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BARGAINING STRUCTURES AND MACROECONOMIC PERFORMANCE IN A SMALL OPEN EUROPEAN ECONOMY WITH IMPERFECTLY COMPETITIVE WORLD MARKETS

by

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Abstract

This paper analyzes the macroeconomic effects of a national union, which coordinates the wage negotiations in different industries, in a small open economy, trading in imperfectly competitive world markets. Industry wage levels are determined as cooperative Nash bargaining solutions on the labor demand curve. If wage contracts affect industry output prices, a national union leads to wage moderation, higher employment, and lower inflation. By generating inflation and by reducing aggregate and intermediate demand, a wage increase in an industry causes a real income loss and unemployment for members outside the industry. A national union takes this externality into account and settles for a lower nominal wage than an industry-specific union would. Yet, if aggregate demand policies systematically absorb part of the unemployment consequences of excessive wage settlements, this conclusion could be reversed.

I. Introduction

In the current academic and non-academic debate about the causes of unemployment in Europe, institutional aspects of the wage formation process have received increasing attention. One of the recurring themes in this discussion relates real wage restraint to the degree of centralization in the bargaining process between trade unions and employers. The main hypothesis states that a more centralized wage setting results in wage moderation, lower inflation, and higher employment. McCallum (1983,1985), and Bruno and Sachs (1985) find some empirical support for this view. More specifically, they claim that inflation-unemployment trade-offs have developed more favorably in economies with a high degree of centralization than in economies with decentralized wage setting.

Unfortunately, neither the exact meaning of centralization nor the relation between centralization and labor market performance is made very clear in these empirical studies. Most authors, including McCallum, and Flanagan, Soskice, and Ulman (1983, esp. pp. 27- 29) point to the presence in the economy of national unions which coordinate the wage negotiations in different industries. A national union represents the interests of workers in the whole economy and therefore takes into account the consequences of its wage decisions in one industry on the rest of the economy. This would motivate the national labor organization to set more reasonable wage goals although only Jackman (1985) explores this link between a national union and wage restraint in somewhat greater detail. None of the mentioned papers analyzes why and under what conditions a national union in a small open economy would adopt a moderated wage policy. This lack of firm theoretical basis is reflected in rather ad hoc empirical measures for the degree of centralization. In addition, the recent severe unemployment problems in some countries with strong national unions such as Belgium and the Netherlands are difficult to explain without a deeper theoretical understanding of the effects of centralization.

This paper attempts to close some of the gap between theory and empirical

evidence. More specifically, we analyze the impact of a national union in a multi-industry open unionized economy with fixed exchange rates, trading on imperfectly competitive world markets. Imperfect competition arises from product differentiation between foreign and domestic industries. Labor negotiations between unions and employers determine the wage levels in the economy. A distinction is made between a bargaining system with and without a national union. In the so-called localized bargaining system, unions and employer organizations are industry-specific. Wage negotiations address the concerns of the industry involved. This system prevails in Great-Britain and Italy (Barkin, 1983). In a coordinated bargaining system, the industry unions form part of a national union, which coordinates the negotiations in different industries. We will assume throughout the paper that wage agreements in this bargaining structure are concluded at the industry level and that strikes are confined to the industry where negotiations have failed as would be the case in Austria and Germany. Abraham (1987) provides the straightforward extension to a bargaining system with national negotiations and strikes, which would be more relevant for such countries as Sweden, Norway, and Belgium.

We will show that a national union is able to achieve a higher utility level than an industry-specific union when wage contracts affect output prices. In that case, the wage agreements have an indirect effect on aggregate consumption and intermediate demand, and on the general price level. This further influences real wages and employment in other industries. More specifically, a wage increase in one industry is likely to reduce real wage and employment levels of union members in other industries and thus creates a negative externality. A national union internalizes this externality and adopts a more restrained bargaining strategy. This leads to higher employment and aggregate output and to a lower general price level.

Government policies have a significant impact on the national union's incentive for wage moderation. It is well-known from the work by Calmfors (1984,1985) and Driffill (1985), among others, that expansionary aggregate demand policies provide the union with

an incentive to bargain for a higher wage. No attention has yet been given to the effectiveness of government policies in bargaining structures with different degrees of centralization. We will argue that accommodating stabilization policies weaken and may even reverse the national union's motivation for wage restraint as compared to a bargaining system with industry-specific unions.

The analysis of a unionized economy requires a model that explicitly integrates unions in the wage formation process. Most of the existing macroeconomic literature in this area makes use of a model where unions set wages unilaterally (see, for instance, Jackman, 1985, Jackman and Layard, 1982, Nickell and Andrews, 1983, and Layard and Nickell, 1985). This model does not take into consideration the role of employers in the bargaining process and does not correspond to a reasonable description of a bargaining game. A recent paper by Davidson (1985), concentrating on the microeconomic analysis of bargaining structures in one oligopolistic industry, provides an appropriate game-theoretic approach to modeling the bargaining systems considered here. Davidson's game converges to a cooperative Nash bargaining solution. After presenting the model of this paper in Section II, this solution is used in Section III to derive the wage and employment outcomes in a localized and a coordinated bargaining system. Subsequently, the main results are compared to the existing macroeconomic literature on externalities in imperfectly competitive markets. Section IV analyzes the impact of a national union when the government follows a known stabilization policy rule. Section V contains a concluding summary.

II. A General Equilibrium Model for a Small Open Unionized Economy in Imperfectly Competitive World Markets

Assumptions of the model and profit maximization for an industry

In this section, we describe the model of imperfect competition, define the general equilibrium in the economy, and derive the equilibrium levels of labor demand and profits, assuming that wages have been set earlier during labor negotiations between unions and employers.

