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<https://escholarship.org/uc/item/5w75g2d8>

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Publication Date

1993-06-01

BARGAINING REGIMES AND WAGE DISPERSION

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June 1993

This research was supported by the Austrian 'Fonds zur Förderung der wissenschaftlichen Forschung' under the project JO548-SOZ (Zweimüller) and the Norwegian NORAS under the LOS-program as well as NAVF who provided travel support (Barth). We wish to thank Bill Dickens, Jonathan Leonard and Halvor Mehlum as well as the participants of the Labor Seminar at the UC Berkeley for discussion and valuable comments. Thanks also to the Institute of Industrial Relations, University of California, for its hospitality and support.

Abstract

The paper studies the relationship between wage dispersion and centralization. We distinguish between two sources of wage differentials: Heterogenous *workers* with different skills and *firms* with varying levels of economic rent per employee. The corresponding dimensions of centralization, i.e. coordination across skills or across firms and industries, are studied separately. The analysis shows that centralization may produce both lower and higher skills differentials, depending on the relative factor shares of the different types of workers. Inter-firm or -industry wage differentials among workers of identical productive characteristics, on the other hand, is always reduced with a higher degree of centralization. With a high- and a low-wage sector, the central union tends to gain from the shift in employment associated with a narrowing of the wage gap since more workers are employed in the high-wage sector.

1. Introduction

It is a central proposition of the economic paradigm that there exists a trade-off between equality and efficiency. For instance, institutions in the labor markets which tend to equalize the distribution of earnings, disturb the allocation of labor so that workers are not employed in activities where they are most productive (Roy, 1951). Moreover, whenever such policies increase the bottom level of the wage distribution, the result should be unemployment.

It is difficult to reconcile this view with the actual labor market experience of the OECD-countries during the past decades. Freeman (1988) concludes that countries with a very high or very low dispersion of wages have better employment performance than the ones in the medium range. In a recent paper, Rowthorn (1992) shows that there is almost no correlation between wage dispersion across industries and the (un)employment experiences in a cross section of 17 developed countries. Moreover, the example of the Nordic countries shows that equal wage structures and favorable employment records are not incompatible.

That structures of collective bargaining may have a major effect on the ability of creating and maintaining high levels of employment was pointed out in the works of Bruno and Sachs (1986), Calmfors and Driffil (1988), Moene, Wallerstein and Hoel (1991) and Layard, Nickell and Jackman (1991) among many others. However, the literature hardly addresses the issue of how these labor market institutions affect the structure of wages. Wallerstein (1990) is one exception, showing that a risk averse central union chooses a more compressed wage structure. Rowthorn (1992) extends the Calmfors and Driffil (1988) model and identifies asymmetries in the structure of bargaining between different sectors as a possible source of higher wage dispersion.

Our focus is different. In the present paper we investigate the effect on wage dispersion from the different employment concerns of the negotiating parties in decentralized versus centralized bargaining regimes. It turns out that wage dispersion is

strongly affected by the level of centralization. As pointed out by Moene, Wallerstein and Hoel (1991), the effects of centralization on wage outcomes may be systematically related to the dimension along which it occurs. In some countries coordination occurs between unions within each craft, while in others industrial unions are the rule. The model of Calmfors and Driffill (1988) for instance, generates a hump shaped relation between the level of real wages and the degree of coordination between monopoly unions from different firms and sectors. Their focus, however, is on the average real wage rather than the distribution of wages across sectors. If, on the other hand, centralization concerns coordination across workers of different skills, the outcome may depend on whether the different types of labor are substitutes or complements (Horn and Wolinsky, 1988).

The distinction between differences in workers' skills versus different characteristics of the firms also has empirical relevance when it comes to comparing the wage structures of the exemplar corporatist economies Austria and the Nordic countries. Average industry wage differentials are high in Austria (Rowthorn 1992, Freeman 1988). But disaggregated analysis shows that this is almost entirely due to aggregation. After controlling for different skills and gender, the industry wage differences turns out to be as low as in Scandinavia (Zweimüller and Barth, 1992). However, unlike the latter economies, Austrian skill differentials are very high¹. In all these countries, coordination *across industries* is strong. One difference between these cooperatist countries, however, is that while coordination is high among all unions in Austria, bargaining is more decentralized *across skills* in the Nordic countries where the blue- and white collar workers as well as professionals mostly bargain independently.

