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Unemployment and wages and centralization in wage bargaining: Some analytical explanations [*]

By Ana Paula MARTINS [†]

Abstract. This paper discusses the relation between centralization in union bargaining and the wage-(un)employment mix. Empirical findings point to a positive relation between the degree of coordination in union bargaining and wages till a certain point, and a negative one afterwards. A theoretical argument fits such evidence, relying on the mechanism behind the free-rider problem in union bargaining. If earnings taxes were introduced to finance the unemployment insurance fund, that relation could change. The impact on the equilibrium wages and multipliers in the several scenarios is briefly explored. Indirectly, an explanation for the shape of the empirical "wage curve" is also derived.
Keywords. Monopoly unions, Wage determination models, Union bargaining, Corporatism, Wage curve, Unemployment insurance.
JEL. J51, J65, E24, E62, H55, H39, D42, D43.

1. Introduction

Empirical findings point to a positive relation between the degree of coordination or centralization in union bargaining and wages (or, rather, the unemployment rate) till a certain point, and a negative one at high levels of centralization [2]. We depart from an argument previously stated in the literature which explains part of the observed relation (wage increases with centralization when bargaining is decentralized) - exposed in section 1 -, and suggest - in section 2 - an explanation for the other part (after some degree of centralization, wage decreases with it).

We do not invoke for the explanation any efficient bargaining considerations [3]: a closed shop monopoly union environment with respect to the target (firm, industry or total economy) is always assumed; unions maximize collective income. Also, monetary considerations are "sterilized" – unions and firms perform in a real environment. The difference in behavior results from the way unions perceive the alternative to employment of their members; with economy-wide bargaining, unemployment is certain and necessarily internalised in union's expectations; with decentralised union bargaining, eventually dismissed unemployed members are seen as competing for any union´s jobs.

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If unemployed, members receive the unemployment benefit; employed members face earnings taxes. It is likely that unions, as workers, are responsive to after-tax wages. This motivates section 3, that briefly contrasts the two equilibrium outcomes under income taxation.

Going a step further, it can be that the unemployment benefit bill is passed on to employed members through the tax system. In section 4, we compare the two wage bargaining arrangements for the case where earnings taxes are levied to finance the unemployment benefit [4]. Interestingly, the relation between wages and coordination in union bargaining could be reversed, with economy-wide bargaining generating higher wages than industry bargaining.

The exposition ends with a brief summary of the main conclusions in section 5.

2. Firm and industry-wide bargaining

1. Suppose unions maximize members´ earnings, and behave in a decentralized way. Each union solves

$$\max_{L,\,W} \quad W L + W_a (M - L) \qquad \text{s.t.:} \quad L = L(W) \tag{1}$$

where W denotes the wage achieved by union members, L employment, W_a, the alternative received by unemployed members, and M the exogenous number of union members; L(W) is the demand for union members´ labor, a negatively sloped function, i.e., $L'(W) < 0$. The union will pick [5]:

$$W = \frac{W_a}{1 - \dfrac{1}{\eta_{L,W}}} \; ; \; W \geq W_a \tag{2}$$

and $$\frac{W - W_a}{W_a} = \frac{1}{\eta_{L,W} - 1} \; ; \; \frac{W - W_a}{W} = \frac{1}{\eta_{L,W}}$$

where $\eta_{L,W} = -\dfrac{L'(W)\,W}{L(W)}$ denotes the wage elasticity of labor demand in absolute value. Given that $L'(W) < 0$, in the internal solution, $W \geq W_a$. The percentage deviation of the negotiated wage over the alternative W_a - the "wage markup" - is equal to the inverse of the excess of the demand elasticity over unity. The wage set will be higher the lower is the elasticity of demand. In the optimal solution, for positive wages, we will necessarily have that $\eta_{L,W} > 1$. Also:

$$\frac{dW}{dW_a} = \frac{L'(W)}{2\,L'(W) + (W - W_a)\,L''(W)} \tag{3}$$

For second-order conditions of problem (1) to hold, the denominator of (3) is negative [6]. Hence, being labor supply negatively sloped, (3) is positive. If labor demand is linear, $\frac{dW}{dW_a} = \frac{1}{2}$: a unit increase in the alternative increases the optimal wage - earnings of an employed member - by 0,5. If labor demand is convex, i.e., $L''(W) > 0$, $\frac{dW}{dW_a} > \frac{1}{2}$, if it is concave and $L''(W) < 0$, $\frac{dW}{dW_a} < \frac{1}{2}$. If $\frac{dW}{dW_a} < 1$, the difference between W and W_a shrinks when the alternative rises; hence, this happens necessarily with linear or concave demand, but may or may not be the case if demand is convex.

