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Unions and Wage Determination: Can Monopsonist Unions Reduce Unemployment?

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Abstract. This paper extends the standard closed shop union model of wage determination by introducing endogeneity of union membership. The labor market outcome with endogenous membership may differ when unions behave monopsonisticaly relative to the case where they are "membership-takers", resulting in higher or lower wages (more or less favorable contract curve in efficient bargaining) according to the form union´s utility function and/or implicit decision process value union size. Some notes are added highlighting the role of membership fees in the membership function determination of a union that works as a nonprofit organization.
Keywords. Unions, Wage Determination Models, Union Membership, Union Bargaining, Corporatism, Monopsonist Union, (Collective Choice).
JEL. J51, J42, E24, D71, P42.

1. Introduction

We present some of the analytical consequences of introducing endogenous membership in the standard union model. Endogeneity of union status in bargaining models has been previously addressed in the literature [i], and this includes very early references[ii]. However, a simple and clear methodological distinction of the issues underlying the final labor market outcome has not, to our knowledge, been advanced.

Hence, the analysis of labor market outcomes in the presence of endogenous membership involves three levels of considerations: one is how the union's objective function is affected by the number of "insiders" [iii]. The other is how applicants - potential insiders - react to conditions offered by union membership, which calls for the definition of a membership demand function. Finally, unions may or may not be able to decide membership size - which determines whether the union must behave competitively or not towards membership demand.

Usually, it is not considered explicitly - or it is irrelevant and taken as given - how union size affects the union's utility function. On the one hand, for given wages and total employment, an increase in membership decreases the probability of (union) employment of union members. But also, union size may affect positively the union´s ability to behave as a monopoly. Moreover, a larger number of members at given wages (say, in an utilitarian environment) would probably be seen as a positive fact. On the other hand, as it is the argument behind the median voter structure, the decision process ruling union behavior is also a factor affecting union's goals. In sum, the union´s objective function may be considered to depend

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not only on employment and wage but also on membership - its effect on utility may be positive or negative.

The membership function measures how the labor force gets unionized and is therefore assumed to be positively related to the wages the union jobs offer [iv]. Some theoretical models of union behavior have treated demand for union services as coming from median voter models [v]. We note that, specially with corporate bargaining, the membership function is ultimately related to labor supply - it is as if unions, that may behave as a "monopsonist" [vi] in the hiring market, make the "interface" between the labor supply and firms' labor demand. If closed-shop agreements are ruled out, and if the union has no ability to avoid membership - or agreements with respect to wages must be extended to any employed worker [vii] - it will probably have to take into account such fact in optimization - i.e., make "conjectures" about membership behavior (demand) or internalise membership response to union wages.

In section I, we discuss the role of endogenous membership and compare the situation where a monopoly union behaves as a monopsonist with respect to membership demand to the one where it behaves "competitively". Section II reproduces the exercise for an environment with efficient bargaining.

Some special cases are presented in section III, with less usual unions' utility functions: directly using absolute unemployment (and wages) as arguments; average utility of members; money value of aggregate surplus or "economic rent" obtained by members.

In section IV, we present an analytical and graphical derivation of the "microfoundations" of the membership function [viii]. We diverge from the issues that have been previously raised and emphasize the behavior of the union as a nonprofit organization facing bargaining costs.

The modelling is kept as simple as possible in order to focus on the special mechanism in study.

The exposition ends with a brief summary in section V.

2. The Role of Labor Supply - Endogenous Union Membership and the Monopoly Union

1. The demand for union membership will probably increase with the wage set by the union, i.e., we consider that membership M, M = M(W) and is increasing in W.

Assume the union maximizes total utility, and the unions' utility depends, as usual on total employment, L; wage, W, and also on M, i.e., [ix]

$$\max_{L,\,W,\,M} U(L, W, M) \tag{1}$$
$$\text{s.t.:} \quad L = L(W) \;\; ; \;\; M = M(W)$$

L(W) denotes a negatively sloped demand for labor [x]. Alternatively, we can write (I.1) as:

$$\max_w \; U[L(W), W, M(W)] \tag{2}$$

The optimal solution will be W^M such that [xi]:

$$U_L L_W + U_W + U_M M_W = 0 \tag{3}$$

2. Assume U = U(L, W, M) is increasing and quasi-concave in its arguments. Then, given that U_M and M_W are positive, the utility function will be increasing in the point W* where union ignores union membership demand, i.e., in the solution of:

$$U_L[L(W), W, M(W)]\, L_W + U_W[L(W), W, M(W)] = 0 \tag{4}$$

which would correspond to the usual monopoly union solution, in the Dunlop (1944) tradition.