We first describe the basic characteristics of the model which are the same for the two bargaining structures. We consider a small open economy with m industries, all of which are unionized. Each domestic industry contains a number of perfectly competitive identical firms. The industry sells its output on the domestic and foreign market. Exchange rates are fixed.

Bargaining in the economy takes place between union and employer representatives and results in labor contracts specifying one wage for each industry, but not the levels of employment. Once a wage agreement has been reached, all firms in the industry choose their optimal labor input taking the negotiated wage as given. Total employment in an industry i is determined as a point on the industry labor demand curve.[1] Labor and intermediate inputs are the only variable inputs in the production process. The capital stock is fixed during the time of the labor contract which allows for nonzero profits in the model.

The model of imperfect competition is kept as simple as possible. Four fundamental assumptions are made. We first assume that the domestic and foreign suppliers within the same industry sell similar but not identical products. This assumption

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[1]We do not consider the alternative contract-curve model described in McDonald and Solow (1981).

is consistent with the empirical evidence which suggests that economic agents do not view imports and domestic goods as perfect substitutes but distinguish the production of the same industry according to the country of origin (Deardorff and Stern, 1986). However, world prices are independent of domestic supply. The domestic industry takes the price of its foreign competitor as a given focal point, determined in the world market beyond its control. Changes in the margin between the domestic and the world price causes demand shifts between the domestic and foreign product. Consequently, industry product demand depends on total domestic and foreign demand at each price level and, hence, on the production levels in other domestic industries. This brings us to the other assumptions. We assume that firms in an industry view the output and price levels of other industries as independent of their own production decisions. Thirdly, each firm is assumed to be small enough to view aggregate domestic and foreign demand as exogenously determined. Finally, firms within one domestic industry act as perfect competitors once wages have been set. These last three assumptions simplify the analysis considerably. The results of this paper do not hinge on this simplification.

With these underlying assumptions we first derive the demand function facing the industry. Demand for good i comes from four distinct sources. A part of industry i's output is sold to domestic consumers. The utility of a representative consumer depends on the consumption of produced goods and a non-produced good, called money. Aggregate consumer demand for good i depends on its price, the import price of good i, the prices of domestic and foreign substitutes and complements, consumption taxes and aggregate private disposable income. For simplicity, we assume that all tax revenues in the domestic economy are generated by one exogenously determined uniform consumption or value added tax t. We also ignore foreign taxes and government transfers. Hence:

$$D_i^c = D_i^c (p_i, p_{\_i}, p^M, A^d, t)$$

with D_i^c = total real domestic consumption demand for good i;

p_i = domestic price of good i;

p_{-i} = vector of prices of domestically produced goods other than good i;

p^M = vector of import prices;
= $p^F R$ where p^F is a vector of world prices for the foreign products and R is the fixed exchange rate;[2]

A^d = aggregate private disposable income.

An increase in p_i lowers the domestic consumption of good i because of substitution, income, and real balance effects.

Good i is further used as an intermediate input in the production of other domestic industries. To derive an expression for intermediate demand we write the cost function for a representative firm in industry j as:

$$c_j = c_j (\psi_j, W_j, K_j, p_j, p_{-j}, p^M) \quad (1)$$

with ψ_j = output level of the representative firm in industry j;

W_j = Nominal wage in industry j;

K_j = Capital stock in industry j;

p_{-j} = vector of prices of domestic goods other than j.

The first derivative of the cost function with respect to p_i yields the representative firm's intermediate demand for good i (Varian, 1984, p.54). Aggregating for all firms in industry j, and repeating the same steps for all industries other than i, we obtain total intermediate demand for good i, $X_{i.}$.

$$X_{i.} = X_{i.} (p_i, y_{-i}, W_{-i}, p_{-i}, K_{-i}, p^M)$$

with y_{-i}, W_{-i}, K_{-i} = vector of output levels, wages, and capital stocks of industries other than i.

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[2]Domestic currency per unit of world currency.

An increase in p_i, makes the use of domestic good i as an intermediate input less attractive.

Government spending on good i, G_i, constitutes a third component of demand. We assume that the government's policy rule is not systematically related to the industry's employment situation. G_i is therefore exogenous to the industry. This assumption is relaxed later.

Finally, part of the domestic output of good i is sold to foreign consumers and producers. Foreign economic agents base their decisions on foreign disposable income and government spending, on the prices of all domestic and foreign goods expressed in foreign currency, as well as on foreign wages and capital stocks.

Total demand for good i, y_i^d, is the sum of the various components of demand at each price level. Hence,

$$y_i^d = y_i^d (p_i, p_{-i}, y_{-i}, W_{-i}, R, K_{-i}, A^d, G_i, t, F_i) \tag{2}$$

where F_i denotes a vector of all exogenously foreign variables determining the output of industry i.

At the profit maximum for a representative firm in industry i price equals marginal cost from which the supply function of the firm can be derived. Aggregating over all firms yields industry i's supply function:

$$y_i = y_i(W_i, p_i, p_{-i}, K_i, p^M) \tag{3}$$

In equilibrium, industry demand equals industry supply. Solving for the equilibrium price p_i and substituting the result back in equation (3), we find the equilibrium output level in industry i as:

$$y_i^* = y_i^* (W_i, p_{-i}, y_{-i}, W_{-i}, R, K_i, K_{-i}, A^d, t, G_i, F_i) \tag{4}$$

Starred variables denote equilibrium values.

Equilibrium labor demand, profits, and the consumer price index

We now derive the equilibrium levels for output, labor demand, profits, and the consumer price index. General equilibrium requires that aggregate private wealth equals aggregate disposable income. Assuming that all profit income is consumed, and that there are no bonds in the economy, this implies that:

$$A^d = \sum_{i=1}^{m} W_i N_i + \sum_{i=1}^{m} \Pi_i + M \tag{5a}$$

with M = total equilibrium money holdings;

N_i = the equilibrium employment level in industry i;

Π_i = the equilibrium profit level in industry i.

