the wage w. But what is the income of union members during a labor dispute? Striking workers are not paid by the firm, of course. Although striking workers frequently receive strike benefits, the benefits must be paid out of strike funds that have been built from workers' own contributions unless the strike is subsidized from outside. Here we assume that neither side receives outside support during a strike.

Let the utility of employed union members be given by the quasi-linear utility function $w–v\ (e)$ where $v\ (e)$ is the disutility of working at a fa-

ster pace, with $v'(e) > 0$ and $v''(e) \leq 0$. Then the local union's payoffs can by written as

$$u = \begin{cases} w - v(e) & \text{if there is an agreement,} \\ 0 & \text{if there is a strike.} \end{cases} \quad [7]$$

In addition, the bargaining outcome must satisfy two constraints. The first is that profits cannot be negative or the firm will shut the plant down. The second is that the wage cannot be less than the minimum wage required to attract workers. Thus the solution must satisfy $\pi \geq 0$ and $u \geq r$ where r is equal to the utility that workers can obtain by quitting and searching for employment elsewhere.

According to standard bargaining models, the bargaining outcome with local bargaining is given by

$$w_L = \begin{cases} \alpha [R(e, L, K)/L] + (1-\alpha)\, v(e) & \text{if } \alpha [(R/L) - v] > r, \\ r + v(e) & \text{otherwise} \end{cases} \quad [8]$$

where $\alpha \in (0,1)$ depends on the relative impatience of the two sides to settle (22). If the wage rate is given by equation [8], it is easy to see that, with local bargaining, profits are given by

$$\pi_L = (1 - \alpha)\, [R(e, L, K) - v(e)\, L] - C(K) \quad [9]$$

and the utility of the union is given by

$$u_L = \alpha \left[\frac{R(e, L, K)}{L} - v(e) \right] \quad [10]$$

provided $u \geq r$. Equations [9] and [10] indicate that the union and the firm share the quasi-rents $[R - v(e)]$ according to the proportions α and $(1 - \alpha)$.

For our model of bargaining at the industry or national level, we assume that that payoffs to the union are the same as at the local level. For employers, we assume that the employers' association seeks to maximize the sum of its members profits $\Sigma (R_i - wL_i - C_i)$. Then, the bargaining outcome is given by

$$w_C = \alpha \frac{\Sigma R(e, L, K)}{\Sigma L} + (1 - \alpha)\, v(e) \quad [11]$$

where R and L are summed over all plants that are covered by the wage negotiations provided, as before, that $u \geq r$. Since α depends on the relative discount rates of the two sides (see footnote 22), there is little reason to expect α to vary systematically with the level of bargaining. Thus, we assume the union's share of the quasi-rents is the same at different bargaining levels. What changes is the definition of the relevant

quasi-rents. In local bargaining, the quasi-rents are those of the particular plant. At the industry or national level, the quasi-rents are the average taken over all plants that are covered by the wage agreement.

All wage bargaining entails a sort of profit-sharing. The higher the firms' profits, the more the union is able to take out in wages. When profits are low, unions must settle for lower wage growth or lower employment (or a combination of the two). At the local level, wage bargaining is a form of profit sharing between a firm and its work force. At higher levels, the profits that are shared are aggregated over an industry or an entire economy. Unless a firm is large relative to the bargaining unit, the wage contract will not be sensitive to *its* profits. Only at the local level, therefore, will the implicit profit-sharing affect the firms' and unions' decisions regarding variables outside the wage agreement. Three variables are particularly important: workers' effort on the job, employment and investment.

4.1. The Choice of Effort

Workers' effort on the job is both productive (for the firm) and costly (for workers). Some aspects of workers' effort can vary from worker to worker. Other aspects of effort, however, are decided collectively. This is particularly true of the introduction of new techniques of production that increase productivity but demand greater effort. Workers' effort can rarely be negotiated at the industry level and never at the national level. Work places are too heterogeneous for effort to be settled in a centralized manner. Yet whether effort is determined through local bargaining or by unilateral action, the presence or absence of local bargaining may have an important effect.