Therefore:

$$W^M > W^* \quad ; \qquad M^M > M^* \quad ; \qquad L^M < L^* \tag{5}$$

Unemployed members, u(W) = M(W) - L(W), will be more than if union membership effect was taken as exogenous, i.e., $u^M > u^*$.

Consider the graphic representation of the problem in the following way: Take the problem written as:

$$\max_{W,\, M} U[L(W), W, M] = \omega(W, M) \tag{6}$$
$$\text{s.t.:} \quad M = M(W)$$

ω(W, M) arises from the substitution of L by labor demand in the general utility function U(L, W, M). F.O.C. will yield:

$$-\frac{\omega_W}{\omega_M} = M_W \quad ; \tag{7}$$
$$\omega_W = U_L[L(W), W, M]\, L_W + U_W[L(W), W, M] \;;\; \omega_M = U_M[L(W), W, M]$$

We are assuming $\omega_M > 0$; a typical "reduced" union indifference curve defined over W and M, $\omega(W, M) = \bar{\omega}$, will be positively sloped near the optimal solution - where $\omega_W < 0$ – and, for an internal solution, concave. Utility increases to southeast. The indifference curves will have a point for which $\omega_W = 0$, representing a membership-taker first-order condition: for low wage levels, an indifference curve will be negatively sloped.

The solution of W* and W^M are depicted in Fig. 1. W* is the wage at which an indifference curve achieves $\omega_W = 0$ on the membership demand curve, M = M(W). Plotting also the underlying demand function L(W), we can visualize not only membership, but also demand, and corresponding unemployment level in the two situations.

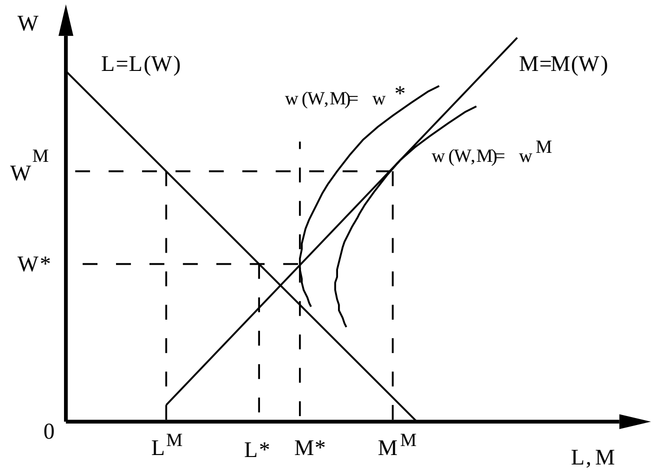

Fig. 3

Figure 1.

3. Suppose that U_M < 0. Then, indifference curves - ω(W, M) = $\bar{\omega}$ - in (M,W) space would increase to northwest, we would want them to be convex, and W* would be higher than W^M.

Proposition 1. If membership demand increases with the wage set in the negotiations, and the union´s utility increases with the number of members:

1. The monopoly union that behaves as a monopsonist in the membership market will choose a higher wage, higher membership and lower employment than the one that behaves competitively in the membership market.

2. The opposite occurs if either the membership function is negatively sloped or union´s utility function decreases with membership.

4. Alternatively to formulation (6), the monopoly union problem can be written in terms of L and W:

$$\max_{L,\,W} \; U[L, W, M(W)] = \nu(L, W) \tag{8}$$

$$\text{s.t.:} \quad L = L(W)$$

F.O.C. will yield:

$$\frac{\nu_W}{\nu_L} = -L_W \quad ; \quad \nu_W = U_W + U_M M_W \tag{9}$$

The graphical representation of this problem is identical to the one in which M is taken as exogenous, but with respect to the modified utility function ν (L, W). At the tangency of the optimal indifference curve with labor demand, provided $U_M M_W > 0$, $\frac{U_W}{U_L} < \frac{\nu_W}{\nu_L}$; the tangency with a membership-taker´s indifference curve will be to the southeast of the solution (9).

(9) defines a relation between the wage and employment, W = g(L); its intersection with labor demand yields the optimal solution, (W^M, L^M) We can see

it depicted in Fig. 2. The slope of g(L), $\frac{dg}{dL} = -\frac{\nu_{LL} L_W + \nu_{WL}}{\nu_{LW} L_W + \nu_L L_{WW} + \nu_{WW}}$ (and probably positive). Being $U_M M_W > 0$, it lies to the left of the function W = h(L), solving $\frac{U_W}{U_L}\Big|_{M=M(W)} = -L_W$, which would intersect labor demand at the membership-taker solution W*.