The union maximand increases with W_a. Denote by U* its value at the equilibrium solution; then, $\frac{dU^*}{dW_a} = M - L > 0$.

2. For a particular union, the alternative wage, W_a, is taken as exogenous. It may be seen as the weighted average of the unemployment benefit, b, received in case of unemployment, and the wage (also exogenous to the union control) received if the individuals get employment in other sectors. That is, unemployed members compete for other (any) unions´ jobs. If all sectors are unionised, this wage will equalize across sectors. Let u denote the unemployment rate in the economy:

$$u = \frac{M - L(W)}{M} \tag{4}$$

Then:

$$W_a = u\,b + (1-u)\,W \tag{5}$$

Replacing in (2) [7]:

$$W = \frac{b\,u}{u - \frac{1}{\eta_{L,W}}} = \frac{b}{1 - \frac{1}{u\,\eta_{L,W}}} \quad ; \quad W \geq b \tag{6}$$

and $\frac{W - b}{b} = \frac{1}{u\,\eta_{L,W} - 1}$; $\frac{W - b}{W} = \frac{1}{u\,\eta_{L,W}}$

In the optimal solution - see (6) -:

$$\eta_{L,W} > \frac{1}{u} > 1 \tag{7}$$

3. With an explicit form for L(W), we may be able to derive an explicit solution for u and W as a function of b. Using (6) and (4) - considering a inelastic labor supply M -, one can show that in internal solutions:

$$\frac{dW}{db} = \frac{u\,L'(W)}{2\,L'(W) + (W - W_a)\,L''(W) + L'(W)\,\frac{(1-u)^2}{u}} = \tag{8}$$

$$= \frac{u^2}{u\,(W - W_a)\,\frac{L''(W)}{L'(W)} + 1 + u^2}$$

Hence, the wage and the unemployment rate will increase with the (exogenous) unemployment benefit b. If, but not only if, $u < 0{,}5$, (8) will be smaller than 1 – and equilibrium wages will rise by less than an exogenous increase in the unemployment benefit. Also, if demand is linear, $L''(W) = 0$, $\frac{dW}{db} = \frac{u^2}{1+u^2} \leq \frac{1}{2} < 1$. If demand is concave, $L''(W) < 0$, and also $\frac{dW}{db} < \frac{u^2}{1+u^2} \leq \frac{1}{2}$; if demand is convex, $L''(W) > 0$, $\frac{dW}{db} > \frac{u^2}{1+u^2}$.

$\frac{dU*}{db}$ = (M – L) u – (M – L) $\frac{(1-u)^2}{u}\,\frac{dW}{db}$, nonnegative and, around the same unemployment level, smaller than $\frac{dU*}{dW_a}$ = M - L = M u was. However, the union´s utility function is incorrectly perceived ex-post; with respect to the relevant maximand, $\frac{d[W\,L + b\,(M - L)]}{db}$ = M – L - L $\frac{1-u}{u}\,\frac{dW}{db} = \frac{1}{u}\,\frac{dU*}{db}$, the effect is larger than $\frac{dU*}{db}$, but still expected to be smaller than $\frac{dU*}{dW_a}$.

4. The "unsolved", so to speak, equation (6) is useful to interpret estimated (observed) relations between unemployment and wages. Assume the unemployment benefit level can be controlled for, or is constant over a particular sample – of time series, or of cross section data; then, provided the wage elasticity of demand is the same for all observed units (an economy in different years; or in different sample regions; or in different industry sectors or professions) – and the same institutional arrangements, i.e., monopoly union wage-setting -, autonomous changes/differences in labor demand (for instance, business cycle induced movements; regional

size effects; industry-profession labor demand specificities) will lead to different wage-(un)employment mixes across units, but over that stable relation between the two aggregates. Under those circumstances, (6) asserts that the higher is the wage level, the lower will be the unemployment rate [8] in the economy.