In the analysis below we deal with both these dimensions of centralization separately. We describe the general set-up of our models as well as the characteristics of centralization in section 2. In section 3 we study a model where wage dispersion results

¹See also Barth and Zweimüller (1992) for a more detailed comparison between Austria, Norway and the U.S.

from differences in the productive characteristics. The analysis in this section thus describes effects of coordination across crafts or skills in the economy. In this case the effect of centralization on wage dispersion depends on the factor shares of each type of labor. In section 4 we consider wage differentials arising from heterogeneity between firms with different levels of economic rent per worker. This analysis is thus intended to portray centralization across firms and industries with different levels of capital labor ratio or monopoly power in the product market. It turns out that central negotiators tend to agree on an egalitarian wage distribution, while decentralized bargaining or rent sharing produces unemployment and inter-industry wage differentials between workers of identical productive capacities. Section 5 concludes the paper.

2. The Set Up

To keep things simple, we confine the analysis to two types of jobs throughout the paper: If the source of wage dispersion is worker heterogeneity, we analyze compensation for two skill groups employed in a representative firm. To model differentials among equally qualified workers, we focus on the situation where two types of firms have different degrees of monopoly power or labor intensity. The goal is to derive relative wages under a regime where each union bargain separately. This we call the "local" or "decentralized" bargaining case. The outcome is then compared to relative wages resulting from a "central" or "national" bargain: in this case both employers and workers are represented within economy wide federations who determine the different wages simultaneously.

We assume that both local and central negotiators strike a Nash-bargain over wages. Following Binmore et al (1986), we use the players income during a conflict as the appropriate disagreement point. The Nash bargaining solution is given by:

$$W = \operatorname{argmax} [U - U^0]^\beta [\Pi - \Pi^0]^{1-\beta} \quad (1)$$

where π and π' represent profits from full operation and during a strike, respectively.

Similarly, U and U' represent workers' utility during work and conflict.

Firms are expected to maximize profits. The employers' confederation cares about aggregate profits. If firms are homogenous, this is the representative firm's profit. Once firms are allowed to be heterogenous, the employers' representatives focus on the sum of profits as their measure of success. Implicitly, we thus allow for money transfers between firms organized in the centralized alliance.

In both bargaining regimes we employ the right-to-manage assumption: firms are assumed to determine the level of employment unilaterally after the wage bargain is concluded. This is obviously a reasonable assumption in the centralized bargaining case. However, with firm specific bargaining, cases can be made both for the efficient bargaining model (McDonald and Solow, 1981), as well for a situation where the firms set employment before wage bargaining occurs (Moene, Wallerstein and Hoel 1991). We follow Layard et al (1991) who view the right to manage assumption model as the most realistic one. Usually turnover in firms is high, so that most employment decisions are hiring decisions.

For the same reason, local unions derive utility exclusively from the level of wages, and do not care about employment. We thus implicitly assume that the median (or most influential) member(s) of the local union view their survival probability within the firm as independent of the union's wage demands.

On the centralized level, however, workers care about employment as well. The confederation of unions is assumed to maximize the weighted sum of wages, the weights being determined by group employment shares. The central union thus maximizes the total wage bill. This maximand is consistent with maximizing expected income of the members (disregarding any unemployment benefits, which are, after all, paid by workers in any case). This assumption is crucial to our discussion, as workers' concern for employment is the major distinguishing feature between the bargaining regimes.

Moreover, the bargaining regimes differ with respect to the pay-offs during conflict.

With decentralized bargaining, the workers are assumed to receive a strike support equal to a fraction of alternative income outside the firm: $kA = (1-u)\bar{W}$.² However, if there is disagreement in the national bargain, there is "no place to go", and the workers get zero income during an economy-wide strike. This is apparent once we recognize that workers "income" from their own available funds should not be included in the disagreement point. There thus exists an externality in the local bargain which is internalized in centralized negotiations.