3. Endogenous Union Membership with Efficient Bargaining.

1. The efficient bargaining solution comes from [xii]:

$$\max_{L,W} \; U[L,W, M(W)] + B\,\Pi\,(L,W) \tag{10}$$

where B is directly related to the relative power of the employer in negotiations, and would yield:

$$\frac{\nu_W}{\nu_L} = \frac{\Pi_W}{\Pi_L} \tag{11}$$

If the firm('s) is a profit maximizer:

$$\frac{\nu_W}{\nu_L} = \frac{U_W + U_M M_W}{U_L} = \frac{L}{W - P F_L} \tag{12}$$

If $U_M M_W > 0$, the locus (L,W) such that [xiii]

$$\frac{U_W}{U_L}\Big|_{M=M(W)} = \frac{L}{W - P F_L} \tag{13}$$

will be to the right of the efficient locus given by the tangency points of (14), because at any point (L,W):

$$\frac{U_W}{U_L}\Big|_{M=M(W)} < \frac{U_W + U_M M_W}{U_L} \tag{14}$$

So, once $\frac{\partial \frac{U_W}{U_L}}{\partial L} > 0$, for each level W, a lower L will be chosen in an efficient contract agreement in the case where membership is taken as endogenous. Alternatively, at a tangency between an indifference curve and an isoprofit curve that satisfies (12), $\frac{U_W}{U_L}\Big|_{M=M(W)}$ - the slope of U(L,W,M) = $\bar{U}$ evaluated at M =

M(W) - is smaller than $\dfrac{L}{W - P F_L}$; to achieve tangency of an indifference curve, i.e., (14), with the same isoprofit curve, the solution must lie to the southeast of (13). CC, defining tangency of indifference curves with isoprofit curves when membership is endogenously considered by the union, will be to the left (in space (L,W)) of the locus defined by (14) – the contract curve of the traditional membership-taker union, so to speak -, C´C´. We can see both curves in Fig. 2.

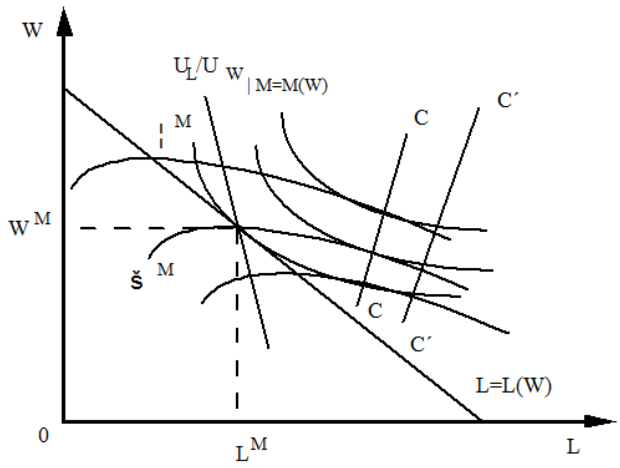

Figure 2.

3. If $U_M M_W < 0$, the conclusions would be reversed and the "monopsonist" contract curve lies to the right of the "membership-taker" union - implying that for the same employment level, lower wages will be achieved.

Proposition 2. If membership demand increases with the wage set in the negotiations, and the union´s utility increases with the number of members:

1. The efficient bargaining locus of the "monopsonist" union will lie to the left (less L for given W; higher W for given L) of that of the "competitive" union.

2. The opposite occurs if either the membership function is negatively sloped or union´s utility function decreases with membership.

4. In an efficient contract solution, an increase in membership may decrease B, i.e., B = B(M) and $B_M < 0$ -, or decrease the cost of rising wages, and additional effect could be in place, this favoring a shift to the right of the contract curve.

4. Analytical Examples

Case A. Unions Utility Depending on u and W

1. A special case of $U_M < 0$ would be the utility function of the problem:

$$\max_{L,\, W,\, M,\, u} \; U(u, W) \qquad (15)$$

$$\text{s.t.:} \quad u = M - L \;; \quad L = L(W) \;; \quad M = M(W)$$

where $U_u < 0$ and $U_W > 0$. We see that $U_M = U_u$ and $U_L = - U_u$; so the union values employed and total members utility symmetrically.

Consider the excess supply of members

$$u(W) = M(W) - L(W) \tag{16}$$

We have that

$$u_W = M_W - L_W > -L_W > 0 \tag{17}$$

Problem (15) can be written as:

$$\max_{u\ W} \ U(u,W) \tag{18}$$
$$\text{s.t.:} \quad u = u(W)$$

The problem can be represented in the (u,W) space - see Fig. 3. A typical indifference curve slopes upward - as well as u(W) - and the utility level increases to the northwest.