5. For any variable wage-elasticity demand curve:

$$\frac{d\eta}{dW} = - \frac{(1+\eta_{L,W})\,L'(W) + W\,L''(W)}{L(W)} \tag{9}$$

In the optimal solution given by (3), $\eta_{L,W} > 1$; given second order conditions of problem (1), provided W_a L"(W) is small or non positive (e.g., if demand is linear or concave, or around $W_a = 0$ if convex), $\frac{d\eta}{dW} > 0$. $\frac{d\eta}{du}$ will have the same sign. Whatever causes a rise in W (and u) will increase the equilibrium wage elasticity of demand.

Assume a constant elasticity labor demand function, $L(W, \eta_{L,W})$. Then, the analysis of the previous paragraph does not apply. Consider, in this case, a change in the elasticity of demand $\eta_{L,W}$; differentiating the last equation of (6) and using (4):

$$\frac{dW}{d\eta} = \frac{b\,(L_\eta \frac{\eta}{M} - u)}{(\eta\,u - 1)^2 - b\,L_W \frac{\eta}{M}} \tag{10}$$

$$\frac{du}{d\eta} = \frac{b\,u\,L_W - L_\eta\,(\eta\,u - 1)^2}{M\,(\eta\,u - 1)^2 - b\,L_W\,\eta} \tag{11}$$

If $L_\eta = \frac{\partial L}{\partial \eta} \leq 0$ [9], the wage rate decreases with η; if L_η is small in absolute value (or not too negative), the unemployment rate will also decrease with η[10].

Denote the industry level elasticity of demand by η_I. The lower is this elasticity, the higher will be the wage. If decentralizing bargaining – e.g., moving from industry bargaining to firm-level bargaining - has the same effects as increasing the elasticity of the implicit aggregate labor demand function, considerations pertaining to the interpretation of (10) and (11) apply. Hence, decentralized (firm) level bargaining will lead to a lower wage, once labor demand is seen as more elastic.

This result would seem to suggest that if bargaining was staged at the economy-wide level - because labor demand is even less elastic -, we would observe an even higher wage rate. This need not be the case, as we will see in the next section.

3. Economy-wide bargaining

1. Consider an economy-wide bargaining process. The alternative wage will be the unemployment benefit b with probability one - (2) will apply with $W_a = b$:

$$W = \frac{b}{1 - \frac{1}{\eta_{L,W}}} \quad ; \quad W \geq b \tag{12}$$

and $$\frac{W - b}{b} = \frac{1}{\eta_{L,W} - 1} \quad ; \quad \frac{W - b}{W} = \frac{1}{\eta_{L,W}}$$

Let W_i denote wage with type i bargaining, i = I (industry), G (economy-wide). Then:

$$\frac{W_I}{W_G} = \frac{1 - \frac{1}{\eta_G}}{1 - \frac{1}{\eta_I u_I}} \tag{13}$$

The ratio will be higher:
- the higher η_G
- the lower η_I
- the lower the unemployment rate in the industry bargaining, u_I.

The ratio will be larger than one as long as:

$$\eta_G > \eta_I u_I \tag{14}$$

Given that (for interior solutions) $0 < u_I < 1$, even if $\eta_G < \eta_I$, we expect this condition to hold; if $\eta_G = \eta_I$, the wage with industry-level bargaining will be higher than with economy-wide bargaining. The reason lies on the fact that for a industry union, the alternative wage is perceived as higher than with economy-wide bargaining [11].

2. The previous comments apply regardless of whether aggregate demand shifts or not when we move from industry to economy-wide bargaining. Let us assume that it does not – the only difference comes from enhanced employment competition of dismissed employees in the former.

As $L'(W_I)(W_I - W_a) + L(W_I) = 0$ – first-order conditions of problem (1) - and $W_a \geq b$, $L'(W_I)(W_I - b) + L(W_I) = L'(W_I)(W_a - b) < 0$ (Or given (3) and because $W_a \geq b$), $W_G \leq W_I$. Then, economy-wide bargaining will lead to a lower wage – yet, to a higher wage bill, once wage-elasticity of demand is larger than one.

