Thünen-Series of Applied Economic Theory

Thünen-Reihe Angewandter Volkswirtschaftstheorie

Working Paper No. 17

Wage-Employment Bargaining in a Unionized Oligopoly and International Market Integration

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1998

Wage Employment Bargaining in a Unionized Oligopoly and International Market Integration[1]

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Abstract

In a framework of a n-union/n-firm oligopoly, this paper analyzes the incentive for firms and unions to adopt efficient bargaining, i.e. negotiating over wages together with employment. The analysis is conducted for the case of autarchy and for an integrated product market. Firm profits, union utility and industry rents are compared under two different bargaining regimes – the right-to-manage model and the efficient bargaining model. For centralized negotiations, it is shown that under autarchy bargaining over wages and emplyment does not necessarliy imply efficiency as total industry rents decrease. In the case of an integrated product market, however, adopting efficient bargaining raises rents if the market share of the domestic industry is relatively small.

JEL classification: J50, L13

Keywords: Trade Unions, Oligopoly, Efficient Bargaining, Integration

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[1] I would like to thank Michael Rauscher for helpful comments.

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1. Introduction

The process of wage determination is increasingly perceived as an important determinant of the international competitiveness of a firm or an industry. The ongoing process of product market integration therefore raises the question as to how national systems of wage determination will be affected by increasing international competition and vice versa. The institutional determinants of the wage-setting process concern several features of the labor market, such as trade union density, minimum wage regulations, unemployment benefits and the degree of centralization in collective bargaining.

The importance of bargaining centralization has been stressed in a number of papers (see for example Calmfors & Driffill (1988), Comeo (1995), Soerensen (1994)). Another interesting aspect concerning the interaction between product market integration and institutional labor market characteristics is the question of the scope of bargaining, i.e. whether firms and unions bargain either over wages solely or over wages together with employment. Bargaining over wages is referred to as the *right-to-manage model* (Nickell and Andrews, 1983), in which firms and unions bargain over wages solely and firms set employment unilaterally. In the *efficient bargaining model*, in contrast, wages together with employment are bargained over (McDonald and Solow, 1981). The focus on the scope of bargaining may be motivated by recent empirical evidence suggesting a considerable change in labor-management relations in the EC and in the United States, since non-pecuniary aspects, such as job-security and work time, have become a major issue in union-firm negotiations as foreign competition intensified (e.g. Goto (1990), Katz (1993)). In spite of the empirical evidence, there has been relatively little economic analysis of this aspect of union-firm negotiations.

One interesting exception is Yang (1995), who examines this issue from a strategic point of view and endogenously determines the mode of bargaining in a duopolistic product market. He shows that efficient bargaining over wages *and* employment is preferred by both the firms and the unions and therefore arises in equilibrium. The purpose of the present analysis is to address the question as to whether similar results may be derived for the more general case of a n-firm/n-union oligopoly, in which wages or wages together with employment will be determined by Nash bargaining between firms and unions, respectively. The framework of a unionized oligopoly is employed because product market imperfections allow the generation of rents over which unions and firms can bargain.

Specifically, the questions addressed in this paper include the following: Does bargaining over both wages and employment necessarily imply efficiency in a n-firm/n-union set-up? Do firms and unions gain from adopting efficient bargaining under intensifying foreign competition? How does increasing foreign competition change the preferences of the bargaining parties concerning the scope of bargaining?

Evaluating the impact of foreign competition on the bargaining preferences requires an examination of firm profits, union utility and industry rents under both bargaining regimes in the cases of autarchy and of an integrated product market. Furthermore, the following analysis will be conducted for centralized negotiations on the industry-level. Based on the assumption that on the industry-level, the mode of bargaining may be coordinated between each union-firm pair, the scope of bargaining does not represent a strategic variable for each bargaining unit. Thus, in the present analysis, the bargaining mode will not be endogenously determined, but will be taken as exogenously given for the whole industry.

For a closed economy, it will be shown that under certain conditions neither party benefits from efficient bargaining and total rents will always be lower. This stands in contrast to the well known one-firm/one-union set-up, where efficient bargaining turns out to be Pareto-efficient. This result is due to the fact, that for the generalized n-firm/n-union setting interactions between the bargaining units have to be taken into account. Thus, under autarchy, bargaining over wages and employment is unlikely to occur in equilibrium. Considering an integrated product market, it will be shown that firms will always be worse off under efficient bargaining. Under certain conditions, however, adopting efficient bargaining raises total domestic industry rents and makes the union better off. Allowing for side-payments, this might therefore provide an incentive to adopt efficient bargaining as foreign competition intensifies. Specifically, it will be shown, that the efficiency of bargaining over wages together with employment depends on the market share of the domestic industry.