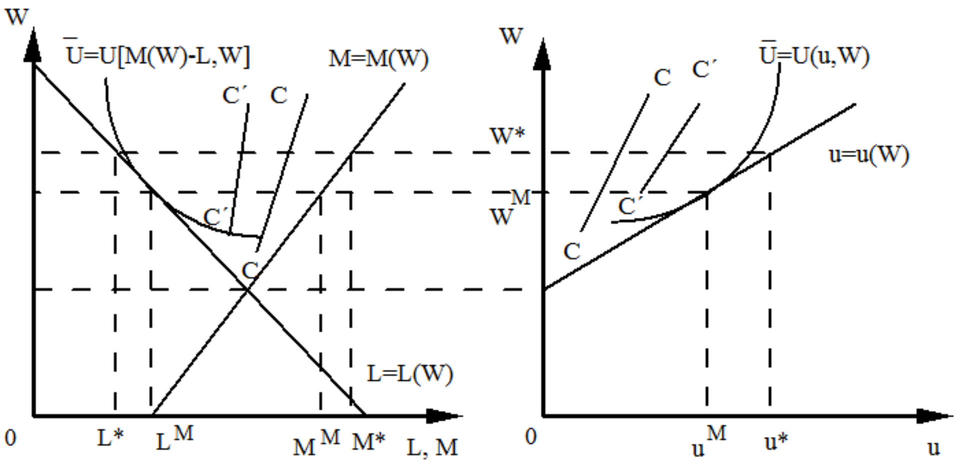

Figure 3.

The optimal solution will be such that:

$$-\frac{U_W}{U_u} = u_W = M_W - L_W \tag{19}$$

Efficient bargaining satisfies:

$$\max_{L,\ u,\ W} \ U(u,W) + B\,\Pi\,(L,W) \tag{20}$$
$$\text{s.t.:} \quad u = M(W) - L$$

or

$$\max_{L,\ W} \ U[M(W) - L, W] + B\,\Pi\,(L, W) \tag{21}$$

The optimal solution obeys:

$$- \frac{U_u M_W + U_W}{U_u} = \frac{L}{W - P F_L} \quad \text{or} \tag{22}$$

$$- \frac{U_W}{U_u} - M_W = \frac{L}{W - P F_L} = \frac{\Pi_W}{\Pi_L} \tag{23}$$

Consider then the problem in space (L,W). We will have that for any tangency,

$$\frac{U_W}{U_L} \Big|_{M=M(W)} = - \frac{U_W}{U_u} > - \frac{U_W}{U_u} - M_W \tag{24}$$

Therefore the efficiency locus CC (monopsonist) in the (L,W) space will lie to the right of the curve C´C´ (membership -taker) - the opposite occurring in the (u, W) space - given by

$$\frac{U_W}{U_L} \Big|_{M=M(W)} = \frac{\Pi_W}{\Pi_L} \tag{25}$$

2. Take a particular example where the union´s utility function is of the form:

$$U(u, W) = u^{-\gamma} (W - W_a)^{\theta} \tag{26}$$

2.1. The monopoly union solution will yield:

$$\frac{\theta}{\gamma} \frac{u}{W - W_a} = M_W - L_W = u_W \tag{27}$$

Assume that $W_a = 0$. Then, we can manipulate the expression to yield:

$$\frac{\theta}{\gamma} = u_W \frac{W}{u} = \eta_{u,W} = (M_W \frac{W}{M}) \frac{M}{u} - (L_W \frac{W}{L}) \frac{L}{u} = \tag{28}$$
$$= \eta^M \frac{M}{u} + \eta^D \frac{L}{u}$$

Denote the unemployment rate $u_r = \frac{u}{M}$. Then, we can solve (28):

$$u_r = \frac{\eta^M + \eta^D}{\frac{\theta}{\gamma} + \eta^D} \tag{29}$$

where η^M denotes the (positive) elasticity of membership demand (labor supply) and η^D the labor demand elasticity in absolute value. The unemployment rate will be between 0 and 1 if $\eta^M < \frac{\theta}{\gamma}$; this condition guarantees that the unemployment rare increases with the elasticity of demand. (29) also suggests that the unemployment rate will be higher the larger is the elasticity of membership demand (labor supply), η^M - yet, an interior solution may be impossible for constant wage-elasticity labor demands.

The competitive solution is given by (29) with $\eta^M = 0$, a lower unemployment rate.

2.2. The efficient bargaining locus will be (assuming $W_a = 0$).

$$\frac{\theta}{\gamma}\frac{u}{W} - M_W = \frac{L}{W - P F_L} \qquad (30)$$

In terms of the unemployment rate:

$$u_r = \frac{\eta^M (1 - \frac{P F_L}{W}) + 1}{\frac{\theta}{\gamma} (1 - \frac{P F_L}{W}) + 1} \qquad (31)$$

Proposition 3. If membership demand increases with the wage set in the negotiations, and the union´s utility is of the form (26):

1. The monopoly union solution of the "monopsonist" union will lead to lower wages and lower unemployment than the "membership-taker" union.
2. The efficient bargaining locus of the "monopsonist" union will lie to the right (higher L for given W; lower W for given L) of that of the "competitive" union.
3. The unemployment rate of the "monopsonist" union will respond positively to both the elasticity of demand (in absolute value) and the elasticity of the membership function with respect to the wage rate.