Suppose, first, that there is local wage bargaining. It is clear from equations [9] and [10] that whether the level of effort is set by the union, the firm, or negotiated jointly, the choice will be the level of effort that maximizes the quasi-rents to be shared $R\ (e, L, K) - v\ (e)\ L$, or that equates the marginal benefit, $\partial R/\partial e$, with the marginal cost, $v'\ (e)\ L$. Because of profit-sharing, local bargaining leads to an efficient choice of effort, regardless of whether effort itself is included in the bargain.

Consider the case with centralized wage bargaining. With centralized bargaining, the wage reflects the average productivity of the industry (or national economy) which is insignificantly affected by the productivity of any single plant. Now control over the determination of effort is of critical importance. Employers would ignore the cost of workers' effort and set it as high as possible. The local work force would ignore the productivity gains of effort and attempt to keep effort as low as possible. Even if effort is bargained at the local level, there is no reason to believe that the efficient level of effort would be obtained unless employers and employees can make trade-offs between effort and wage increases.

The importance of effort for workers' welfare and firm's productivity is an important explanation of the ubiquity of local bargaining, even in highly centralized bargaining systems. In Norway and Sweden, centralized wage agreements at the national level are followed by subsequent supplementary bargaining at the industry and local level. In Germany, the introduction of new technology must be negotiated with local works councils. Local bargaining performs the critical function of creating a community of interest between employers and workers in the introduction of new technology.

4.2. Employment and Investment

Local bargaining as a form of rent-sharing also affects decisions regarding employment and investment. According to the model of wage demands that we used in sections 2 and 3, firms choose the level of employment along the demand for labor curve where profits are maximized for a given wage. This is appropriate for bargaining at the industry or national level where the firm is small compared to the bargaining unit. In that case, each firm considers the wage to be exogenous and optimally adjusts employment. But if the firm is large in relation to the bargaining unit, as is the case with decentralized bargaining, then firms might not ignore the way that current employment influences future wage bargains.

With local bargaining, employers can lower the wage by raising employment and thereby reducing output per worker (R/L). According to equation [9], if the relationship between employment and wage level is taken into account in maximizing profits, employers would choose the level of employment given by the condition $\partial R/\partial L = v$. Observe that the marginal costs of labor to the firm with local bargaining, v, is less than the union wage, w, and may well be less than the competitive wage. This implies that local bargaining can lead to a full employment, suction equilibrium where the employers' desire to expand is constrained by the supply of labor similar to the equilibrium of Weitzman's share economy. Local unions may have sufficient power to block expansions of employment that reduce their wages, but at least employers would desire to hire more workers with local wage bargaining than with centralized bargaining.

One might question whether a choice of labor off the demand for labor curve is an equilibrium. Since $w > v$, firms could increase profits in the short run by laying off workers and returning to their demand for labor curve as soon as the wage contract is signed and wages are fixed. Yet, there will be new negotiations in one or two years. If the firm cannot suddenly expand its work force just before the next round of bargaining begins, the wage in the future will be influenced by the level of employment chosen in the present.

If the wage in the current bargaining round depends on the level of employment chosen after the previous bargaining round, Moene, Wallerstein and Hoel (1993) show that the firm's employment policy is determined by the rate at which the firm discounts the future. If the firm's discount rate is very high so that future wage agreement matter little, then the firm chooses the level of employment given by the standard condition $\partial R/\partial L = w$. If the firm's discount rate is low, however, future agreements matter greatly and the firm's optimal level of employment with local wage bargaining approaches $\partial R/\partial L = v$.

Local rent-sharing increases the employers' demand for labor. In this way, the debate over whether or not employment is covered in the labor agreement or set by the firm that has occupied so much of the literature has been misguided. When bargaining is centralized at the national level, agreements covering employment are infeasible. Even at the industry level, agreements over manning rules and the like are difficult if work practices differ among plants. Thus with national wage contracts and, we suspect, with most industry-level contracts, firms set employment taking the union wage as given. When bargaining is decentralized, in contrast, employment may exceed the level indicated by the demand for labor curve, whether or not employment is set by the firm or covered indirectly by negotiations over work rules and the like. What matters fundamentally is the level of bargaining, not the coverage of the labor agreement.