The rest of the paper is organized as follows. Section 2 sets up the basic model. Section 3 investigates firm profits, union utility and industry rents under both bargaining regimes in the case of autarchy. Section 4 examines the equilibrium outcomes for an integrated product market.

2. The Model

2.1. Union and firm objectives

This section presents a partial-equilibrium model of a unionized oligopoly for a homogeneous commodity. The commodity is supplied by n identical profit-maximizing firms, denoted by $j = 1,..., n$. Following the conventional literature, firms are assumed to produce with a constant marginal product of labor, the only variable input. Normalizing the output per worker to unity yields $q_j = L_j$, where q_j is output and L_j is employment in firm j. The marginal cost for firm j is the negotiated wage w_j, which it pays to each of its L_j employees and fixed costs are F. Firms are assumed to face a linear inverse demand function

(1) $$p(Q) = a - bQ, \quad \text{where } Q = \sum_{j=1}^{n} q_j .$$

The operating profits for firm j are given by

(2) $$\pi_j(q_1,...,q_n) = q_j(a - bQ - w_j), j = 1,...,n .$$

Workers in each firm are represented by a firm-specific union. However, by allowing collusive wage setting behaviour between unions, this may capture as well the case of firm-level organization within an industry-wide union (see Dowrick, 1989).

Preferences over employment and wages are represented by the union utility function

$$U_j(w_j, q_j) = w_j \cdot q_j + (M_j - q_j) \cdot \overline{w}, \quad j = 1, \ldots, n \tag{3}$$

where $\overline{w}$ denotes the alternative wage, which workers may expect to earn elsewhere in the economy. $\overline{w}$ depends positively on the alternative outside wage as well as unemployment benefits, and is negatively affected by the unemployment rate. Since the general price level is normalized to unity and the industry considered is assumed to be small compared to the rest of the economy, w_j denotes both the real and the nominal wage. M_j represents exogeneous membership of union *j*. With $M_j < q_j$ the probability of getting a job is q_j / M_j, and the probability of being unemployed is $(M_j - q_j)/M_j$. With M_j exogeneous, this utility function can therefore be interpreted as the expected income of a worker facing random lay-off or the objective function of a utilitarian union, where constant marginal utility reflects the special case of risk-neutrality (Oswald, 1985).

2.2. Wage and employment determination

Two dominating approaches have been established in the trade union literature to model the determination of wages and employment. According to the the right-to-manage model (Nickel and Andrews, 1983), firms and unions bargain over wages solely, and the firm retains the discretion to set employment unilaterally on its labor demand curve, after wage negotiations. The commonly used model of a ‚monopoly-union', which sets the wage unilaterally while the firm sets employment, can therefore be thought of as a special case of the right-to-manage model conferring upon the union the whole bargaining strength. Due to this rather unrealistic assumption, the monopoly-union approach has often been criticized and it seems therefore reasonable to assume the wage to be fixed by collective agreement and not simply imposed by the trade union. However, as long as unions are willing to trade off wages for employment, wage employment combinations on the labor demand curve turn out to be inefficient in the sense that there exist alternative wage-employment combinations, which make both the firm and the union better off.

Hence, if the outcome is to be Pareto-efficient, bargaining should cover wages as well as the employment level (McDonald and Solow, 1981). To illustrate the determination of wage and employment under the two different modes of bargaining, it may be useful to contrast the case of efficient bargaining with the extreme case of a monopoly-union in a one-firm/one-union setting[3]. In Figure 1, *MR* represents the firm's marginal-revenue curve (demand for labor), π^i are the isoprofit curves, which intersect the marginal revenue curve at the maximal wage. I^i are the union indifference curves.

According to the monopoly-union model, the union fixes the wage and the firm sets employment to maximize profits. The wage-employment outcome is therefore determined by the tangency of an indifference curve with the firm's labor demand curve. There are, however, a number of wage-employment combinations (represented by the lens between the isoprofit curve π^0 and the union indifference curve I^0) at which both the firm and the union are better off. The efficient bargaining outcomes lie on the contract curve *CC*, which can be derived as the locus of tangencies between the isoprofit-curves and the union indifference curves.