Case B. Union Maximizes Average Utility

Consider that the union maximizes the average utility, i.e.,

$$\underset{L, W, M}{\text{Max}} \quad \frac{U(L, W, M)}{M} \qquad (32)$$

s.t.: $L = L(W)$;$M = M(W)$

or, alternatively:

$$\text{Max}_W \quad \frac{U[L(W), W, M(W)]}{M(W)} \qquad (33)$$

This utility function may be justified in analogous terms as the labor managed firm [xiv] objective function (revenue per worker): union members, in their decision processes concerning letting "outsiders" come in, maximize the "amount of utility" that accrues to each member.

The F.O.C. for an interior solution will give an optimal W^{2M} such that

$$(U_L L_W + U_W + U_M M_W) M - U M_W = 0 \tag{34}$$

Recall that at W^M, $U_L L_W + U_W + U_M M_W = 0$. Therefore, U is (already) decreasing at W^M: as expected (because as W increases M increases, decreasing, for fixed U, $\frac{U}{M}$), $W^{2M} < W^M$. The wage is now smaller than in the case where it maximizes total utility - demand will be higher, membership lower and the unemployment of members lower.

Let us compare the solution with the one where membership is exogenously considered, W*. For this solution, $U_L L_W + U_W = 0$. So we have two possibilities; at W*, either:

a) $U_M M_W M - U M_W > 0$, or $U_M \frac{M}{U} > 1$ (elasticity of U respect to M is larger than 1).

In this case, at W*, U is increasing and so $W^{2M} > W^*$. We will have, therefore:

$$W^* < W^{2M} < W^M \tag{35}$$

Graphically, this problem will yield the same conclusions as the one of Case A.

b) $U_M M_W M - U M_W < 0$, or $U_M \frac{M}{U} < 1$ (elasticity of U respect to M is smaller than 1).

In this case, at W*, U is decreasing and so $W^{2M} < W^*$. We will have, therefore:

$$W^{2M} < W^* < W^M \tag{36}$$

It is easy to show that the solution of this case will have similar properties as the one in the example. Typically, it corresponds to a similar graph as the one of Fig. 3.

Consider the utilitarian union: $U(W, L, M) = L\, u(W) + (M - L)\, u(W_a) = L\, [u(W) - u(W_a)] + M\, u(W_a)$, where u(W) - increasing and concave in its argument - is the typical member utility function. Then the union maximizes the expected utility of the representative worker [xv] - an objective function well known in the literature - $\frac{L\,[u(W) - u(W_a)]}{M} + u(W_a)$, which is equivalent to maximize $\frac{L\,[u(W) - u(W_a)]}{M}$; then (III.23) holds as long as $W > W_a$.

Proposition 4. If membership demand increases with the wage set in the negotiations, the union´s utility increases with the number of members, the monopoly union maximizes average (over all members) utility and behaves as a monopsonist in the membership market:

1. the wage, membership and unemployment will be lower (and employment higher) than if the "monopsonist" union maximizes total utility.

2. the wage, membership and unemployment will be:

- lower than if the union behaved "competitively" in the membership market if the elasticity of the union´s utility function with respect to M is smaller than one (in this case the union´s objective function decreases with M).

- higher than if the union behaves "competitively" in the membership market if the elasticity of the union´s utility function with respect to M is larger than one.

Case C: Union Maximizes Money Value of Surplus

Consider the utility function that corresponds to the collective rent [xvi]. It is sometimes assumed that the alternative wage is the one corresponding to the equilibrium solution without the union. If we have a membership "demand" M = M(W), we can interpret it (as any labor supply curve) as valuing the alternative use of time (leisure) by workers. Consider the inverse demand and membership functions:

$$W = W^{D}(L) \quad \text{and} \quad W = W^{M}(M) \tag{37}$$

Denote by W_a the wage that equalizes membership and demand, i.e.:

$$W_a = W^{D}(L_a) = W^{M}(L_a) \tag{38}$$

We can postulate an utility function where what is maximized is the monetary surplus of employed members, i.e.:

$$U(W, L) = W\,L - \int_0^L W^{M}(u)\,du \tag{39}$$

The monopoly union problem will be:

$$\max_{L,\,W}\; W\,L - \int_0^L W^{M}(u)\,du \tag{40}$$

$$\text{s.t.:}\quad W = W^{D}(L)$$

or

$$\max_{L}\; W^{D}(L)\,L - \int_0^L W^{M}(u)\,du \tag{41}$$

F.O.C. originate:

$$W^D(L) + L\frac{dW^D(L)}{dL} = W^M(L) \tag{42}$$

that is, marginal revenue of the union - $\frac{d(WL)}{dL}$ - equals membership demand (labor supply) wage in the employment level (implicitly) chosen.