Another important aspect of centralized versus decentralized bargaining is the impact of the bargaining level on investment in plant and equipment. While local bargaining increases employers' incentives to hire labor, it lowers employers' incentives to invest in physical capital (23). With centralized bargaining, the wage is exogenous from the point of view of each firm and firms invest until the marginal revenue product of capital equals its marginal cost, or $\partial R/\partial K = C'(K)$. With local bargaining, however, firms choose the level of capital that maximizes profits as given in equation [9], or $\partial R/\partial K = C'(K)/(1-\alpha) > C'(K)$. Thus, local bargaining raises the implicit cost of capital.

Investment in fixed capital increases the cost to the firm of a work stoppage and therefore increases the union's bargaining power. Since, with local bargaining, firms know that greater fixed costs increase their vulnerability to the threat of a strike, firms invest less. One cannot conclude, however, that local bargaining will reduce investment because local bargaining may increase employment which raises the productivity of capital. Alternatively, centralized bargaining may increase investment which raises the productivity of labor. Whether local bargaining results in more or less investment or more or less employment than centralized bargaining depends on such aspects of the economic environment as the industry's demand curve and the supply constraints for capital and labor inputs. The most that can be said that is generally true is that the capital-labor ratio is lower with decentralized bargaining than with centralized bargaining since local bargaining lowers the implicit cost of labor and raises the implicit cost of capital.

4.3. Entry and Exit

Until now, we have assumed that the number of firms (or plants) was fixed and that all firms shared the same technology. Yet much of the dynamic of capitalist economies is due to the continual entrance of new firms and the failure of existing firms. Expansions are marked by the building of new plants; contractions by the closure of old ones. Entry and exit alter more than the quantity of labor and capital employed. New entrants often bring new techniques, while departing firms leave behind the most efficient. When new techniques are embodied in new plant and equipment, technical progress entails continual turnover of plants and firms. In this way, both entry and exit change the mix of firms in the industry and increase average productivity. In this section, we investigate the way in which the pace of both entry and exit is affected by the level of bargaining (24).

The difference between local bargaining and centralized bargaining at the industry or national level can be seen in Figure 1. Figure 1 displays a cross-sectional view of the industry. The top downward sloping exponential curve represents revenue per worker in plants with fixed labor requirements ranked along the horizontal axis from most to least productive. With local bargaining, wages in more productive plants are higher than in less productive plants.

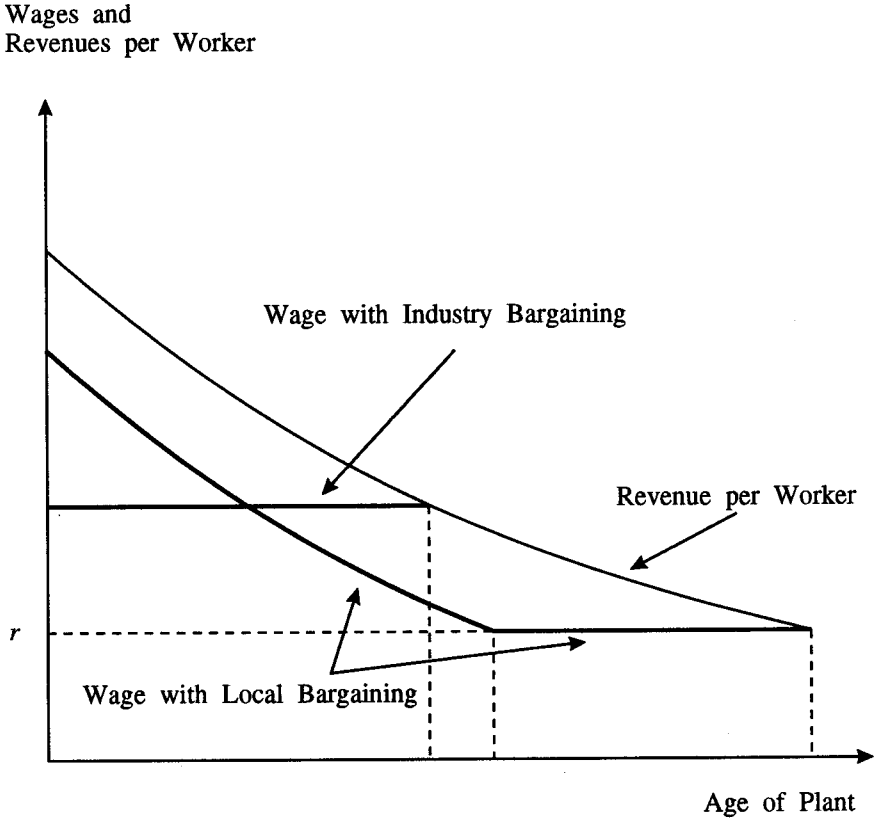
In the figure, locally-set wages are a fixed proportion of each plant's output per worker until the constraint that $w \geq r$ becomes binding (Figure 1 is drawn with $v\,(e) = 0$). Since wages can't fall below r, the wage in the least productive plants remains constant until one reaches the plant whose productivity is just high enough to pay $w = r$ and make zero profits. In contrast, centralized bargaining sets a uniform wage in all plants that is a proportion of the average revenue per worker in the industry.