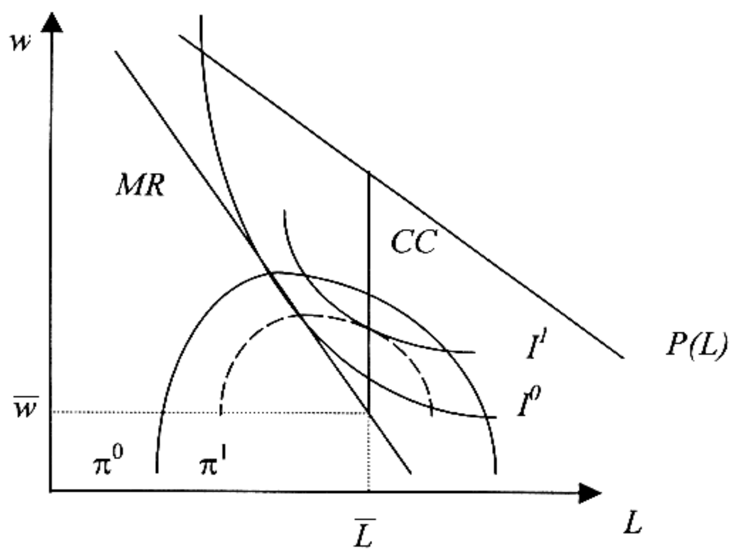

Figure 1 Wage determination in the monopoly-union and efficient bargaining model

[3] Here, the subscripty *j* will be omitted for convenience.

Since no bargain will be struck with $w < \overline{w}$, the contract curve begins at the alternative wage $\overline{w}$. It ends reaching the inverse demand function as with a wage exceeding the product price the firm's operating profit becomes negative. Equating the slopes of the isoprofit curves and the union indifference curves yields

$$(4) \qquad -\left.\frac{dw}{dq}\right|_{d\pi=0} = \frac{a-w-2bq}{q} = -\frac{w-\overline{w}}{q} = -\left.\frac{dw}{dq}\right|_{dU=0}$$

$$\Leftrightarrow \overline{q} = \frac{a-\overline{w}}{2b}$$

Thus, the contract curve derived from the union utility function (3) and the firm's profit function (2) turns out to be vertical at the competitive employment level, $\overline{L}$, thereby reflecting the assumption of risk-neutrality of union members[4].

3. Collective Bargaining in a Closed Economy

This section explicitly derives and compares wage and employment outcomes in a n-firm/n-union oligopoly under the two modes of bargaining in the case of centralized negotiations. Centralization has two dimensions here. First, it is assumed that the mode of bargaining is not a strategic variable for individual unions and firms. Thus, throughout the following analysis, the mode of bargaining will not be endogenously determined between each union-firm bargaining unit and is instead taken as exogenously given for the whole industry. I.e. all union-firm pairs either negotiate over wages only or they behave according to the efficient bargaining hypothesis.

The second dimension along which centralization occurs is related to collusive wage setting behaviour. In the efficient bargaining case, however, it will turn out that the

[4] Generally, it can be shown, that a utility function reflecting risk-aversion of workers implies a positively sloped contract curve. Unions produce overemployment as it is ex post more attractive to be employed than unemployed. Finally, if unions redistribute income so as to equalize ex post utilities, the contract curve will be negatively sloped as the incentive to be employed will be diminished (McDonald & Solow, 1981).

degree of centralization reflected by wage setting behaviour has no impact on wages so that centralization refers to the mode of bargaining solely.

The outcome of negotiations in the right-to-manage model is to be determined by the subgame perfect Nash equilibrium of the following two-stage game: In the first stage, wages are negotiated between the firms and the unions. In the second stage, firms simultaneously set employment in a Cournot-like quantity game. The wage and employment outcome under efficient bargaining are in contrast determined by solving a one-stage game, in which unions and firms bargain over wages and employment simultaneously.

3.1. Efficient bargaining

The outcomes of wage and employment negotiations are modelled in terms of the generalized Nash solution, allowing for asymmetric bargaining strength. The equilibrium wage is derived by maximizing the asymmetric Nash product with respect to q_j and w_j

(5) $$N_j = \left((U_j(w_j, q_j) - \overline{U})^{\gamma} (\pi_j(w_j, q_j) - \overline{\pi})^{(1-\gamma)} \right),$$

where $\gamma \; \varepsilon \; (0,1)$ represents bargaining power of the union[5]. As γ approaches 1, the union objectives carry all the weight, whereas a value of zero confers upon the firm the whole bargaining strength. A value of $\gamma =$ ½ corresponds to the symmetric Nash maximand.