Denote the above solution (L_1,W_1). Comparing with the solution (L_0,W_0), corresponding to the rent maximizer union with fixed W_a (i.e., that looks at membership supply as perfectly elastic at the wage that equates labor demand and membership supply) - see Fig. 4 -, we conclude that - as long as membership supply is not perfectly elastic - we achieve a lower wage and higher employment in the case where the surplus - the area below W until L between W line and the membership function - is maximized.

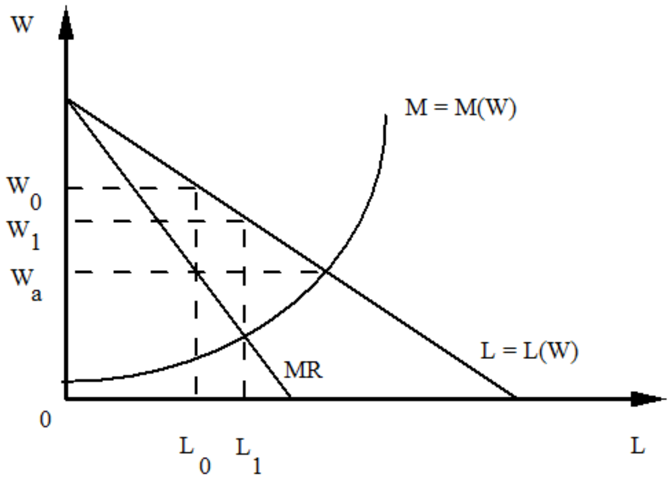

Figure 4.

Summarizing:

Proposition 5. If membership demand increases with the wage set in the negotiations, the monopoly union maximizes the members aggregate rent and behaves as a monopsonist in the membership market, the wage, membership and unemployment will be higher than if the union behaves "competitively" in the membership market. It will be lower than if the union considers supply of members as perfectly elastic at the “competitive wage”.

We should notice that even if the union acts with benevolent intentions, say, members are altruistic and so is the union, it is still the case that the role of the union is very different from the one of a social planner. In some cases, if unions behave as monopsonists towards the labor market, the outcome may be worse in terms of unemployment than if they did not; in others, it may be better. Notwithstanding that it is (still...) the case, behind these models, that unions are considered a means of achieving redistribution purposes but not efficiency.

5. Membership Fees and Bargaining Costs: Wage Determination and Membership Demand

We have considered a membership demand function M(W) without referring to its formation [xvii]. On the one hand, one can - specially if corporate bargaining is considered - interpret it as labor supply. Alternatively, we could see it as arising from a more general problem and identify membership response to membership fees in general form [xviii].

1. Denote membership fees by a. Membership demand will likely be

$$M = M(W, a) \quad ; \quad M_W > 0 \; ; \; M_a < 0 \tag{43}$$

Let C denote union bargaining costs. They will be increasing in M and, eventually, W.

$$C = C(M, W) \tag{44}$$

The union behaves as a nonprofit organization, i.e., works under a budget constraint (which gives rise to membership supply $M = M^S(W, a)$):

$$C(M, W) = M\, a \tag{45}$$

The union´s utility function will depend negatively on a, once members income decreases as a increases:

$$U = U(L, W, M, a) \tag{46}$$

The monopoly union problem can be written as:

$$\max_{L, W, M, a} U(L, W, M, a) \tag{47}$$
$$\text{s.t.:} \quad L = L(W) \; ; \quad M = M(W, a) \quad ; \; C(M, W) = M\, a$$

Let us consider the restrictions (44) and (45). We can derive:

$$a = \frac{C(M,W)}{M} \tag{48}$$

Replacing in the membership demand function (43), $M = M(W, a)$, we get:

$$M = M[W, \frac{C(M,W)}{M}] \tag{49}$$

From an explicit form (49), we can solve for $M = M(W)$. Graphically - see Fig. 7 -, we can see how this function is formed. In the space (M,W), we have the union average cost curves (for different levels of W); say curve C_0 corresponds to the average cost of attaining wage W_0, i.e., has the form $a = \frac{C(M,W_0)}{M}$ and C_1, for a given $W_1 > W_0$, $a = \frac{C(M,W_1)}{M}$; The intersection of these curves with $M = M(W_0, a)$ and $M = M(W_1, a)$ respectively, yields a membership/membership fees relation $M = M(a)$. To each intersection corresponds, therefore a given level of M - the relation $M = M(W)$ is represented in quadrant II. From here we conclude that M(W) may not be positively sloped - it will not be if average costs rise sufficiently fast with W relative to the shift of M(a, W); it will have the same slope as M(a). The relation between a and W is in quadrant IV and will always be positive.