There are several other possible externalities involved in decentralized bargaining Elster (1989). Spillovers from one bargain to the other include: "your wage is my consumption price" (Calmfors and Driffil, 1988), "your wage is my input price", (Wallerstein, 1990) or "your unemployment benefit is my tax" (Holden and Raaum, 1991). Also efficiency wage effects and unions' care for relative wages may be internalized in centrally (Hoel 1989, Rødseth 1992 and Moene, Wallerstein and Hoel 1992). In our analysis below, however, we confine ourselves to the externality involved in the threat points of the unions, as well as to our main focus, which is the employment concern of the central union.

3. Different types of labor

Consider an economy with a large number of equal firms which employ different types of labor, L_1 and L_2 to produce the final output X . Suppose further, that each worker supplies labor inelastically to the market, and that the total amount of labor supply is exogenously given by \bar{L}_1 and \bar{L}_2 .

Revenues of the representative firm are given by $R(L_1, L_2)$ with $R'_i = \delta R / \delta L_i > 0$, $R''_{ii} = \delta^2 R / (\delta L_i \delta L_j) < 0$. Demand for labor of type i can be written as:

² Using a non-cooperative bargaining framework, Barth (1991) shows that this may be an appropriate disagreement point when workers cannot credibly threaten to strike forever.

$$R_i = W_i, \quad i=1,2 \quad (2)$$

where W_i is the wage rate for labor of type i . In the absence of imperfections in the labor market, it follows that relative wages in the market clearing equilibrium are:

$$\frac{W_2}{W_1} = \frac{R'_2(L_1, L_2)}{R'_1(L_1, L_2)} \quad (3)$$

It turns out to be convenient to express relative wages in terms of the elasticity of revenue with respect to the different types of labor. Let $\varepsilon_i = R'_i L_i / R$. We may then rewrite (3) as:

$$D^w = \frac{W_2}{W_1} = \frac{\bar{\varepsilon}_2 \bar{L}_1}{\bar{\varepsilon}_1 \bar{L}_2} \quad (4)$$

where $\bar{\varepsilon}_i$ is also the factor share when both types of labor are fully employed. (4) gives the relative wages in the Walrasian case, indicated by the superscript "w".

Let us now turn to the case where unions and employers negotiate over wages *at the firm level*. We assume first that each type of labor is represented by a single union, which bargain separately with the employer. Later on, we study the outcome when both parties are represented by central federations, and bargain at the national level.

The argument to enter the Nash-maximand from the side of the union representing workers of type i is:

$$U_i - U_i^0 = W_i - s_i \quad (5)$$

where s_i is the income during conflict for workers of type i . We assume that the income the workers gets during a conflict is a given fraction, k of their alternative income "elsewhere" in the economy:

$$s_i = kA = k \frac{L_i \overline{W}_i}{L_i} \quad (6)$$

where \overline{W}_i is the average wage rate for workers of type i in all other firms.

Firms maximize profits. In the case of disagreement with union i , employers still have to compensate type j workers. We focus on a situation where the types of labor clearly are of different skills and not too close substitutes: More specifically, we assume that both groups are necessary for production. If group i goes on strike, the plant thus closes down and the firms suffers a net loss of $-W_j L_j$. The employers contribution to the Nash maximand for wage bargaining over wage i is thus given by:

$$\Pi - \Pi^0 = R - W_1 L_1 - W_2 L_2 - (-W_j L_j) \quad (7)$$

Inserting (5) and (7) into the Nash product and solving the maximization problem gives

$$W_i = \beta \frac{R}{L_i} + (1 - \beta) s_i \quad (8)$$

This is the standard outcome that wages are equal to a weighted sum of revenue per employee and the disagreement option, with bargaining power β and $(1 - \beta)$ as weights. By symmetry, all firms pay the same wage in equilibrium, so $W_i = \overline{W}_i$. Using this together with the definition of ε_i enables us to solve for the employment of labor of type i as:

$$L_i = \overline{L}_i \frac{\varepsilon_i - \beta}{k(1 - \beta)\varepsilon_i} \quad (9)$$

Equation (9) implicitly defines the level of equilibrium unemployment. We also note that the condition for an interior solution with employment of each type of workers is that bargaining power is not too large, i.e. $\varepsilon_i > \beta$ for both i . Wage levels consistent with (9) can be calculated as proportions of total revenues by using the definition of ε . Relative wages in equilibrium with decentralized bargaining may then be written as:

$$D^d = \left(\frac{W_2}{W_1}\right)^d = \frac{L_1 \varepsilon_2^2 (\varepsilon_1 - \beta)}{L_2 \varepsilon_1^2 (\varepsilon_2 - \beta)} \quad (10)$$

where superscript "d" denotes decentralized bargaining. We note that as $\beta \rightarrow 0$, $D^d \rightarrow D^w$.