The unemployment benefit "wage multiplier" becomes, under economy-wide bargaining, (3), replacing W_a by b:

$$\frac{dW}{db} = \frac{L'(W)}{2\,L'(W) + (W - b)\,L''(W)} = \tag{15}$$

$$= \frac{1}{2 + (W - b)\dfrac{L''(W)}{L'(W)}}$$

(15) is positive and if labor demand is linear, $\frac{dW}{db} = \frac{1}{2}$. Comparing with (8), we conclude that if the term in L"(W) is negligible – e.g., demand is linear or b is close to the equilibrium wage -, the impact of a unit increase in b on W is much smaller under industry bargaining – and smaller than u times the economy-wide "multiplier".

$\frac{dU^*}{db}$ = M – L > 0. As discussed previously, it is expected to be larger than under industry bargaining.

Assuming unions are utilitarian, members are risk neutral and a fixed and exogenous unemployment benefit level:

Proposition 1. 1.1. Economy-wide (corporate) bargaining will lead to a lower wage than industry-wide bargaining if (in equilibrium)

$$\eta_G > \eta_I\, u_I$$

The intuition behind the result lies on the fact that in decentralized bargaining the probability of employment outside a particular union is seen as positive - and, thus, higher than in corporate bargaining.

1.2. If the unemployment benefit is (exogenously) set around the wage rate (and for the same labor demand in the two cases), or demand is linear, the positive impact on the wage (negative impact on employment) of a unit increase in the unemployment benefit is magnified with economy-wide bargaining.

1.3. With industry-wide bargaining, the "unemployment benefit multiplier" will be smaller than one when the unemployment rate is smaller than 0,5. It will never be larger than $\frac{1}{2}$ if labor demand is linear or concave.

4. Introducing income taxes

1. Consider that we have taxes, s per unit of earned income, on employed workers and the union responds to after-tax wages. The utilitarian union with risk neutral individuals will solve

$$\max_{L,\,W} \ (W - s)\, L + W_a\, (M - L) \tag{16}$$

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

The union will choose:

$$W = \frac{W_a + s}{1 - \dfrac{1}{\eta_{L,W}}} \ ; \ W - s \geq W_a \ \text{ or } \ W \geq W_a + s \tag{17}$$

One can show, in line with (3) and (8), that:

$$\frac{dW}{dW_a} = \frac{dW}{ds} = \frac{L'(W)}{2\, L'(W) + (W - s - W_a)\, L''(W)} \tag{18}$$

The gross wage rate increases with the alternative W_a and unit tax s according to the same multiplier – second-order conditions require the denominator to be negative. If unions respond to after-tax wages, because $\frac{dW}{ds} > 0$, they will choose higher unemployment and equilibrium wages than if they respond to gross wages. However, the net wage rate may decrease with the tax rate (iff (18) is smaller than unity); this will occur if $L''(W)$ is small.

$\frac{dU^*}{dW_a} = M - L$ and $\frac{dU^*}{ds} = -L$: a rise in the unemployment benefit will increase union´s welfare, an increase in the tax rate will decrease it.

Assume the unemployment benefit is not taxed – unemployed workers are recipients in the fiscal system. Then, replacing W_a for b in (17) and (18), we obtain, respectively, the wage curve and the benefit and tax rate multipliers with economy-wide bargaining.

2. If union(s)´ behavior is not fully centralized,

$$W_a = u\, b + (1-u)\, (W - s) \tag{19}$$

Replacing in (17) and solving for W,

$$W = \frac{b+s}{1-\dfrac{1}{u\,\eta_{L,W}}} \quad ; \; W - s \geq b \text{ or } W \geq b + s \tag{20}$$

The union responds to an increase in b, the unemployment benefit, in the same way as to an increase in s, taxes.

$$\frac{dW}{db} = \frac{dW}{ds} = \frac{u\;L'(W)}{2\,L'(W) + (W - s - W_a)\,L''(W) + L'(W)\,\dfrac{(1-u)^2}{u}} \tag{21}$$

(21) is still positive but smaller than (18) – with W_a replaced by b in (18) - under the same restrictions of the previous comparison of (15) and (8). If (but not only if) u < 0,5, or demand is linear, (21) will be smaller than 1 and net wages will decrease with s.