$\overline{U}$ and $\overline{\pi}$ are the relevant fallback-utilities of the two parties and determine the upper and lower limits of the feasible bargaining set on the contract curve. Following Binmore et al. (1986), the fallback utilities are to be identified either with each side's option during a dispute or with their options should bargaining break down. Here, for simplicity, it will be assumed that $\overline{\pi} = 0$ and $\overline{U} = \overline{w} \cdot M_j$, which is the

[5] The asymmetric Nash solution can be developed either from an axiomatic framework (Svejnar, 1986) or from a strategic perspective (Binmore et al., 1986).

alternative income of union members. Given the negotiated wages and quantities of the rest of the industry, for each union-firm bargaining unit the equilibrium wage, w_j, and quantity, q_j, must satisfy the following condition:

(6) $$(w_j^{EB}, q_j^{EB}) = \underset{w_j, q_j}{\arg\max}\, N_j(q_1, \ldots, q_n, \overline{w}, \gamma),$$

The first-order conditions are:

(7) $$\frac{\partial \ln N_j}{\partial w_j} = \frac{\gamma}{w_j - \overline{w}} - (1-\gamma)\frac{1}{a - bQ - w_j} = 0$$

(8) $$\frac{\partial \ln N_j}{\partial q_j} = \frac{\gamma}{q_j} + (1-\gamma)\frac{a - 2bq_j - w_j - b\sum_{i \neq j} q_i}{(a - bQ - w_j)q_j} = 0$$

Note, that wages of other firms w_i, $i \neq j$,do not enter the first-order conditions (7) and (8). An interesting feature of the efficient bargaining equilibrium is therefore the fact, that the degree of bargaining centralization reflected by wage conjectures concerning wages of other firms is not relevant to the solution of the bargaining problem. As Dowrick (1989, p. 1128) has pointed out, „a union-firm pair is affected by the employment decisions of other firms because these decisions influence industry output and price; but wage outcomes affect only the distribution of net income within a union-firm pair". Hence, in the efficient bargaining case, the centralization of negotiations only refers to the mode of bargaining.

Based on the assumption, that all bargaining-units are identical, a symmetric industry equilibrium can be derived by imposing equal outputs and wages. Combining eqs. (7) and (8) yields the generalized contract curve *CC* corresponding to the n-firm/n-union set-up:

$$(9) \qquad w - \overline{w} = w - (a - bQ) + bq_j = w - P + q_j P'$$

$$\Leftrightarrow q_j^{EB} = \frac{a - \overline{w}}{b(n+1)}$$

Eq. (9) implies, that the contract curve will be vertical at the competitive employment level corresponding to the alternative wage level $\overline{w}$. Finally, eq. (8) implies:

$$(10) \qquad w_j = \gamma(a - bQ) + (1-\gamma)(a - bQ - bq_j) = \gamma P + (1-\gamma)(P + q_j P'),$$

which is referred to as the Nash bargaining curve or equity locus (Dowrick, 1989). The Nash bargaining curve determines the negotiated wage on the contract curve. It indicates, that the negotiated wage is a weighted average of the inverse demand function and the marginal revenue product. As γ approaches 1, total rents are appropriated by the unions. A value of zero implies $w_j = P + q_j P'$, so that with eq. (9) workers are paid the alternative wage $\overline{w}$.

Specifically, eqs. (9) and (10) imply the following equilibrium wage outcome

$$(11) \qquad w_j^{EB} = \overline{w} + \gamma \frac{(a - \overline{w})}{n+1}.$$

Rents $R_j = (a - bQ - \overline{w}) \cdot q_j$, profit and utility outcomes per bargaining unit are characterized by

$$(12) \qquad R_j^{EB} = \frac{(a - \overline{w})^2}{b(n+1)^2}, \quad \pi_j^{EB} = \frac{(1-y)(a - \overline{w})^2}{b(n+1)^2}, \quad U_j^{EB} = \frac{\gamma(a - \overline{w})^2}{b(n+1)^2}.$$

According to eq. (11), the equilibrium wage w_j^{EB} is an increasing function of the alternative wage and the union's bargaining strength; the wage is decreasing in the number of firms in the industry. The intuition for this latter result is straightforward. The less competitive an industry, the higher will be the pool of rents over which unions can bargain (Dowrick, 1989). Note that in the case of risk neutrality the rent per union-firm pair is not affected by the bargaining strength of the union as the equilibrium quantity will always be equal to the competitive employment level corresponding to the alternative wage level, $\overline{w}$.

3.2. Bargaining in the right-to-manage model

The equilibrium of the two-stage game will be computed proceeding by backward induction. In the second stage of the game, firms set employment simultaneously, taking the negotiated industry wage level, w_j, as given, which applies to all firms of the industry. Given the employment decisions of the rest of the industry, maximizing profits yields output of firm j, q_j, and industry output, Q:

(13) $$q_j = \frac{a - w_j}{b(n+1)} \quad \text{and} \quad Q = \frac{na - nw_j}{b(n+1)}, \quad j = 1,\ldots,n.$$

The equilibrium industry wage, w_j, must satisfy the following condition:

(14) $$w_j = \underset{w_j}{\arg\max}\, N_j(w_j,\ldots,w_j,q_1,\ldots,q_n,\overline{w},\gamma)$$

subject to $$q_j = \frac{a - w_j}{b(n+1)} \quad .$$

Based on the assumption that the bargaining power of both parties will be affected by exogenous factors rather than by the scope of bargaining itself, bargaining strength is assumed to be the same as in the efficient bargaining case[6].