Suppose that the elasticities of revenue with respect to the two skills groups are constant. This is the case if the production function is Cobb-Douglas and the elasticity of product demand is fixed. Then it is clear from (10) that D^d is increasing in $\varepsilon_2/\varepsilon_1$, and it is decreasing in β for $(\varepsilon_2/\varepsilon_1) > 1$.

This reasoning, however, rests on the assumption that the elasticity of substitution between the two types of labor equals 1. Intuitively, a result about relative factor prices is likely to be sensitive to assumptions about the degree of substitutability. However, it turns out that the above relationship continues to hold even if we relax the restriction of unit elasticity of substitution. This leads to the following:

Lemma 1

If the firms technology is CES, then an increase in bargaining power will unambiguously decrease (increase) wage differentials, as long as the factor share of high wage workers of total revenues exceeds (falls short of) the share of low wage workers.

Proof. See appendix.

When wages are determined by *central negotiations*, compensation for both skill groups is determined simultaneously. Let the total wage bill represent the central union's utility, so:

$$U = L_1 W_1 + L_2 W_2 \quad (11)$$

can be interpreted as an utilitarian welfare index with employment levels as weights. What

is important for our purpose is that employment levels now enter the union's objective.

Just like in the case of local bargaining, a central employers' federation tries to maximize the profit of the representative firm. However, contrary to decentralized negotiations, conflict pay offs are zero for both parties. The employers never have to pay for one of the groups when the other is in conflict, and workers will not get any alternative income in case of a general strike.

Suppose for the moment, that the central union determines wages for both types of labor unilaterally. What is the wage structure a central union federation would choose? Taking the derivative of (11) with respect to W_i gives:

$$\frac{\delta U}{\delta W_i} = L_i(1+\lambda_i) \quad (12)$$

where λ_i is the elasticity of labor demand with respect to wages. When $L_i < \bar{L}_i$, and $\lambda_i < -1$, the central union has an incentive to decrease wages. In this case the employment gains from lower wages outweigh the loss in compensation per worker. This effect continues to work as long as there is unemployment. When wages reaches the level where $L_i = \bar{L}_i$, the employment effect obviously disappears.

Clearly, also the bargaining outcome should be the same. Firms profit from lower wages, and both parties choose the level compatible with full employment for workers of type i . This proves

Lemma 2

If the elasticities of labor for both types of labor are greater than 1, wage differentials under central bargaining is equal to relative wages in the Walrasian case, and the labor force will be fully employed.

We may now use Lemmas 1 and 2 to derive:

Proposition 1.

When wage inequality is the result of heterogeneity in skills and labor demand elasticities exceed unity, both the competitive economy and the centralized economy will increase (decrease) wage dispersion whenever the high wage group has a larger (smaller) share of total revenue.

Proof: Consider first the case where type 2 workers are both high wage workers and the group with the higher factor share. Then we have $w_2/w_1 > 1$ and $\varepsilon_2/\varepsilon_1 > 1$. Lemma 1 implies that decentralized bargaining generates lower relative wages than the competitive one. By lemma 2 they will then also be lower than under centralized bargaining. If type 2 workers earn high wages but a smaller share of revenue, the same reasoning implies that centralization decreases wage dispersion.

Discussion. Proposition 1 is the result of two factors. First, both the decentralized market economy and the centralized economy will produce full employment. This point is in line with most theoretical work in this area (see eg Layard et al 1991, Moene, Wallerstein and Hoel, 1991). $D^c = D^w$ is the wage distribution consistent with full employment for both types of labor.