$\frac{dU^*}{db} = u\ (M - L) - (M - L)\ \frac{(1-u)^2}{u}\ \frac{dW}{db} > 0$, and $\frac{dU^*}{ds} = -\ L - u\ L\ (1 + \frac{1-u}{u}\ \frac{dW}{ds})$. Taxes seem to have a more negative effect on perceived utility than with economy-wide bargaining.

Proposition 2. If unions respond to net wages.

2.1. The tax and the unemployment benefit have similar treatment in the "bargained real wage curve".

2.2. The equilibrium wage and unemployment rate respond (positively and) equally to tax as to unemployment benefit changes (even if union´s welfare decreases with taxes and increases with the unemployment benefit level).

2.3. After-tax wages decrease with the unit tax rate if (but not only if) demand is linear or concave. Under industry bargaining, also if (but not only if) the unemployment rate is smaller than 0,5.

2.4. Proposition 1. still holds.

3. If unions recognize that taxes enter the alternative wage, they could behave as if

$$\max_{L,\,W}\ (W - s)\ L + W_a^*\ (M - L) - s^*\ (M - L)$$

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

where $W_a^* = u\ b + (1 - u)\ W$ and $s^* = (1 - u)\ s$; under decentralized bargaining, s* is outside the union control. Then, we can show that:

$$W = \frac{W_a * + u\,s}{1 - \frac{1}{\eta_{L,W}}} \quad ; \quad W - u\,s \geq W_a^* \text{ or } W \geq W_a^* + u\,s$$

Replacing W_a^* and solving for W, we arrive at (20). We therefore do not complicate the analysis further with this refinement.

5. Transfers: A balanced budget constraint

1. Suppose taxes are levied to finance the unemployment benefit under a balanced budget constraint:

$$u\,b = (1\text{-}u)\,s \tag{22}$$

Yet, unions fail to recognize it in their decisions.

The comparison of this scenario with the one of the previous section depends on the tax level. If taxes, without intentional restriction, are set at the level that insures (22), equilibrium wages are the same. If, departing from (17) or (20), to insure the budget constraint, the government must increase the tax rate, equilibrium wages (and unemployment) increase, according to (18) and (21) respectively. However, it may not have to increase the tax rate when, in the previous equilibrium, $u\,b > (1\text{-}u)\,s$ – that will depend on the size of the deficit, $u\,b - (1 - u)\,s$, and on the sign of

$$\frac{d[u\,b - (1 - u)\,s]}{ds} = -(1 - u)\,(1 - \eta_{L,W}\,\frac{b + s}{W}\,\frac{dW}{ds}) \tag{23}$$

This can be, in either of the two bargaining systems, positive or negative. For economy-wide bargaining and linear demand, if but not only if $\eta_{L,W} < 3$; for industry-wide bargaining, if (but not only if) $\eta_{L,W} < \frac{(1 - u)^2 + u}{u^2} = \frac{(1 - u)^2}{u^2} + \frac{1}{u}$, (23) is negative and an increase in the tax rate closes a positive deficit [12].

The previous statements can be explained as follows: when the tax rate increases, optimal gross wages increase - according to the previous section findings; hence, also unemployment. Then, two counteractive effects are in place with respect to the total impact on the deficit of the rise in s: on the one hand, the direct negative effect of the increase in the unit fiscal contribution. But, on the other, the increase in the unemployment insurance bill due to the larger number of unemployed, and decrease of (employed) taxpayers – a positive effect(s), expected large if labor demand reacts sizeably (i.e., labor demand elasticity is large) to the implicit rise in wages. If the second prevails, the unit tax rate should decrease to close a positive deficit.

(23) may (also) be positive or negative at zero taxes. If u b – (1 –u) s changes smoothly with s, and we depart from a positive deficit at s = 0, the deficit may be increasing or decreasing as we rise s - (23) may be positive or negative. But the deficit must start decreasing with s somewhere and be decreasing with s when we achieve the balance. For a positive (23) around the balanced budget under such smoothness, either there are multiple solutions for the s that solves the balanced budget; or the internal conditions found for the problem with no taxes do not guarantee 0 < u < 1 (0 < L(W) < M) – that is, the interior solution for s=0 is not available.