Taking the first derivative of the cost function with respect to W_i at the equilibrium output level y_i^*, we obtain equilibrium labor demand in industry i.

$$N_i = N_i (y_i^*, W_i, p_i^*, p_{-i}^*, p^M, K_i) \tag{6a}$$

Equilibrium profits are equal to

$$\Pi_i = \Pi_i (y_i^*, W_i, p_i^*, p_{-i}^*, p^M, K_i) \tag{7a}$$

with y_i^* defined in equation (4).

After substituting the expressions for N_i and Π_i in equation (5a) and expressing equilibrium prices as a function of output levels we obtain:

$$A^d = A^d (y_i^*, y_{-i}^*, W_i, W_{-i}, G_i, G_{-i}, V) \tag{5}$$

with G_{-i} = government spending on domestic goods other than i;

V is used to simplify notation and defines the following a vector of exogenous variables:

$$V = [F_i \; F_{-i} \; K_i \; K_{-i} \; M \; R \; t]$$

where F_{-i} = foreign variables determining the output of

domestic industries other than i.

Combining equations (4) and (5) we are able to define equilibrium industry output as a function of other output levels, the wage structure in the economy and a set of exogenously determined variables.

$$y_i^* = y_i^* (y_{-i}^*, W_i, W_{-i}, R, G_i, G_{-i}, V) \quad \text{for } i = 1...m \tag{8}$$

Equation (8) defines a system of m equations in m unknowns. A Nash equilibrium for the economy is achieved when each industry chooses its profit maximizing output based on correct expectations about the equilibrium production levels in other industries. The equilibrium describes the levels as a function of the negotiated wages and all exogenous variables.

$$y_i^* = y_i^* (W_i, W_{-i}, G_i, G_{-i}, V) \tag{9}$$

Finally, we substitute equation (9) in equations (6a) and (7a) for the equilibrium labor demand and profit functions of industry i.

$$N_i = N_i (W_i, W_{-i}, G_i, G_{-i}, V) \tag{6}$$

$$\Pi_i = \Pi_i (W_i, W_{-i}, G_i, G_{-i}, V) \tag{7}$$

A wage increase in industry i leads to a cutback in production which results in additional lay-offs. At the contracted wage, profits must fall in response to a wage increase because otherwise both unions and employers could be made better off by a higher wage.

The wage increase in industry i also affects profits and employment in other industries. The price and output adjustments to the wage change alter total revenue generated in industry i. This revenue is paid out in factor income and profits and constitutes a part of aggregate demand. A decline in revenue forces wage earners and stockholders in industry i to consume less and reduces the industry's purchases of intermediate goods from other industries. The Technical Appendix shows that total

revenue in industry i falls in response to a wage increase if :

$$\eta_i + \eta_i^{\pi} \frac{\delta_i^{\pi}}{\delta_i} + \eta_i^{h} \frac{\delta_i^{h}}{\delta_i} \geq 1$$

with η_i, η_i^{π}, η_i^{h} = absolute value of the wage elasticity of labor demand, profits, and intermediate cost in industry i;

δ_i, δ_i^{π}, δ_i^{h} = share of labor, profit, and intermediate factor income in total revenue of industry i.

Symons and Layard (1983) for six OECD countries, and Drèze and Modigliani (1981) for Belgium, estimate the wage elasticity of labor demand, η_i, to be larger than 1.[3] This empirical evidence suggests that the above inequality holds even in the extreme case of both η_i^{π} and η_i^{h} equal to zero. Hence, wage gains reduce factor income and, through their negative impact on consumption and intermediate demand, worsen demand conditions for other industries.

The price increase of good i, resulting from the higher wage in industry i, leads to additional adjustments in intermediate and consumption demand. Complements of good i experience a further decline in demand which reinforces the revenue effects of the wage increase. The demand for gross substitutes goes up in response to the higher price of good i. Potentially, strong substitution effects could dominate the negative demand consequences of the reduced factor income although this would be the exception rather than the rule. After all, products of different industries rather than similar goods, produced by firms within the same industry, are considered here. In open, internationally trading European economies, most demand shifts occur between products of the same foreign and domestic industries : firms compete with other firms within the same domestic

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[3] η_i measures the wage elasticity of labor demand taking output adjustments into account. Most empirical studies estimate the constant-output labor-demand elasticity which is much smaller and is found to be in the .15–.5 range (Hamermesh, 1984).

industry and with foreign companies producing similar products. Products of other domestic industries are more likely to be complements. For example, when an inflationary wage agreement makes Swedish cars more expensive, consumers may switch to other modes of transportation but will, more likely, buy cheaper Japanese and German cars. In its turn, the Swedish steel industry is harmed by the slower sales of Volvo's and Saabs and is only partially compensated by orders coming from bus or train producing companies.

We conclude that a wage increase in one industry negatively affects profits and employment in most or all other industries ($\frac{\partial \Pi_j}{\partial W_i}$ and $\frac{\partial N_j}{\partial W_i} \leq 0$ for most or all i and j). These spill-over effects of a wage change create a link between the wage decisions in different industries and are crucial for our further analysis.

Finally, it can be seen from equations (2), (5), and (9) that the equilibrium consumer price index P_c depends on the same variables as equilibrium output.

$$P_c = P_c (W_i, W_{-i}, G_i, G_{-i}, V) \tag{10}$$

Rising wages decrease industry output, push up output prices, and generate domestic inflation.

III. Wages and Employment in an Economy With and Without a National Union

A localized bargaining system

We now derive the outcome of the wage bargaining between industry-specific union and employer organizations in a localized bargaining system. During the negotiations, both parties take into account the consequences of their wage decisions for employment, profits, and inflation. It is assumed that they know the true structure of the economy as described in the previous pages.