The second point concerns decentralized bargaining. Consider the case where $W_2 > W_1$ and $\varepsilon_2/\varepsilon_1 > 1$. In this case decentralization of bargaining produces a more compressed wage structure. Unions are stronger when they bargain separately. On the one hand, both groups are able to shut down the whole plant independently. On the other hand, when the firm has to pay wages to the workers not on strike. This tends to equalize wages: When type 1 workers are on strike, the firm has to pay out the higher wage bill of type 2 workers. This increases the loss the firm has when type 1 workers go on strike and consequently tends to increase type 1 wages. Analogously, centralization increases wage dispersion when low wage workers have the higher share in revenues.

The above results depend on the assumption of exogenous supply of each type of labor. This deserves some discussion. Assume that the acquisition of skills is costly and the source of worker heterogeneity is differences in their ability of learning. Then the relative size of the labor force is no longer exogenous, but rather be determined relative wages themselves. It should be clear that this does not alter our conclusions for the non-union and centralized cases: in both the outcome correspond to the full employment situation which has a unique solution.

However, it is not clear whether our results also holds in the decentralized case: the distribution of workers to the two types of labor will be different from the full employment case. To show that this does not alter the qualitative content of proposition 1 we make use of the fact that as $\beta \rightarrow 0$ the decentralized pay gap approaches the market outcome. Again, we consider the case where workers of type two has the larger factor share: $\varepsilon_2/\varepsilon_1 > 1$. Let now relative labor supply be a function of relative wages:

$$\frac{\bar{L}_1}{\bar{L}_2} = f(D) \quad (13)$$

where $f' < 0$ as higher wage premia in favor of group 2 reduces the relative share of type 1 labor in the labor force. Define for simplicity:

$$\frac{\varepsilon_2 (\varepsilon_1 - \beta)}{\varepsilon_1 (\varepsilon_2 - \beta)} = b(\beta) \quad (14)$$

where $b' < 0$ for $(\varepsilon_2/\varepsilon_1) > 1$. We have:

$$D^l = D^m b(\beta) = \frac{\varepsilon_2}{\varepsilon_1} f(D^l) b(\beta) \quad (15)$$

and we get:

$$\frac{dD^l}{d\beta} = b' \frac{\varepsilon^2 f}{\varepsilon^1 - \varepsilon^2 f' b} < 0 \quad (16)$$

for $(\varepsilon_2/\varepsilon_1) > 1$. We know that $b(0)=1$ and thus $D^m > D^l$ for all $\beta > 0$: wage dispersion is lower under decentralized bargaining even after allowing for endogenous relative labor supply. A similar reasoning applies to the case when $\varepsilon_2/\varepsilon_1 < 1$.

Another generalization is to consider a more general welfare function for the affiliation of unions. We have chosen the above specification because it is plausible and because it produces a clear-cut result. Note, however, that all specifications involving the union choosing full employment for both groups will produce the result presented in proposition 1 from the fact that this is the only relative wage consistent with full employment.

Consider next the more general function $U = U(w_1, w_2)$. From (2) and (5) it is easy to derive the equilibrium wage dispersion:

$$D^c = \frac{\varepsilon_2 U'_1(w_1, w_2)}{\varepsilon_1 U'_2(w_1, w_2)}$$

in the centralized bargaining case. Clearly, the size of this depends on the functional form of $U()$. A solidaristic federation of unions may favor the lower paid group, and thus produce a more equal dispersion. However, this is at the cost of unemployment for low-skilled labor.

4. Rent Sharing in Heterogenous Firms

In this section, we derive the equilibrium wage dispersion for the case when all workers share identical productive characteristics, but firms are no longer homogenous. They may differ in potential economic rent associated with operating on the market. This may be the consequence of differences in market power: one type of firms produce goods with

relatively inelastic demand, whereas the scope of price setting is more limited for type 2 companies. Similarly, rent could be the result of differences in capital intensities. High fixed costs incurred in the past should result in relatively higher operating profits in the present, thus increasing the pie per worker over which negotiations may take place.

It is convenient to distinguish "high-rent" and "low-rent" sector by their respective elasticity of revenue with respect to employment, ϵ_i . With a production elasticity lower than 1 as a result of decreasing returns to labor, and a price elasticity of product demand above unity, ϵ_i is lower than 1. Moreover, the higher the elasticity of product demand (i.e. less power in the product market) and the higher the production elasticity of labor (i.e. the lower the capital intensity) the higher is ϵ_i . It follows that "high-rent" firms are characterized by low ϵ_i 's and vice versa. For simplicity of exposition, we will now suppress L_i as an argument of ϵ_i , although we do not confine the analysis to the special constant elasticity case. Note further, that R_i now denotes the *level* of revenues in type i firms, while R'_i now denotes *marginal revenues*.