[6] This stands in contrast to Yang (1995), who assumes that under wage bargaining the union has the whole bargaining power whereas under wage-employment negotiations bargaining strength is symmetric.

Thus, N_j will be defined as in eq. (5). Solving (14) implies for the industry wage, w_j, and quantity per firm, q_j [7]:

$$w_j = \overline{w} + \gamma \frac{(a-\overline{w})}{2} \quad \text{and} \quad q_j = \frac{(2-\gamma)(a-\overline{w})}{2b(n+1)} \tag{15}$$

Note, that in contrast to the efficient bargaining outcome, the negotiated wage does not depend on the number of firms in the industry. Under efficient bargaining, the wage depends on the rent per bargaining unit, which in turn is influenced by the number of firms. Here, however, the degree of product market competitiveness does not influence the wage as profits are maximized given the negotiated wages. Therefore the profit-margin constitutes an exogenous wedge between the wage and the product price, which does not influence the union's trade-off between employment and wages (Dowrick, 1989). Inserting w_j and q_j into (2) and (3) yields

$$\pi_j = \frac{(2-\gamma)^2(a-\overline{w})^2}{4b(n+1)^2} \quad \text{and} \quad U_j = \frac{\gamma(2-\gamma)(a-\overline{w})^2}{4b(n+1)}. \tag{16}$$

Industry rents per firm, R_j, are

$$R_j = (a-bQ-\overline{w})q_j = \frac{(2-\gamma)(2+\gamma\cdot n)(a-\overline{w})^2}{4b(n+1)^2}. \tag{17}$$

3.3. Comparison of the equilibrium outcomes

The solutions for the equilibrium wage, employment level, firm profits, union rents, and industry rents under the two modes of bargaining are summarized in Table 1.

[7] For the first-order-condition see the Appendix.

Efficient Bargaining		Right-to-Manage
$w_j^{EB} = \overline{w} + \gamma \dfrac{(a-\overline{w})}{n+1}$	<	$w_j = \overline{w} + \gamma \dfrac{(a-\overline{w})}{2}$
$q_j^{EB} = \dfrac{(a-\overline{w})}{b(n+1)}$	>	$q_j = \dfrac{(2-\gamma)(a-\overline{w})}{2b(n+1)}$
$\pi_j^{EB} = (1-\gamma)\dfrac{(a-\overline{w})^2}{b(n+1)^2}$	<	$\pi_j = \dfrac{(2-\gamma)^2(a-\overline{w})^2}{4b(n+1)^2}$
$U_j^{EB} = \dfrac{\gamma(a-\overline{w})^2}{b(n+1)^2}$	> <	$U_j = \dfrac{\gamma(2-\gamma)(a-\overline{w})^2}{4b(n+1)}$
$R_j^{EB} = \dfrac{(a-\overline{w})^2}{b(n+1)^2}$	<	$R_j = \dfrac{(2-\gamma)(2+\gamma \cdot n)(a-\overline{w})^2}{4b(n+1)^2}$

Table 1 Equilibrium outcomes under the two different bargaining modes for n > 1

Comparing the equilibrium outcomes under efficient bargaining and the right-to-manage- model reveals that total industry rents will always be lower under efficient bargaining, i.e. $R_j^{EB} < R_j$, for $n > 1$ and $0 < \gamma < 1$. The interesting thing about this result is that it differs from the prediction derived in a one-union/one-firm set-up, where $R_j^{EB} > R_j$. This can be explained by the fact that if $n > 1$ interactions between the union-firm bargaining units have to be taken into account. As has been already stated, under efficient bargaining the quantity settled in firm j is not affected by the wages settled in the rest of the industry. Since a firm's competitive position is only determined by the negotiated quantity, wages no longer serve as a commitment to setting output levels but may rather be thought of as the outcome of the distribution of rents within each bargaining unit. Rents per union-firm pair are, in turn, affected by the negotiated quantities. Since the union's share of the pie will increase with the size of total rents, each firm's quantity will be set so as to maximize the rent per bargaining unit, given the union's degree of risk aversion. Since quantities are settled non-cooperatively by each bargaining unit, rent maximization per firm does not involve a maximization of total industry rents, for $n > 1$.