What goals is the union trying to achieve? In the literature on union behavior, it is common to represent the union's utility as a concave function of real wages and employment (see Oswald,1982) :

$$U_i = U_i (w_i, N_i)$$

$$\text{where } w_i = \frac{W_i}{P_c}$$

The employer organization maximizes joint industry profits of all firms in industry i, Π_i. What will be the outcome of the negotiation process?

Davidson (1985) models a sequential bargaining game between unions and employers for a localized bargaining system in a two industry economy.[4] Employers and unions in each industry make alternating offers. Davidson proves that equilibrium wages are completely determined by what happens in the subgames in which the wage in one industry has been accepted, or is expected to be accepted, while bargaining in the other industry continues. Lately, there has been substantial progress in dealing with two-person bargaining models with this structure, following the strategic approach developed by Rubinstein (1982). It can be proven that a unique pair of equilibrium wages exists and that, when the period between offers and counteroffers becomes very small and the discount factors of the union and employers are the same, the wage outcome converges to the symmetric Nash cooperative bargaining solution.[5]

The Nash cooperative solution depends on the rewards for both parties in the case when a labor contract is signed and on the payoffs when no agreement can be

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[4]An extension of Davidson's model to m sectors would go far beyond the present effort of this paper. We shall proceed accordingly on the presumption that the support for the Nash cooperative solution in the m=2 case justifies its use in the more general case and that, in itself, the analysis of a two-industry economy is worthwhile enough to pursue further.

[5]The Nash bargaining solution has been used in the trade union literature by Nickell (1982), and Pissarides (1985). Horn and Wolinsky (1985) present the only application of Davidson's game-theoretic framework we are aware of.

reached. In a localized bargaining system, the union in industry i achieves a utility level $U_i (w_i, N_i)$ when a wage agreement is reached. In that case, the employers in industry i make a profit of Π_i. During a strike, the firms earn no profits and the union's utility is $U_i($ 0,0) which is normalized to be zero.[6] The Nash cooperative bargaining solution for industry i is found by maximizing the product of the gains each party achieves by not striking. This implies that the following expression is maximized with respect to the wage W_i:

$$\max Z_i^m = U_i\left(\frac{W_i}{P_c}, N_i(W_i, W_{-i}, G_i, G_{-i}, V)\right) \cdot \Pi_i (W_i, W_{-i}, G_i, G_{-i}, V)$$

with respect to the wage W_i with P_c defined in equation (10).

The first-order conditions for an interior solution become:[7]

$$\frac{\partial Z_i^m}{\partial W_i} = \frac{dU_i}{dW_i} \Pi_i + U_i \frac{\partial \Pi}{\partial W_i} = 0 \qquad (11)$$

$$\text{with } \frac{dU_i}{dW_i} = \left[\frac{U_{w,i}}{P_c} (1 - \epsilon_i) - s_i U_{N,i}\right]$$

$$\text{and } \epsilon_i = \frac{\partial P_c}{\partial W_i} \frac{W_i}{P_c} = \text{elasticity of the consumer price index with respect to a change in the nominal wage of industry i;}$$

s_i = absolute value of the slope of the labor demand curve

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[6]Strike funds or other income streams for striking union members could easily be integrated into the analysis.

[7]It is assumed that, in all industries, the contracted wage exceeds the reservation wage of employed workers. During the period of the wage contract the employed do not accept a job in another industry. This is a reasonable description of the European situation where high mobility costs and generous unemployment benefits result in virtually no short run labor mobility. Relaxing this assumption does not change the conclusions of the paper (see Abraham, 1987)

at the equilibrium wage.

$$= - \frac{\partial N_i}{\partial W_i}.$$

Equation (11) is equivalent to

$$\frac{dU_i}{dW_i} \frac{W_i}{U_i} = - \frac{\partial \Pi_i}{\partial W_i} \frac{W_i}{\Pi_i} \qquad (11b)$$

Equation (11b) says that, at the optimal wage, the union's gain from a 1% wage increase equals the employer's loss from the higher wage. If a small wage change significantly improves industry profits with only minor utility losses for the union, the prevailing wage is not optimal and a lower wage would augment the combined gains of employers and unions.

The marginal utility of a wage increase, $\frac{dU_i}{dW_i}$, depends on the magnitude of s_i and ϵ_i. A steeper labor demand curve (a smaller s_i) diminishes the employment costs of a wage increase for the union. As a consequence, a wage increase is more beneficial to the union than harmful to the employer and thus a higher wage is needed to achieve equilibrium. The link between nominal wages and inflation (as reflected in ϵ_i) is a source of wage moderation. By putting pressure on the industry price level, a nominal wage increase causes domestic inflation, which reduces the marginal utility of a nominal wage increase for the union.

A coordinated bargaining system

We now consider a coordinated bargaining structure where the industry unions form a part of a national union but continue to bargain at the industry level. The goal of the union is to maximize the sum of the union's utilities in all industries, $\sum_{i=1}^{m} U_i (w_i, N_i)$. An analogous but algebraically more complex analysis could be repeated for the case

where the national union maximizes a general welfare function $G(U_1,\ldots,U_m)$. The employer organization is assumed to be industry-specific and maximizes industry profits Π_i. The analogous case of a national employer organization, maximizing $\sum_{i=1}^{m} \Pi_i$, is analyzed in Abraham (1987).

In Davidson's game for a coordinated bargaining system, the same union offers and accepts wages in all industries. As before, equilibrium wages are determined by the subgames in which industry negotiators know the (expected) settlements in the rest of the economy. Wages are found by applying the symmetric Nash cooperative bargaining solution.