Over time, new plants are built with the latest and most productive technology. As the average productivity of the industry or national economy increases, workers' alternative income, r, rises, pushing the least productive plants out of the market. In this way, productivity grows through the replacement of older plants by new ones. It can be seen from Figure 1 that local bargaining raises wages in newer plants relative to centralized bargaining, since workers in new plants are able to capture a share of their above-average productivity. In contrast, local bargaining reduces wages in plants with below-average productivity.

Since plants are closed when revenues per worker fall below the wage, industry-level bargaining shortens the lifespan of plants in the industry. When bargaining is centralized, the least efficient plants are prevented from lowering their wage. As a consequence, marginal plants are pushed out of the market. Thus, industry-wide bargaining lowers the average age of plants in operation, thereby increasing the average productivity of the industry. While increasing productivity is an important goal, however, productivity increases that occur through reductions in employment may signify a reduction in welfare rather than an improvement.

Figure 1

The Distribution of Wages across Plants with Local and Industry Bargaining



Thus, it is necessary to compare how the different bargaining systems affect the number of new plants that are built each period. Firms' entry decisions are based on a comparison of the market value of a newly built plant (or the present value of the stream of future earnings) and the cost of construction. Industry-wide bargaining affects the future discounted earnings of the firm in two countervailing ways. Relative to decentralized bargaining, industry-wide bargaining holds down wages in plants when they are relatively new, but increases the wage relative to local bargaining when plants are older. In addition, industry-wide bargaining shortens the period over which firms can expect to maintain a plant in operation.

Moene and Wallerstein (1993a, 1993b) show that the impact of the bargaining system on entry depends on the gap between the union wage and the competitive wage. When the gap is small, industry-wide bargaining

increases both employment and average productivity relative to decentralized bargaining. The greater entry of new plants under industry-wide bargaining more than compensates for the earlier closing of older plants. When the gap is sufficiently high, however, decentralized bargaining generates greater employment. Thus whether or not industry-wide bargaining is more efficient than decentralized bargaining, in the sense of raising productivity and employment simultaneously, depends on the difference between the union wage and the market-clearing wage.

In both Norway and Sweden, collective agreements cover most of the labor market and, in both countries, unemployment rarely rose above 3 per cent until the late 1980s. With unemployment so low, the difference between the union wage and the competitive wage could not have been large. Thus, under the conditions prevailing in Norway and Sweden, the equalization of wages across plants that was accomplished via solidaristic bargaining may have increased economic efficiency, just as Gösta Rehn and Rudolf Meidner argued it would when the solidaristic wage policy was first proposed in the early 1950s (25).