In the case of wage bargaining, however, firms set quantities so as to maximize profits in the second stage of the game, given the negotiated wage, which exceeds $\overline{w}$ for γ > 0. According to eq. (13), the equilibrium quantity under wage bargaining turns out to be lower than the quantity under efficient bargaining and gives rise to a higher industry price and rents. A wage exceeding the competitive wage, $\overline{w}$, may therefore be thought of as a device for firms to commit themselves to a lower quantity closer to a more cooperative quantity solution.

What about the preferences of the bargaining parties concerning the two modes of bargaining?
Comparing the different profit outcomes leads to the conclusion that firms will always be better off under pure wage negotiations, i.e. $\pi^{EB} < \pi$ for all *n*. This result becomes immediately clear if one considers the fact that all wage-employment combinations on the contract curve lie to the right of the marginal-revenue curve. Thus, under efficient bargaining the negotiated wage always exceeds the marginal revenue product, whereas under the right-to-manage approach each firm has the discretion to choose its profit maximizing quantity on the labor demand curve.

As regards union preferences, comparing the utility outcomes yields $U^{I} > U^{EB}$, for $(n+1)(2-\gamma) > 4$, which holds for n > 2 and for all γ. Following Yang (1995), an intuitive explanation for this conclusion may be provided as follows: Under wage negotiations, workers benefit from centralized bargaining due to the union's collusive wage behaviour. While firm-level bargaining provides an incentive to cut wages in order to gain a larger share of industry output, this competitive mechanism disappears on the industry level, where a uniform wage applies to all firms. A higher wage can be achieved without losing many jobs. Under efficient bargaining, however, this bargaining strength is balanced out, since a higher employment level settled in firm *j* cuts employment in the rest of the industry.

Thus, under the conditions derived above, in a n-firm/n-union setting neither party profits from adopting efficient bargaining[8]. Moreover, total industry rents, i.e. the ,cake' to be divided between workers and firms, will be lower. This indicates, that bargaining over wages as well and employment turns out to be Pareto-inefficient for $n > 1$. For a closed economy, these results may lead to the conclusion, that this mode of bargaining is unlikely to occur in equilibrium if bargaining takes place on the industry-level.

4. Collective Bargaining in an Integrated Product Market

In this section, the model set up in Section 2 will be extended to analyze the case of an integrated product market in two countries. There are again n firms, where $m < n$ firms are located in the home country and $(n - m)$ firms in the foreign country. To keep the analysis as simple as possible, the labour market in the foreign country is assumed to be competitive, with $\overline{w}$ equal to the competitive wage in the home country. That is, the countries differ with respect to the labor market and the number of firms[9].

Firms are again assumed to face the linear inverse demand function

$$(18) \qquad p(Q) = a - bQ, \quad \text{where } Q = \sum_{j=1}^{m} q_j + \sum_{j=m+1}^{n} q_j^* .$$

where q_j^* represents the output of foreign firm j. Profits for domestic firm $j = 1,..., m$ are given by

[8] As has been demonstrated above, $U^{EB} > U$ holds for $(n + 1)(2 - \gamma) > 4$. Specifically, the case $n = 2$ and γ close to unity provides an exception. For $n = 2$, the wage under efficient bargaining approaches the wage demand under wage bargaining as the number of competing firms is very small. However, with a relatively high γ, quantities set by firms under wage bargaining turn out to be much lower than q^{EB}, so that $U^{EB} > U$ in this special case.

[9] Of course, this model must be seen as a very stylized version of foreign competition. For example, the introduction of trade unions in the foreign labor market would be a straightforward extension of the present analysis. However, the assumption of a competitive foreign labor market might be interpreted as an approximation of a foreign unionized labor market, with unions having negligible bargaining power.

(19) $$\pi_j(q_1,...,q_m,q_{m+1}*,...q_n*)) = q_j(a - bQ - w_j), j = 1,...,m ,$$

where w_j is the negotiated wage. Finally, profits for foreign firms can be written as

(20) $$\pi_j*(q_1,...,q_m,q_{m+1}*,...q_n*) = q_j*(a - bQ - \overline{w}), j = m+1,...,n .$$

4.1. Efficient bargaining in the home country

As in the case of an autarchic regime, wage and employment outcomes under efficient bargaining will be determined by solving a one-stage game, in which unions and firms bargain over wages and employment simultaneously, given the quantities, q_j*, set by the foreign firms.