According to the right to manage assumption, both firms set employment ex post to satisfy $R'_i = W_i$, which may also be written:

$$\frac{R_i}{L_i} = \frac{W_i}{\epsilon_i} \quad (18)$$

Consider first the situation under *local bargaining*. As before, unions maximize W , and the firm $R-WL$. During a conflict, the unions' payoffs are $s=kA$ while the firm gets zero profits. The outcome of the Nash bargain in firm i is:

$$W_i = \beta \frac{R_i}{L_i} + (1-\beta)s \quad (19)$$

which reproduces equation () above. The only difference is that now the revenues now refers to the type of the firm. By using the definition of ϵ_i , we may now express the negotiated local wage as:

$$W_i = \frac{1-\beta}{1-\beta/\varepsilon_i} s \quad (20)$$

Since the workers have identical productive characteristics, they face the same alternative wage. Their wage, however, differs between firms because there is more rent to bargain over in the "high-rent" firm. Relative wages in the decentralized case are:

$$D^d = \frac{W_2}{W_1} = \frac{\varepsilon_2 \varepsilon_1 - \beta}{\varepsilon_1 \varepsilon_2 - \beta} \quad (21)$$

Note also that this is the outcome in a decentralized economy in which unions are absent, but profits are shared between the firms and their workers according to an exogenously given sharing rule. To see this let wages be given as alternative wages plus a share of the quasi rent $R_i - AL_i$ per worker, and let β be the share parameter: $W_i = \beta (R_i - AL_i)/L_i + A$. Inserting the employment condition and dividing the wages gives the outcome (20).

The Walrasian case is equal to the Nash-outcome as $\beta \rightarrow 0$ and we obtain equal wages for all workers. In the decentralized bargaining or rent sharing economy, on the other hand, $\beta > 0$, if $\varepsilon_2/\varepsilon_1 > 1$ and $D^d > 1$. This is a case for inter-firm (or industry) wage differentials for workers of identical skills. High-rent firms pay better, and moving workers from the low wage sector to the high wage sector increases the total wage bill.

The Central Bargain over Wages

By the same argument as above, the most likely outcome of the central bargain is wages compatible with full employment. This is due to the fact that as long as there is unemployment, both sides are better off with lower wages in each firm.

The central union's objective is to maximize:

$$U = L_1 W_1 + L_2 W_2 \quad (22)$$

where we have normalized the total labor supply to unity. Taking the partial derivative

with respect to wage i gives:

$$\frac{\delta U}{\delta W_i} = L_i(1+\lambda_i) \quad (23)$$

where λ is the elasticity of labor with respect to wages. For $\lambda < -1$ $\delta U/\delta W_i$ is always negative: the wage bill increases with decreasing wages as employment goes up by a larger proportion. Also the firms gain from lower wages. With the right to manage assumption, the envelope theorem implies that $\delta \Pi/\delta W = -L < 0$. This shows that firms will never choose wages giving unemployment.

We then proceed by solving the bargaining problem by substituting the full employment constraint into the Nash maximand. Full employment means that $L_2 = 1-L_1$. Consider now bargaining over the wage structure under this constraint. We have:

$$U = W_2 + (W_1 - W_2)L_1 \quad (24)$$

and

$$\Pi = R_1(L_1) + R_2(1-L_1) - W_1L_1 - W_2(1-L_1) \quad (25)$$

Unlike in a situation with unemployment, where both parties prefer reduced wages in both sectors, with full employment, they have conflicting interests over the wage structure. The reason for this difference is that an increase in employment in one firm now has to be offset by an identical decrease in another.