The derivation of the wage outcome in industry i requires the correct specification of the disagreement outcome for the national union. A strike causes a temporary shutdown in industry i. This production stop results in excess demand for product i and drives up the price of good i as well as the consumer price index. Furthermore, employees receive no wage income during the strike and shareholders earn no dividends, so that aggregate disposable income and consumption in the economy falls. Finally, other industries are not able to sell part of their production as intermediate inputs to industry i. Thus, real wages and employment outside industry i indirectly suffer from the strike. The union's utility levels in other industries are therefore lower than when the employer and union in sector i sign a labor contract. Denote U_j^0 as the utility in sector j when sector i strikes. Since $U_i^0 = 0$, the disagreement outcome for the national union bargaining in industry i is $\sum_{j\neq i} U_j^0$ with $U_j^0 \leq U_j\left(\frac{W_j}{P_c}, N_j\right)$ for all j. A labor contract in industry i thus yields a utility gain of $U_i\left[\frac{W_i}{P_c}, N_i\right] + \sum_{j\neq i}^{m}\left[U_j\left(\frac{W_j}{P_c}, N_j\right) - U_j^0\right]$ in comparison to a strike.

The industry-specific employer organization earns Π_i with, and no profits without a wage contract. The Nash solution for industry i follows from maximizing the

product of the gains of reaching agreement for the national union and the employer organization:

$$\max Z_i^{mc} = \left[U_i \left[\frac{W_i}{P_c}, N_i \right] + \sum_{j \neq i}^{m} \left[U_j \left(\frac{W_j}{P_c}, N_j \right) - U_j^0 \right] \right] \quad x \quad \Pi_i$$

with respect to W_i. N_i, N_j, Π_i and P_c are defined in equations (6), (7) and (10).

This yields,

$$\frac{\partial Z_i^{mc}}{\partial W_i} = \frac{\partial Z_i^{m}}{\partial W_i} - \Pi_i \sum_{j \neq i}^{m} \frac{dU_j}{dW_i} + \frac{\partial \Pi_i}{\partial W_i} \sum_{j \neq i}^{m} \left[U_j - U_j^0 \right] = 0 \qquad (12)$$

$$\text{with} \sum_{j \neq i}^{m} \frac{dU_j}{dW_i} = \sum_{j \neq i}^{m} \frac{U_{w,j}}{P_c} \frac{W_j}{W_i} \epsilon_i + \sum_{j \neq i}^{m} U_{N,j} \frac{\partial N_j}{\partial W_i}$$

In proposition 1, we compare the solutions for a localized and coordinated bargaining system.

PROPOSITION 1: Under general conditions (to be specified below), nominal wages in each industry are lower and employment is higher in a coordinated than in a localized bargaining system. Moreover, a localized bargaining structure leads to a higher general price level at the cost of a lower level of real activity.

Proof:

a. Evaluate $\frac{\partial Z_i^{mc}}{\partial W_i}$ in (12) at the optimal wage W_i' that would prevail in a localized bargaining system. Since $\frac{\partial Z_i^{m}}{\partial W_i} = 0$ at W_i', the first part of equation (12) drops out and we obtain:

$$-\Pi_i \sum_{j\neq i}^{m} \frac{U'_{w,j}}{P'_c}\frac{W'_j}{W'_i}\epsilon'_i + \Pi_i \sum_{j\neq i}^{m} U'_{N,j}\frac{\partial N'_j}{\partial W'_i} + \frac{\partial \Pi'_i}{\partial W'_i}\sum_{j\neq i}^{m}[U'_j - U^0_j] \qquad (12b)$$

A prime denotes that the function is evaluated at W'_i. Since the second-order conditions for a maximum require that $\frac{\partial^2 Z^{mc}_i}{\partial W_i^2} \leq 0$, the objective function is increased by a lower wage when the expression in (12b) is smaller than or equal to zero. The wage must then be lowered below W'_i in order to reach a maximum in a coordinated bargaining system. Since $\frac{\partial \Pi'_i}{\partial W'_i} \leq 0$ and $\epsilon'_i \geq 0$, the first and last terms of (12b) are nonpositive. For reasons discussed before, $\frac{\partial N'_j}{\partial W_i} \leq 0$ for all or most i and j, so that (12b) is negative and proposition (1) holds. Only in exceptional cases, a wage increase in industry i would stimulate employment in the rest of the economy. Even then, W_i only exceeds W'_i when $\sum_{j\neq i}^{m} U'_{N,j}\frac{\partial N'_j}{\partial W'_i}$ is large enough to dominate the negative terms in equation (12b). This seems unlikely for any particular industry and very improbable for a large enough number of industries to reverse the basic result of proposition 1.

b. With lower nominal wages, firms hire additional workers and produce more. Finally, wage moderation in all sectors results in a lower general price level.

Proposition 1 is best explained by referring to the well known concept of negative externalities. The wage increase of one industry raises the general price level for everyone and, in this way, creates a negative externality for workers in other industries. The total utility loss of the real wage reduction for workers outside industry i is measured by the first term of equation (12b). The wage increase also reduces aggregate disposable

income and intermediate demand which causes economy-wide unemployment. The second term of equation (12b) reflects the utility cost of this decline in employment for union members who are employed in industries other than i. An industry-specific union does not care about the negative repercussions of its wage decision on other unions' utilities. A national union internalizes the externality because it represents workers in the whole economy. In order to keep inflation and unemployment under control, it bargains for a lower nominal wage. An industry-specific union has no incentive to moderate its wage demands because, as long as other industries do not follow its example, such unilateral wage moderation would lower its utility.