Taking the domestic employment levels as fixed, foreign firms choose quantities, q_j*, so as to maximize their profits (20). Allowing for symmetry in the home as well as in the foreign country, the best response to q_j is

(21) $$q_j* = \frac{a - \overline{w} - bmq_j}{b(n - m + 1)}, \quad j = m+1,...,n .$$

Given the negotiated wages and quantities of the rest of the industry, for each domestic union-firm bargaining unit the equilibrium wage, w_j, and quantity, q_j, solve:

(22) $$(w_j^{EB}, q_j^{EB}) = \underset{w_j, q_j}{arg\,max}\, N_j(q_1,...,q_m,q_{m+1}*,...,q_n*,\overline{w},\gamma) \quad , \; j = 1,...,m$$

The first order conditions are:

(23) $$\frac{\partial \ln N_j}{\partial w_j} = \frac{\gamma}{w_j - \overline{w}} - \frac{(1-\gamma)}{a - bQ - w_j} = 0$$

(24) $$\frac{\partial \ln N_j}{\partial q_j} = \frac{\gamma}{q_j} + (1-\gamma)\frac{a - b(n-m)q_j^* - 2bq_j - \sum_{i \neq j} q_j - w_j}{a - bQ - w_j} = 0$$

Combining eqs. (23) and (24) yields

(25) $$\gamma(a - b(n-m)q_j^* - b \cdot q_j \cdot m - w_j) = (1-\gamma)(w_j - \overline{w})$$

(26) $$a - \overline{w} = b(m+1)q_j + b(n-m)q_j^*$$

Solving eqs. (21), (25) and (26), the equilibrium outcomes for $w_I^{EB}, q_I^{EB}, U_I^{EB}$ and π_I^{EB} in an integrated product market are:

(27) $$w_I^{EB} = \overline{w} + \gamma \frac{(a - \overline{w})}{n+1}, \quad q_I^{EB} = \frac{a - \overline{w}}{b(n+1)}$$

(28) $$U_I^{EB} = \gamma \frac{(a - \overline{w})^2}{b(n+1)^2}, \quad \pi_I^{EB} = (1-\gamma)\frac{(a - \overline{w})^2}{b(n+1)^2}$$

As can be seen from eqs. (27) and (28), the equilibrium outcomes for $w_I^{EB}, q_I^{EB}, U_I^{EB}$ and π_I^{EB} turn out to be identical to the outcomes of the n-firm-oligopoly in a closed economy. The intuition for this result is straightforward: Since wage outcomes only affect the distribution of net income within a union-firm pair, each firm's quantity will be set so as to maximize the rent per bargaining unit independent on the domestic firm's wage outcomes as well as the foreign wage. As a consequence, the asymmetry concerning the organizational structure of the labor market is only relevant to the distribution of rents within domestic firms but not to the equilibrium quantities settled by domestic union-firm pairs.

4.2. Wage bargaining in the domestic country

In the case of wage bargaining, domestic and foreign firms set employment simultaneously, taken the negotiated domestic industry wage level, w_j, as fixed. Given the employment decisions of the rest of the industry, maximizing domestic profits

$$(29) \qquad \pi_j(q_1,...,q_m,q_{m+1}*,...q_n*) = q_j(a-bQ-w_j), \quad j=1,...,m,$$

and foreign profits

$$(30) \qquad \pi_j*(q_1,...,q_m,q_{m+1}*,...q_n*) = q_j*(a-bQ-\overline{w}), \quad j=m+1,...,n$$

yields output of domestic firms, q_j, and foreign firms, q_j*

$$(31)\, q_j = \frac{(n-m+1)(\overline{w}-w_j)+(a-\overline{w})}{b(n+1)} \text{ and } q_j* = \frac{m(w_j-\overline{w})+(a-\overline{w})}{b(n+1)}, j=1,...,n.$$

The equilibrium industry wage w_j must satisfy the following condition

$$(32) \qquad w_j^I = \underset{w_j}{arg\,max}\, N_j(w_j,...,w_j,q_1,...,q_m,q_{m+1},...q_n,\overline{w},\gamma), j \leq m$$

subject to (31).

Solving eq. (32)[10], the union wage demand, w_j^I, is characterized by

$$(33) \qquad w_j^I = \overline{w} + \gamma \frac{(a-\overline{w})}{2(n-m+1)}.$$

[10] For the first-order-condition see the Appendix.

According to eq. (33), the union wage demand w_j^I is an increasing function of the number of firms in the home country. Comparing w_j^I with w_j^{EB} indicates, that the wage outcome in the right-to-manage case, w_j^I, turns out to be lower than the outcome under efficient bargaining, if $m < (n + 1)/2$. Thus, the smaller the market share of an industry the more moderate will be the negotiated wage. The intuition behind this result is, that a small market share makes an industry more vulnerable from competitive wage setting abroad. This is due to the fact that the market share that the country can lose by having to high wage costs increases with the relative size of the foreign market.