Since we are analyzing centralized bargaining, none of the parties have any income during conflict. Taking the derivatives of the log of the Nash maximand gives the following first order conditions:

$$\beta \frac{1+\lambda_1(1-w_2/w_1)}{U} L_1 - (1-\beta) \frac{L_1}{\Pi} = 0 \quad (26)$$

$$\beta \frac{1-L_1}{U} - (1-\beta) \frac{1-L_1}{\Pi} = 0 \quad (27)$$

Equation (26) and (27) are only satisfied for $W_1 = W_2$: The centralized bargainers choose equal wages.

To understand the intuition behind this result, it may be instructive to take a look at the standard condition for Pareto optimality which is implied by (26) and (27), namely that the marginal rate of substitution be equal for both parties. Let $MRS_x = dW_2/dW_1$, $x=U,\Pi$ be the marginal rates of substitution along the indifference curves in (W_1, W_2) space for the union and employers' federation respectively:

$$MRS_u = \frac{L_1}{1-L_1} \frac{1}{1+\lambda_1(1-w_2/w_1)} = \frac{L_1}{1-L_1} = MRS_\pi \quad (28)$$

If $W_2 > W_1$, $MRS_u > MRS_\pi$. In this case the union is willing to give up more of the wage in firm 2 against one unit of wage in firm 1 than the federation of employers needs to gain in order to keep its level of joint profits constant. They both care in an equal way about the number of people employed in both sectors. However, when $W_2 > W_1$, the union gains from the transfer of workers from type 1 to type 2 companies. The firms, on the other hand, are locally indifferent to employment effects of wage changes. For any given wage structure, W_2/W_1 , the right to manage assumption implies that firms operate on their labor demand curve. This implies that $\delta\pi/\delta L = 0$, from which it follows that the gains/losses from a *change* in aggregate profits as a result of employment shifts are only of second order.

The union is always more willing than the firm to increase wages in the low wage firm at the expense of a reduction of wages in the high wage firm. This shifts employment from the low to the high wage sector. This argument holds whenever one wage is higher than the other, and only equal wages ensure that the trade off is the same for both parties. The above analysis thus proves the following:

Proposition 2

In an economy where firms exhibit different levels of economic rent per worker, and labor demand elasticities are higher than unity, centralization of wage bargaining will produce full employment and give equal wages across firms for workers with identical productive characteristics.

We have found that the central bargainers choose to implement the Walrasian outcome. The reason is that the central union is always willing to trade a reduction of wages in the high wage sector against higher wages in the low wage sector on terms which are favorable to the firm. This difference in the trade offs is due to the fact that the union gains from the re-allocation of employment into the high-wage sector, while the firms are locally indifferent.

Within a bargaining or rent-sharing context, centralization across industries affects not only the level of wages and unemployment, but also the wage distribution and allocation of labor between sectors. Centralization favors high rent industries relative to low rent industries.

In our view, this result may provide some clues to the understanding of the seemingly puzzling empirical results that centralized bargaining institutions produce outcomes more in accordance with the Walrasian case than the market economies do: Inter-industry wage differentials for similar workers are for instance much higher in the U.S and Canada than in Austria, Norway and Sweden (Barth and Zweimüller, 1992, 1993). In the light of the above results, one plausible interpretation of this empirical puzzle could be that rent-sharing is prevalent in the market economies, while the employment considerations of the affiliation of unions equalizes the centrally bargained wages.

5. Conclusion.

Wage dispersion arises along two dimensions. The first source of wage dispersion comes from heterogeneity of workers of different skills and levels of human capital. The other dimension is wage differentials among workers of equal productive characteristics. The Walrasian model predicts wage differentials across skills that both ensures full employment of all groups as well as providing the right incentives to acquire the different skills. Wage differentials for equally endowed workers, however, should be non-existent according to the Walrasian scheme.

We have focused on a central union's concern about (un)employment. In this case, central bargainers tend to choose the outcome of the competitive Walrasian economy. This gives full employment and allocation of labor consistent with the standard competitive model. Decentralized bargaining or rent sharing, on the other hand, produces in most cases, a more equal dispersion across skills and always wage differentials for identical workers across firms or industries with different levels of economic rent per worker.

Provided that the high wage group also has the larger share of total revenue, *decentralized bargaining may produce a more egalitarian wage structure across complementary skills* than coordinated bargaining does. The different skills both get higher wages, but relative skills differentials decline. The reason is that both groups may unilaterally shut down the plants during strikes. At the same time, the firm has to pay out wages to the non-striking group during conflict. The more the high wage group earns, the more the firms are hurt by a strike on part of the low-wage group, and vice versa. These effects work to reduce wage differentials across separately bargaining craft unions.