In the recent macroeconomic literature on trade unions only Jackman (1985) makes related externality arguments.[8] He only considers aggregate demand externalities in a closed economy consisting of two perfectly competitive industries with constant-returns-to-scale technologies using labor as the only variable production factor. In this set-up, the marginal product of labor and hence the real wage is at a technologically determined fixed level. Aggregate demand depends exclusively on the level of real money balances. The unions in each industry set the nominal wage unilaterally and thus indirectly determine prices, real money balances, aggregate demand and employment. If they collude, they would set the money wages at the level that would guarantee full employment. Otherwise, they reach a noncooperative Nash equilibrium with higher money wages, and thus lower real money balances and lower employment.

In contrast to Jackman's results, we find that the national union's incentive for wage restraint disappears in perfectly competitive world markets. When prices and demand are determined abroad, the wage setting in one industry has no impact on union members elsewhere in the economy. Mathematically, $\frac{dU_j'}{dW_i'}$ is zero and $U_j' = U_j^0$ for all $j \neq i$.

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[8]although his paper primarily concentrates on the persistence of monetary shocks in a unionized economy with staggered wage setting.

Hence, equation (12b) is equal to zero. The first-order conditions for a localized and a coordinated bargaining system are the same.

The contradiction between the two papers is the consequence of the informational asymmetry implicit in Jackman's set-up. In his model, union leaders realize that a higher wage in one industry decreases real money balances and employment in the other industry while employers do not. It is never explained why union negotiators would be better informed nor do employers play any role in the wage determination process. In effect, Jackman ignores the entire bargaining process by assuming that unions set wages unilaterally. There is no attempt to assure the consistency between the employer's production decisions and bargaining behavior.

While Proposition 1 requires that the wage contract in one industry influences union members elsewhere, it is true for a far wider range of market and information structures than the ones considered in this paper. For instance, wage settlements in one industry would continue to cause real wage and employment adjustments in other industries, when the employer organization controls the output level of the individual firms and, as a multi-plant monopolist, sets marginal cost equal to marginal revenue. In conjectural variations models with endogenous aggregate demand or/and Stackelberg industry leaders, the interindustry links would be at least as strong as before. Likewise, full knowledge of the structure of the economy is a sufficient but not necessary condition for proposition 1 to hold. One could assume that only the national organizations, operating in the whole economy, fully understand the repercussions of a wage settlement. In this reasoning, bargaining parties in a localized bargaining system do not realize that a wage increase in their industries hurts union members elsewhere. They therefore agree on a higher wage than if they were better informed. Consequently, the findings of proposition 1 would be reinforced.

In a different context, externalities in imperfectly competitive markets have recently attracted renewed interest among macroeconomists. Papers by Akerlof and

Yellen (1985), Blanchard and Kiyotaki (1985), Hart (1982), and Drazen (1987), among others, have revived the fundamental Keynesian idea that the real level of activity in an economy may be too low. Equilibrium prices and wages are higher in an imperfectly than in a perfectly competitive equilibrium so that aggregate production is below the socially optimal level. Given other prices and wages, individual wage and price setters have no incentive to decrease their own price or wage. However, if all price and wage setters would decrease their prices and wages simultaneously, aggregate demand and social welfare would rise. Aggregate demand policies, which bring the economy closer to the perfectly competitive outcome, may be welfare improving.

Our results fit in well with some of the aspects of this research. It becomes clear that institutional features of the labor market influence the gap between the privately and socially optimal output. By simultaneously narrowing the mark-up of the nominal wage over the reservation wage in all industries, the national union moves the economy towards the social optimum. In part, the national union therefore acts as a substitute for aggregate demand management. In this interpretation, the strong support of most European governments for labor negotiations between national employer and labor organizations makes a good deal of sense.

Finally, Proposition 1 throws a different light on the effects of a wage indexation system. Indexing wages to consumer prices provides wage earners with automatic protection against inflation. In negotiating an industry wage agreement, a national union does not have to worry about hurting the real income of workers outside the industry and this diminishes the motivation for wage moderation. Wage indexation thus neutralizes part of the employment benefits of having a national union.

IV. National Unions and Endogenous Government Policies

In this section, we relax the assumption that unions and employers consider

government policies to be independent of the outcome of their wage negotiations. Instead, the government follows a known simple "Keynesian" stabilization policy. If aggregate employment falls below the government's target level, it expands its purchases of domestic goods in proportion to the gap between actual and target employment. This policy rule resembles the specification in Calmfors (1984), Calmfors and Horn (1985, 1986), and Driffill (1985), and is summarized as follows:

$$G_i = G_i (N_i, N_{-i}) \qquad \text{for } i = 1,...m \tag{13}$$

We only consider the situation where aggregate employment falls short of the target rate. For this range $\frac{\partial G_i}{\partial N_i}$ and $\frac{\partial G_i}{\partial N_{-i}} \leq 0$ where $\frac{\partial G_i}{\partial N_{-i}}$ is a vector of first derivatives of G_i with respect to all employment levels outside of industry i. The fact that $\frac{\partial G_i}{\partial N_{-i}} \leq 0$ indicates that the government also stimulates the production of industry i when employment falls elsewhere. With aggregate demand policies, all or most industries benefit from a fiscal expansion. For simplicity, the financing of the policy is not considered here. It can be shown that the results of this section hold for a wide range of tax systems as long as increasing government expenditures stimulates employment.

With the above policy rule, wage contracts between union and employers have an impact on government spending through their impact on employment. Large wage increases lead to unemployment which triggers expansionary fiscal policies. Mathematically, this is seen by using equations (6) and (13) to express government expenditures as a function of wages and all relevant exogenous variables.

$$G_i = G_i (W_i, W_{-i}, V) \tag{14}$$

with $\frac{\partial G_i}{\partial W_j} \geq 0$ for all i and j.