Solidaristic bargaining is not only limited to the elimination of wage differences among plants within an industry. The same policies and arguments can be applied to the elimination of wage differentials between industries. With industry-level bargaining, wages will differ by industry in accordance with industry-level differences in productivity or profitability. Solidaristic bargaining, applied over the national economy, limits the ability of the most efficient industries to pay a wage premium, and prevents the least efficient industries from staying in business by lowering wages. In fact, the elimination of wage differentials between industries can be understood as a subsidy for new industries and a tax on older ones (26). The result of nation-wide solidaristic bargaining is to force older industries to shut down while encouraging the entry and growth of new industries.

Local wage bargaining is sensitive to local conditions. That, in fact, is among the chief virtues claimed by its supporters. Sensitivity to local conditions means that fewer less efficient plants are driven out of business compared to centralized wage negotiations. The other side of the coin is that wages are sensitive upwards in the most efficient plants. This implies that fewer new plants may be built. Industry-level bargaining forces less efficient plants to shut down at a faster rate but local wage bargaining may create a higher entry barrier for more efficient plants.

4.4. Industrial Conflict

One of the striking conclusions of the non-cooperative bargaining model developed by Ståhl (1972) and Rubinstein (1982) is that the equilibrium is efficient in the sense that nothing is lost through conflict. Although the division of the pie is determined by the relative costs of delay, the equilibrium strategies entail an acceptance of the first offer that is

made. This seems to leave the occurrence of strikes or lockouts to random mistakes or deviations from purely rational behavior. Indeed, Hicks (1963) argued that no theory of bargaining founded on rational behavior with a unique solution could ever explain strikes, since both sides could then predict the outcome and agree to it without a costly conflict.

Yet the conclusion that industrial conflict is essentially random is belied by the fact that the frequency of strikes appears to follow predictable patterns (27). One of the most striking empirical regularities is the strong negative correlation between industrial conflict and the centralization of bargaining (28). The effect of centralization on strike frequency can be observed over time within single countries as well as cross-nationally. Norway and Sweden were among the world's most strike and lockout-prone countries during the interwar years before collective bargaining was centralized. In the post-war period of centralized bargaining, in contrast, the frequency of industrial conflict in Norway and Sweden was among the lowest in the world (29). With the recent decentralization of bargaining in Sweden, the frequenzy of strikes has risen again.

The usual way out of the Hicks paradox is to expand the bargaining model to include private information held by one side or both. The most plausible candidate is the information that each firm gathers about the demand for its output. The difficulty that private information creates is easy to understand. Suppose the firm is hit by a sudden decline in demand. If the decline in demand was common knowledge, the union would adjust its expectations accordingly and contract negotations would be no harder than usual. But if the firm notifies the union that conditions have worsened, will the firm be believed? After all, the union knows that it is in the firm's interest to say that conditions have worsened, even if they haven't. Whether demand is falling or rising, the firm always has an incentive to be pessimistic in its message to the union. Knowing this, the union discounts any message from the firm that is not costly for the firm to transmit. One mechanism whereby firms might credibly communicate a worsening of conditions is to lay workers off. Another way is to endure a strike. In fact, the empirical evidence indicates that layoffs and strikes are substitutes at the firm level in the sense that strikes (in the US) are procyclical (30). One can speculate that layoffs are generally used to communicate during downturns in demand. Strikes are more likely to occur during expansions when the union suspects that conditions are better than the firm says they are.

This leads to the following simple explanation of the relationship between centralization and industrial conflict. There is a clear asymmetry in the information available to a firm and the information held by the union. The existence of an asymmetry in the information held by an association of employers at the industry level and an industrial union is less obvious. An industrial union can do its own studies of the demand for the industry's output. At the national level, the existence of any asymmetry of information is even less likely. The national confederation

of trade unions has access to the same information about the state of the aggregate economy as the national confederation of employers. In Norway, for instance, both sides receive the same government reports prepared by the Bureau of Statistics. As a consequence, centralized bargainers are more likely to reach an agreement without conflict than bargainers at the local level.

5. Conclusion

To conclude that an issue is complicated is hardly exciting.