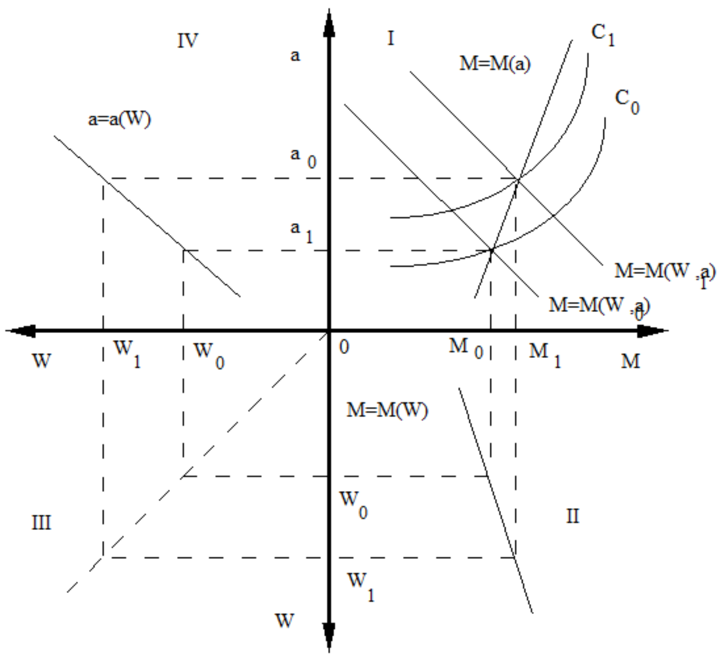

Figure 5.

If we replace restrictions (48) and (49) on the utility function we will obtain a problem of the general form of (I.1) which arguments are L, M and W:

$$\max_{L,\,W,\,M} \; U\left[L, W, M, \frac{C(M,W)}{M}\right] \tag{50}$$

$$\text{s.t.:} \quad L = L(W) \;\; ; \quad M = M(W) = M\left[W, \frac{C(M,W)}{M}\right]$$

Analogously, an efficient solution will answer:

$$\max_{L,\,W,\,M} \; U\left[L, W, M, \frac{C(M,W)}{M}\right] + B\,[P\,F(L) - W\,L] \tag{51}$$

$$\text{s.t.:} \quad M = M(W) = M\left[W, \frac{C(M,W)}{M}\right]$$

2. The previous problem assumes - as noted before - the union behaves as a monopsonist in the "membership market" - the labor market. That is, presumably, a reasonable assumption in "corporate systems". But assume, instead, that the union behaves competitively. This would correspond to the following:

The union, given membership M, decides

$$\max_{L, W, a} \; U(L, W, M, a) \tag{52}$$
$$\text{s.t.:} \quad L = L(W) \;\; ; \quad C(M, W) = M\, a$$

That is:

$$\max_{L, W} \; U\left[L, W, M, \frac{C(M,W)}{M}\right] \tag{53}$$
$$\text{s.t.:} \quad L = L(W)$$

The solution of the problem will yield W and L as a function of M. Then, we can write:

$$M = M^S(W) \tag{54}$$

Using the budget constraint, we can also obtain

$$a = \frac{C[W, M^S(W)]}{M^S(W)} = a^S(W) \tag{55}$$

Competitive equilibrium in the "membership market" can be derived from:

$$M = M^S(W) \quad ; \quad a = a^S(W) \quad ; \quad M = M(W, a) \tag{56}$$

Ultimately, in this market we observe wage determination. Notice that this setting represents the problem

$$\max_{L, W} \; U(L, W, M) \tag{57}$$
$$\text{s.t.:} \quad L = L(W)$$

and exogenous "membership demand" M = M(W) to which endogenous M solution was compared to.

6. Summary and Conclusions

This paper gathers some notes and enlargements to the standard collective bargaining problem in which unions maximize utility and firms maximize profits.

We extended the simple standard model in order to include membership considerations, introducing a union membership demand positively related to wages - eventually arising in a setting where unions behave as nonprofit organizations.

In some cases, wages and unemployment will be higher (the contract curve will shift to the right in efficient bargaining) when the monopoly union can behave as a monopsonist towards the labor supply or membership demand than when it acts competitively, i.e., take membership as exogenously given. This will occur if union's utility function depends positively on number of members. The opposite is expected if the unions' decision process values negatively the number of members. Some examples of both cases are presented as an illustration.