We now analyze the wage determination in **a localized bargaining system**

assuming that the union and the employer take the policy rule into account. Equation (14) is an additional constraint for industry negotiators during the bargaining process. In all other respects, the bargaining problem is identical to the previous case of a localized bargaining system with an independent government. The bargaining outcome for industry i is derived from the following maximization process:

$$\max \; Z_i^d = U_i \left(\frac{W_i}{P_c^d}, N_i^d \right) . \; \Pi_i^d$$

with respect to W_i, subject to the government rule in equation (14), and subject to equations (6), (7) and (10) for N_i^d, Π_i^d and P_c^d. The superscript d indicates that the government policy depends on the wage outcomes in the economy.

This maximization problem is solved by first substituting the policy rule in the labor demand, profit, and consumer price functions. Subsequently, the obtained expressions for N_i, Π_i, and P_c are substituted in the objective functions and maximized with respect to W_i.

The first-order conditions for a maximum are:

$$\frac{\partial Z_i^d}{\partial W_i} = \frac{\partial Z_i^m}{\partial W_i} - \frac{U_{w,i} \, w_i}{P_c^d} \Pi_i^d \sum_{k=1}^{m} \frac{\partial P_c^d}{\partial G_k} \frac{\partial G_k}{\partial W_i}$$

$$+ U_{Ni} \, \Pi_i^d \sum_{k=1}^{m} \frac{\partial N_i^d}{\partial G_k} \frac{\partial G_k}{\partial W_i} + U_i \sum_{k=1}^{m} \frac{\partial \Pi_i^d}{\partial G_k} \frac{\partial G_k}{\partial W_i} = 0 \qquad (15)$$

$$\text{with } \frac{\partial Z_i^m}{\partial W_i} = \left[\frac{U_{w,i}}{P_c^d} (1 - \epsilon_i) - s_i U_{N,i} \right] \Pi_i^d + U_i \frac{\partial \Pi_i}{\partial W_i}$$

Equation (15) shows the effects of the policy rule. The $\frac{\partial Z_i^m}{\partial W_i}$ term corresponds to the first-order conditions for a localized bargaining system with an independent government (see

equation (11)). When the labor contract in industry i does not take the stabilization policy into consideration, $\frac{\partial Z_i^m}{\partial W_i}$ is zero at the optimal wage. The remainder of the equation measures the impact of the government response to a wage change in industry i. The second term of equation (15) reflects the inflationary consequences of the policy rule for the union's marginal utility. The government effort to reduce unemployment generates inflation and therefore decreases the benefit of a nominal wage gain for union members. The third term measures the union's utility of the higher employment in industry i. By expanding public sector expenditures, the policy reduces the employment loss of a wage increase for the union. In general, we would expect the utility benefits of the employment expansion to outweigh the inflationary cost. In this case, the part of equation (15) that represents union preferences is positive. With the stabilization policy, the union would then bargain for higher wages. As seen in the last term of equation (15), the expansionary government policies further offsets some of the profit losses from the wage increase. This diminishes the employer's resistance against wage concessions. As a result, the union and the employer exploit the government's willingness to absorb some of the employment consequences of a wage increase by setting the wage above the level they would otherwise choose. This point was first made by Calmfors (1984).

We now discuss the national union's response to the government policy rule in **a coordinated bargaining system**. The set-up of the bargaining problem is similar to the analysis of a coordinated bargaining system with exogenous government policies. Denoting U_j^0 as the disagreement outcome in industry j, the cooperative Nash bargaining solution for a coordinated bargaining system is found by maximizing:

$$Z_i^{dc} = \left[U_i\left(\frac{W_i}{P_c^d}, N_i^d\right) + \sum_{j \neq i}^{m} \left[U_j\left(\frac{W_j}{P_c^d}, N_j^d\right) - U_j^0 \right] \right] \times \Pi_i^d$$

with respect to W_i, subject to the policy rule in equation (14) and the definitions N_i^d,

N_j^d, Π_i^d, and P_c^d in equations (6), (7), and (10).

This yields:

$$\frac{\partial Z_i^{dc}}{\partial W_i} = \frac{\partial Z_i^d}{\partial W_i} + Q_i - \Pi_i^d \sum_{j \neq i}^{m} \frac{U_{w,j} w_j}{P_c^d} \sum_{k=1}^{m} \frac{\partial P_c^d}{\partial G_k} \frac{\partial G_k}{\partial W_i}$$

$$+ \Pi_i^d \sum_{j \neq i}^{m} U_{N,j} \sum_{k=1}^{m} \frac{\partial N_j^d}{\partial G_k} \frac{\partial G_k}{\partial W_i} + \sum_{k=1}^{m} \frac{\partial \Pi_i^d}{\partial G_k} \frac{\partial G_k}{\partial W_i} \sum_{j \neq i}^{m} (U_j - U_j^0) = 0 \qquad (16)$$

$$\text{with } Q_i = - \Pi_i^d \sum_{j \neq i}^{m} \frac{U_{w,j}}{P_c^d} \frac{W_j}{W_i} \epsilon_i + \Pi_i^d \sum_{j \neq i}^{m} U_{N,j} \frac{\partial N_j}{\partial W_i} + \frac{\partial \Pi_i}{\partial W_i} \sum_{j \neq i}^{m} (U_j - U_j^0) \leq 0$$

To compare the negotiated wage in the two bargaining systems, we determine the sign of $\frac{\partial Z_i^{dc}}{\partial W_i}$ at the wage in a localized bargaining system, that is when $\frac{\partial Z_i^d}{\partial W_i} = 0$. Q_i is negative and summarizes the national union's motivation for wage moderation in an economy with an independent government (compare Q_i to $\frac{\partial Z_i^{mc}}{\partial W_i} - \frac{\partial Z_i^m}{\partial W_i}$). The rest of equation (16) measures the impact of the government policy on the utility of union members outside industry i. The fiscal accommodation results in new jobs throughout the economy at the cost of more inflation. When the employment effects dominate, a wage increase in one industry creates a positive externality for union members in the whole economy. If this positive externality outweighs the union's reasons for wage restraint, a coordinated bargaining system is characterized by higher wages and lower employment than in a localized bargaining system ($\frac{\partial Z_i^{dc}}{\partial W_i} - \frac{\partial Z_i^d}{\partial W_i}$ would then be positive). In any event, accommodating aggregate demand policies reduce the national union's incentive for wage moderation. The benefits of the fiscal expansion, following a wage increase in one

industry, are not confined to that industry. For this reason, the national labor and employer organization exploit the policy rule more thoroughly than an industry-specific organization would.