When the issue is the subject of a lively political debate, however, one of the most useful roles of theoretical analysis is to warn against oversimplification. Consider the effects of purely local bargaining that we have reviewed. On the one hand, local bargaining increases firms' demand for labor and creates incentives for workers to cooperate with the introduction of new technology. In addition, local bargaining, in comparison to industry-level bargaining, limits the ability of workers to pass on the costs of wage increases as increases in the relative price of the product they produce. On the other hand, local bargaining reduces investment in existing plants and the building of new plants if the gap between the union wage and the competitive wage is low. In addition, the decentralization of bargaining among different types of workers who are complements in production leads to higher wage demands and lower employment than if one union represented all. Centralized bargaining results in fewer strikes, increased incentives for investment and lower wage demands for a host of reasons. Yet the absence of local bargaining reduces firm's incentives to hire and worker's incentives to cooperate with productivity improvements.

One of the reasons why the issue is complex is that there are multiple inputs that contribute to good economic performance. Workers' effort, employment and investment in plant and equipment are all vital, and different bargaining institutions may affect each differently. Thus, to evaluate the overall effect of one bargaining system or another, we need a means for aggregating the effects of the bargaining system on each of the inputs. The results of such an aggregation are likely to be dependent on the particular properties of the production functions and demand curves that are used in the analysis.

A second reason why the debate is oversimplified is that centralization is a multidimensional concept. Along one dimension, countries can be ranked along a spectrum that runs from plant-level bargaining to industry-level bargaining to multi-industry bargaining at the national level. According to this ranking, the US and the UK with most bargaining at the plant level are the most decentralized. Japan, with its system of enterprise bargaining is more centralized. Germany, with industry-level bargaining is yet more centralized. Norway and Sweden (prior to 1983) would be the most centralized. On another dimension, countries can be

ranked along a scale from craft unions, to blue-collar and white-collar unions, to unions that include all workers in the enterprise. According to the second dimension, both Japan and Germany are more centralized than the Nordic countries.

Third, even centralized bargaining systems have elements of local bargaining. In the Nordic countries, centralized, national-level agreements are followed by supplementary bargaining at the industry and local level. Locally-bargained wage supplements, called "wage drift", represent a significant share of the total wage increase received by workers in both Sweden (31) and Norway (32). In Germany, there is implicit local bargaining through the works councils. Indeed, the ubiquity of local bargaining suggests that it performs a crucial function in both protecting workers against arbitrary actions of supervisors and creating a community of interest at the local level in measures to enhance productivity.

It follows that we need to analyze the performance of mixed bargaining systems to capture the dynamics of countries with central agreements. Moene (1988), Holden (1989) and Moene, Wallerstein and Hoel (1993) have examined local bargaining following a central agreement and found that central bargainers do not lose control over the total wage increase provided the central agreement includes an industrial peace clause that prohibits strikes and lockouts over local disputes (33). Moene, Wallerstein and Hoel (1993) also found that local bargaining constrained by a no-strike pledge preserves the benefits of purely local bargaining in terms of the choice of workers' effort. In terms of employment and investment decisions, a system with multi-level bargaining produces results in between purely local and purely centralized wage bargaining. Thus, centralized bargaining with subsequent local bargaining appears to be an efficient combination.

One problem with multi-level bargaining, however, is that it may contribute to pressure for an inflationary policy (34). It is difficult to lower nominal wages at any bargaining level. The normal pattern is rather to increase the nominal wages at each level of bargaining. The resulting increase in nominal wage can be difficult to reconcile with price stability, particularly in periods when productivity growth is low.

In addition, multi-level bargaining in the Nordic countries became increasingly unstable over time. Unions differ in the ability of their members to obtain wage increases above the centrally negotiated wage. In response, the unions who did not receive drift successfully demanded compensation in the central agreement. The more workers without drift were compensated for the drift received by others, the less room there was for workers in high drift industries to increase their wage through local bargaining. The final result has been declining support for centralized bargaining among both employers and unions who do well in local bargaining (35).