Centralization across firms and industries eliminates the wage differentials between workers of identical skills that arise in the decentralized bargaining or rent sharing economies. The reason is that the central union is always willing to trade lower wages in the high wage sector against higher wages in the low-wage sector on terms which are favorable to the central association of firms. This difference in trade off arises because the

optimally behaving firms are indifferent with respect to the employment levels, while the union gains from a transfer of employment from the low-wage sector to the high wage sector.

In the decentralized bargaining or rent sharing case, we get both unemployment as well as a higher proportion of workers in low wage sector rather than in the high wage sectors. The centralized bargaining economy thus outperforms the decentralized ones both with respect to the level of employment as well as the allocation of labor between sectors. Also, a more compressed wage structure may be beneficial for growth as well, cf. the arguments of Lommerud and Agell (1991), Moene, Wallerstein and Hoel (1992). However, we should however be cautious not to draw our conclusions too strong. Obviously, our model here captures only a small part of reality, and our arguments depend on the assumptions about the employment considerations of the central union. We focus on this point because we think it is one of the most important distinguishing features between central and decentralized systems of wage determination. But there may, of course, be other aspects of centralization and wage determination ignored here, with potential effects on wage dispersion and economic performance.

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Appendix

Let revenues be given by:

$$R = X^{1-\frac{1}{\eta}} = [(\alpha_1 L_1^\rho + \alpha_2 L_2^\rho)^{\frac{1}{\rho}}]^{1-\frac{1}{\eta}} \quad (\text{A.1})$$

Define $a = \alpha_2/\alpha_1$, $r = \rho/(\rho-1)$ and $\omega = w_2/w_1$. Then the ε_i 's may be written as:

$$\begin{aligned} \varepsilon_1 &= \left(1 - \frac{1}{\eta}\right) \frac{1}{1 + a^{1-r}\omega^r} \\ \varepsilon_2 &= \left(1 - \frac{1}{\eta}\right) \frac{a^{1-r}\omega^r}{1 + a^{1-r}\omega^r} \end{aligned} \quad (\text{A.2})$$

We substitute these expressions into the equation for D^1 . To see how ω varies with β , we make use of the fact that $\text{sign}(d\omega/d\beta) = \text{sign}(d\ln\omega/d\beta)$. Taking logs of equation (10) and implicitly differentiate yields:

$$\frac{d\ln\omega}{d\beta} = - \frac{\frac{1}{\varepsilon_2 - \beta} - \frac{1}{\varepsilon_1 - \beta}}{-1 + 2r - r \frac{\varepsilon_1 \varepsilon_2}{\varepsilon_1 + \varepsilon_2} \left(\frac{1}{\varepsilon_2 - \beta} + \frac{1}{\varepsilon_1 - \beta} \right)} \quad (\text{A.3})$$

where we have used that $\varepsilon_1 + \varepsilon_2 = 1 - 1/\eta$ from A2.

Since we focus on a situation where both factors are needed for production, we should consider case where isoquants neither intersect the L_1 or L_2 axes. This is the case

for $\rho \in (-\infty, 0)$. I.e. we consider values of r which are between 0 and 1. If $r=0$ $d \ln \omega / d\beta < 0$ when $\varepsilon_2 > \varepsilon_1$ in the case where type 2 are the high wage workers. This result continues to hold as $r \rightarrow 1$, as long as

$$\frac{\varepsilon_1 \varepsilon_2}{\varepsilon_1 + \varepsilon_2} \left(\frac{1}{\varepsilon_1 - \beta} + \frac{1}{\varepsilon_2 - \beta} \right) > 1 \quad (\text{A.4})$$

the l.h.s of A4 decreases in β . So if for given values of ε_1 and ε_2 (A4) is satisfied for $\beta=0$ it will also be satisfied for $\beta < \min(\varepsilon_1, \varepsilon_2)$. It is straightforward to show that for $\beta=0$, A4 is an equality. It follows that for $\beta > 0$, (A4) holds. Q.E.D.