For similar reasons a strictly nonaccommodating policy would strengthen the wage moderation by a national union. Consider a government which uses aggregate demand policies for correcting trade balance deficits and maintaining an acceptable rate of inflation. The national union realizes that the government restricts its expenditures on all goods if wage contracts result in a trade deficit or in unacceptable inflation. This would hurt all union members in the economy. For this reason, the national union bargains for lower wages than in a localized bargaining system.

V. Conclusion

This paper analyzed the wage and employment consequences of centralized bargaining in a small open unionized economy with fixed exchange rates and imperfectly competitive world markets. A distinction was made between a bargaining system with and without a national union. A multi-industry model was developed which integrated the different bargaining structures. In this model, wages are determined as the solution to a symmetric Nash cooperative bargaining game and employment is found as the point on the labor demand curve corresponding to the contracted wage level. The model was used to analyze whether the presence of a national union achieves wage moderation and higher employment levels.

We found this to be true under two well-defined conditions. First of all, the country should possess some degree of market power in the world market. When demand conditions and inflation are primarily determined abroad, national and industry-specific organizations sign similar wage agreements. Only with significant linkages among industries and when domestic demand constitutes an important component of total

demand, a national union takes into account the negative economy-wide repercussions of an industry wage agreement and settles for a lower nominal wage. Secondly, the national union should bear the full employment and inflationary cost of a wage increase. Accommodating government policies and wage indexation schemes achieve the opposite result and reduce the national union's incentive for wage restraint.

These findings should caution against any explanation of European unemployment based on simple cross-country correlations between centralization in bargaining and labor market performance. The potential role of a national union depends on a wide range of institutional and structural characteristics of the economy and on the choice of government policy. For this reason, a more detailed country by country approach seems more promising for future research in this area. One could analyze whether the economic structure of a particular country provides the national union with an incentive for wage restraint. This would amount to measuring the impact of industry wages on the general price level and on employment levels in other industries. Also, shifts in bargaining and policy regimes can be studied. Belgium, for instance, had a tradition of strong national organizations and nationally determined labor contracts but in the mid-seventies shifted towards a system of regional and industry-specific negotiations. At about the same time, the government embarked on an accommodation policy of the post-oil-shock recession. These developments coincided with a dramatic deterioration of the employment situation which is generally explained by a surprising lack of real wage moderation.

Finally, this paper has some implications for government policy. The support of most European governments for centrally determined labor contracts makes sense insofar as the government retains its independence in conducting policies. This implies a delicate balance of power which seems to have prevailed during the fifties and the sixties in most European countries with strong national unions. But, in the seventies, the national unions in countries such as Belgium, The Netherlands, and Denmark used their political influence to avoid wage concessions. Expansionary demand policies resulted in

mounting budget deficits but were not able to prevent sharp increases in unemployment. The German government, on the other hand, adhered to a strict nonaccommodating policy in the seventies and experienced the smallest increases of the unemployment rate of all EEC countries excluding Luxembourg. It thus appears that a government commitment to maintain external equilibrium and low inflation may be necessary to moderate excess wage demands in countries with powerful national unions. The austerity programs, which were adopted in the early eighties by several smaller European countries with centralized bargaining, indicate that this point is now better understood.

TECHNICAL APPENDIX

We define total revenue, TR_i, as $TR_i = W_iN_i + \Pi_i + H_i + FC_i$ with H_i = total intermediate cost in industry i and FC_i = total fixed costs in industry i.

Take the derivative of TR_i with respect to W_i

$$\frac{\partial TR_i}{\partial W_i} = N_i - s_iW_i + \frac{\partial \Pi_i}{\partial W_i} + \frac{\partial H_i}{\partial W_i}$$

with s_i = absolute value of the slope of labor demand in industry i.

$\frac{\partial \Pi_i}{\partial W_i}$ and $\frac{\partial N_i}{\partial W_i} = -s_i \leq 0$ for reasons discussed in the text. $\frac{\partial H_i}{\partial W_i} \leq 0$ because a cutback in production lowers the quantity of intermediate inputs demanded by industry i. The negative repercussions on demand for other industries lowers the prices of intermediate goods, which reinforces the decline in intermediate cost for industry i.

Dividing the right hand side of the previous expression by N_i, $\frac{\partial TR_i}{\partial W_i} \leq 0$ when

$$1 - \frac{s_iW_i}{N_i} + \frac{\partial \Pi_i}{\partial W_i}\frac{1}{N_i} + \frac{\partial H_i}{\partial W_i}\frac{1}{N_i} \leq 0$$

Define $\delta_i = \frac{W_iN_i}{TR_i}$, $\delta_i^{\pi} = \frac{\Pi_i}{TR_i}$, $\delta_i^{h} = \frac{H_i}{TR_i}$,

and $\eta_i = \frac{s_iW_i}{N_i}$, $\eta_i^{\pi} = -\frac{\partial \Pi_i}{\partial W_i}\frac{W_i}{\Pi_i}$, $\eta_i^{h} = -\frac{\partial H_i}{\partial W_i}\frac{W_i}{H_i}$

Converting to elasticities and rearranging we find the expression in the text.

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