In sum, the institutional details of each bargaining system are more complex and more interesting than the simple dichotomy between centralized and decentralized bargaining systems allows. To the best of our

knowledge, for example, the Austrian combination of highly centralized authority within the union confederation but decentralized bargaining has yet to be investigated theoretically. Finally, there is a danger of asking too much of the system of wage determination in terms of explaining cross-national differences in unemployment and growth. Macroeconomic (and microeconomic) policies remain critical for economic performance. To study wage formation is a necessary step in developing an understanding of the effect of macroeconomic policies, but it is not sufficient. The task of integrating the theory of bargaining institutions and wage formation reviewed here with theories of macroeconomic policy remains to be done.

Footnotes

(1) The main exception to this generalization is Great Britain, where the decline of the British economy relative to the rest of Europe prompted much discussion of the perceived inadequacies of the British system of industrial relations. The central document in the discussion was the Donovan Report (1968). The period is described in Scharpf (1991).

(2) Our presentation follows the lengthier discussion in Moene, Wallerstein and Hoel (1993). Readers who are interested in the mathematical structure of the arguments presented here should refer to the longer paper for a more comprehensive presentation. Complementary reviews of the literature can be found in Tyrväinen (1989) and Calmfors (1993). See, also, chapter 2 of Layard, Nickel and Jackman (1991).

(3) Farber (1986).

(4) It is more accurate to say that union members care about security of employment (Oswald 1987, Layard, Nickell und Jackman 1991). Thus, we really should write that $\partial u/\partial L \geq 0$ with $\partial u/\partial L > 0$ when layoffs threaten and $\partial u/\partial L =$ otherwise. The union's optimal wage, however, would always be at a point on the demand for labor curve where $\partial u/\partial L > 0$.

(5) Calmfors, Driffil (1988); Strand (1989); Hoel (1991).

(6) Calmfors (1993).

(7) Cahuc (1987).

(8) Bratt (1986).

(9) Calmfors, Driffil (1988) 52.

(10) Wage setting by multiple types of workers organized in separate unions was first studied by Rosen (1970), but the topic received relatively little attention until recently. Oswald (1979) examined the existence of equilibria in an economy with multiple unions. Horn and Wolinsky (1988) and Hersoug (1985) studied the question of the optimal division of workers into separate unions (from the workers' point of view) and highlighted the critical distinction between complements and substitutes in production. Pohjola (1984) and Wallerstein (1990) studied the impact of decentralized versus centralized bargaining with different types of labor within a differential game framework.

(11) Since the output price is assumed to be constant, employment can be written a function of nominal wages.

(12) In Equation [5], we used the assumption that unions have identical preferences and face identical demand for labor curves to conclude that $\partial V/\partial u_i = \partial V/\partial u_j$ implies $\partial u_i /\partial L_i = \partial u_j/\partial L_j$.

(13) Gottfries, Horn (1986); Blanchard, Summers (1987); Lindbeck, Snower (1988).

(14) Frank (1985).

(15) Elster (1989).

(16) Mortensen (1986).

(17) Jackman (1990); Holden, Raaum (1989).

(18) See Akerlof and Yellin (1986) for a collection of papers that describe the relationship between wages and producitivity in many different ways.
(19) Calvo (1979).
(20) Calvo, Wellisz (1978); Shapiro, Stiglitz (1984).
(21) Shaked, Sutton (1984).
(22) To be precise, $\alpha = \rho_F/(\rho_U + \rho_F)$ where ρ_F and ρ_U are the discount rates of the firm and the union respectively. Thus α varies from zero to one as the ρ_F/ρ_U goes from zero to infinity. See Sutton (1986) for a good introduction to non-cooperative bargaining theory.
(23) Grout (1983), Hoel (1990), Moene (1990).
(24) This section is taken from Moene, Wallerstein (1993a, 1993b).
(25) LO (1953).
(26) Agell, Lommerud (1991).
(27) Kennan (1986).
(28) Hibbs (1978).
(29) Ingham (1974).
(30) Kennan (1986).
(31) Calmfors, Forslund (1990).
(32) Rødseth, Holden (1990).
(33) See, also, the empirical evidence in Holden (1989).
(34) Calmfors (1992), Holden (1993).
(35) Moene, Wallerstein (1993c).

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