Inserting (33) into (31), we obtain for the equilibrium quantities q_j^I and q_j*:

(34) $$q_j^I = \frac{(2-\gamma)(a-\overline{w})}{2b(n+1)} \quad \text{and} \quad q_j* = \frac{(a-\overline{w})(2(n-m+1)+m\gamma)}{2b(n+1)(n-m+1)}.$$

It is easy to demonstrate that $q_j^I < q_I^{EB} < q_j*$. Adopting pure wage bargaining induces therefore a shift of rents to the foreign industry. Domestic profits, union utility and industry rents are:

(35) $$\pi_j^I = \frac{(2-\gamma)^2(a-\overline{w})^2}{4b(n+1)^2}, \quad U_j^I = \frac{\gamma(2-\gamma)(a-\overline{w})^2}{4b(n+1)(n-m+1)} \quad \text{and}$$

(36) $$R_j^I = \frac{(2-\gamma)(a-\overline{w})^2(2(m-m+1)+m\gamma)}{4b(n+1)^2(n-m+1)}.$$

Comparing the equilibrium outcomes under efficient bargaining and the right-to-manage model reveals that firm profits will always be lower under efficient bargaining as in an autarchic regime. However, a sufficient condition for total industry rents and union utility to be higher under efficient bargaining is

(37) $$m < \frac{n+1}{2}.$$

What is the intuition behind this result? As regards union utility, it has been shown above, that under the right-to-manage approach wages decrease with the domestic market share. Since $q_j^I < q_j^{EB}$ for all *m*, more moderated wage demands are sufficient to lower union utility.
As for industry rents, recall that in the case of autarchy rents turned out to be higher under the right-to-manage approach because wages above the competitive level $\overline{w}$ served as a commitment to setting lower output levels.

In the case of integration, however, for $m < (n + 1)/2$ a more restrictive quantity policy in the home country does not involve higher domestic rents. The mechanism at work here is that, owing to the relatively high foreign market share associated with a more aggressive behaviour of foreign firms, the home country's influence on the product price is not sufficient to raise product prices and rents. With a small market share, adopting efficient bargaining therefore increases the competitiveness of domestic firms as firms commit themselves to a more aggressive behaviour in the product market. With a relatively high market share, however, output reduction raises domestic rents since the market share held by the foreign industry and therefore its impact on the product price is relatively small.

5. Conclusion

The model presented above casts some doubts on the efficiency of bargaining over both employment and wages in a framework of a n-firm/n-union oligopoly if bargaining is centralized. For risk-neutral unions, it has been shown, that bargaining over both wages and employment does not necessarily imply efficiency as total industry rents, i.e. the cake to be divided, decrease. The intuition behind this result is that under efficient bargaining wages lose their function of a commitment device to lower output levels. Moreover, it has been demonstrated that – under certain conditions – neither party benefits from this mode of bargaining, so that efficient bargaining is unlikely to emerge in an autarchic regime. In an integrated product market, however, efficient bargaining raises total industry rents and union utility if the domestic market share is relatively small and the foreign labor market is assumed to be competitive. Allowing for side-payments, this might therefore provide an incentive to bargain over wages and employment under intensifying foreign competition. Since these results have been derived for a competitive foreign labor market, the introduction of foreign unions would be an interesting extension of the present model.

The focus of the present analysis has been on efficiency considerations. Of course, several questions concerning distributive issues and the well-known incentive problem associated with efficient bargaining are not addressed here and remain to be answered.

Moreover, underlying the results derived above is the assumption of risk-neutrality of union-members. It would therefore be interesting to study whether the results obtained here hold for more general union utility functions. Finally, note that another important assumption of the present model is that of homogenous goods and Cournot competition. This raises the question, whether the results are robust to the introduction to commodity heterogeneity and Bertrand conjectures.

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Appendix

1. Determination of eq. (15)

The first-order-condition of eq. (14) yields:

(A.1.) $$2\cdot(1-\gamma)\cdot(w_j-\overline{w})=\gamma\cdot(a-2\cdot w_j+\overline{w})$$

Solving for w_j and inserting w_j into (13) yields eq. (15).

2. Determination of eq. (33)

The first-order-condition of eq. (32) is

(A.2) $$\gamma\cdot(a-\overline{w}+(n-m+1)\cdot(\overline{w}-w_j))=(2-\gamma)\cdot(w_j-\overline{w})\cdot(n-m+1)$$

Solving for w_j^I yields eq. (33).