This study contains an additional point to the explanation of the hump-shaped relation between wages and centralization in wage bargaining [xix], here working through awareness of labor supply response, rather than union (or firm-union) rivalry. If membership is seen as more elastic to the wage rate when bargaining is coordinated economy-wide, provided that the decision process imply that unions value negatively the number of "insiders", a monopsonist union - representing the corporate bargaining result - will choose a lower wage and lower unemployment than the "competitive" or "membership-taker" union - this being associated to a smaller degree level of centralization, as in industry-wide bargaining.

Notes

[i] See Booth (1995), section 4.6, pp. 108-116, for a thorough recent survey.

[ii] Dunlop (1944), cited in Farber (1986), considers a membership function increasing in the wage rate net of membership fees.

[iii] Using Lindbeck & Snower (1990) term. Notice that we will never measure "outsiders", so we do not have a really insider-outsider scenario.

[iv] There are empirical arguments justifying the use of such function. Duncan & Leigh (1985), for example, provide an empirical analysis involving the treatment of endogeneity of union status, not rejected by statistical tests in their study. See Booth (1995), section 6, pp. 157-182 and references therein.

[v] Grossman (1983), for example, analyses endogenous membership in a system with seniority rules and prohibited closed shops. Booth (1984) links membership demand to individual decision of potential members which compare union's expected payoff with available alternatives.

[vi] We do not follow the interpretation of Lewis (1959), cited in Farber (1986), that the union wants to ´extract from the members all the rents (...)´ through membership fees, but instead we think of an union that may eventually behave as a nonprofit organization.

[vii] This is a feature of the Portuguese bargaining results, for example.

[viii] Relative demand for union status has been modelled as a function of wages by, for example, Booth & Chatterji (1993) in an open shop scenario. They arrive at a union membership demand function where union density is a function of the wages net of membership fees, convex in gross wages. See also Naylor & Raaum (1993) and Naylor & Cripps (1993). More recently, membership demand has received attention in the open shop union literature - see Corneo (1997), Holmlund & Lundborg (1999) and Moreton (2001).

[ix] We consider that the union cannot avoid membership. If it could, the second restriction would be replaced by $M \leq M(W)$ and, if $M(W)$ is positively sloped, would only become active at very low levels of W.

[x] If the firm behaves competitively maximizing profits, the restriction $L = L(W)$ is equivalent to $P\, F_L(L) = W$.

[xi] Second-order condition requiring

$$U_L L_{WW} + U_{LL} L_W^2 + 2\, U_{LW} L_W + U_{WW} +$$
$$+2\, U_{LM} L_W M_W + 2\, U_{WM} L_W M_W + 2\, U_{MM} M_W^2 + U_M M_{WW} \leq 0$$

This is consistent with both positive or negative U_M.

[xii] See Earle & Pencavel (1990) - the "canonical bargaining form". The Nash maximand solution

$$\max_{L,\,W}\ [U(L,W) - \bar{U}]^{\beta}\, [\Pi\, (L,W) - \bar{P}]$$

considered to arise in a bargaining where alternatives to agreement are $\bar{U}$ and $\bar{P}$ for the parties involved, would complicate some of the mathematics - and gives the same efficient combinations (L,W). β corresponds to the ratio of the firm discount rate to the union´s discount rate, and will, therefore, be higher the higher the relative bargaining power of the union. See Layard, Nickell & Jackman (1991), for example.

[xiii] As in McDonald & Solow 's (1981) traditional contract curve.

[xiv] Vanek (1970) is the mandatory reference for the analysis of the labor-managed economy, being the firm's objective function value-added per worker; we use the same argument to postulate the objective function of the union: total utility - whatever it may be, representing a measure of the

aggregate social welfare of members - per member. This analysis is a form of modelling motivations behind the decision on the number of "insiders" and is a way to go around the well-known median voter problem of equilibrium determinacy with union-wage setting.

[xv] Which may differ from the median voter's expected utility, as noted in Booth (1995), for example. Notice that the traditional median voter conclusions would not be applicable once voters also decide on the number of voters...

[xvi] See, for example, Kaufman (1991) for the analytical illustration of the monopoly union solution when the alternative wage is fixed or exogenous. de Menil (1971), cited in Blair & Crawford (1984), assumes that "unions maximize the surplus above the opportunity cost of the employed labour".

[xvii] We also ignore leadership problems or voting mechanisms - including seniority issues. These have been dealt with in the literature - see Farber (1986) for references. The considerations on membership in this paper would therefore apply with more accuracy to corporate bargaining settings.

[xviii] See the reference to and alternative derivations in Farber (1986). More recently, Booth & Chatterji (1995) that models a union as a nonprofit-seeking provider; Booth & Chatterji (1993), Naylor & Raaum (1993) and Naylor & Cripps (1993) model social custom, solidarity and reputation in membership demand.

[xix] See, for example, Calmfors & Driffill (1988). Also, Tarantelli (1986). Flanagan (1999) contains a recent review of international evidence.

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