2. Assume industry bargaining. Replacing (22) in (20):

$$W = \frac{b}{\left(1-\frac{1}{u\,\eta_{L,W}}\right)(1-u)}\,^{13} \; ; \; W \geq \frac{b}{1-u} \text{ or } W\,(1-u) \geq b \tag{24}$$

In internal solutions, the wage multiplied by the employment probability in the economy must be larger than the unemployment benefit.

The relation between W and u in the bargained real wage curve is:

- negative if u is low: $\frac{1}{\eta_{L,W}} < u < \frac{1}{\eta_{L,W}^{1/2}}$
- positive if u is high: $u > \frac{1}{\eta_{L,W}^{1/2}} > \frac{1}{\eta_{L,W}}$

(Note that we must be working - see (17) - in a point where $\eta_{L,W} > \frac{1}{u} > 1$.)

This type of inversion seems to occur for some wage curves' estimates using local data surveyed in Blanchflower & Oswald (1994): when unemployment and unemployment squared are introduced in the wage regressions, the first coefficient is negative and the second-one is positive.

Condition (24) is, thus, appropriate for the comparison of wages set under different demand curves. Let us assume a particular economy and pursue the methodology of the previous sections.

Inserting (22) in (19),

$$W_a = W\,(1-u) \tag{25}$$

Denote by W_I the solution of (1) $L'(W_I)\,(W_I - W_a) + L(W_I) = 0$ – first-order conditions of problem (1) – and W_a, the alternative wage function (5), $W_a \geq b$. Let W_I^S be the (new) solution of (16) combined with (19) and (22) that yield W_a^S: $L'(W_I^S)\,(W_I^S - s_I^S - W_a^S) + L(W_I^S) = L'(W_I^S)\,[W_I^S - s_I^S - W_I^S(1-u_I^S)] + L(W_I^S) = 0$. Then $L'(W_I^S)\,[W_I^S - W_a] + L(W_I^S) + L'(W_I^S)\,[W_a - s_I^S -$

$W_I^S (1 - u_I^S)] = 0$; at W_I^S, $W_a - s_I^S - W_I^S (1 - u_I^S) = u_I^S b - s_I^S < 0$, $L'(W_I^S)(W_I^S - W_a) + L(W_I^S) < 0$ and the maximand of (1) is already decreasing at W_I^S. The denominator of (8) is negative: $L'(W_I^S) [W_I^S - W_a(W_I^S)] + L(W_I^S)$ decreases with W_I^S; hence, $W_I < W_I^S$ [14].

Using (25):

$$\frac{dW}{db} = \tag{26}$$

$$= \frac{\frac{u}{1-u} L'(W)}{2\,L'(W) + (W - s - W_a)\,L''(W) + L'(W)\,[(\eta_{L,W} - 1)\,(1-u) - (\eta_{L,W} - \frac{1}{u})]} =$$

$$= \frac{\frac{u}{1-u}}{2 + (W - s - W_a)\,\frac{L''(W)}{L'(W)} + [(\eta_{L,W} - 1)\,(1-u) - (\eta_{L,W} - \frac{1}{u})]}$$

(26) may be negative or positive [15]. It will be positive if (but not only if) equilibrium conditions yield $\eta_{L,W} < \frac{(1-u)^2 + u}{u^2}$. If positive, around the same solution for (20), it will be larger than (21) [16].

We can show that:

$$\frac{ds}{db} = \frac{u}{1-u} + (\eta_{L,W} - \frac{1}{u})\,\frac{dW}{db} \tag{27}$$

The required unit tax rate to insure (22) may increase or decrease with the unemployment benefit. (27) has the same sign as $\frac{dW}{db}$ (of the denominator of the second version in (26)). Also, or, rather alternatively, once s is seen as endogenously constrained by the balanced budget requirement,

$$\frac{dW}{ds} = \frac{L'(W)}{2\,L'(W) + (W - s - W_a)\,L''(W) + L'(W)\,(\eta_{L,W} - 1)\,(1-u)} \tag{28}$$

$\frac{dW}{ds}$ is always positive. If demand is linear or concave, it is smaller than $\frac{1}{2}$. Around the s that insures a balanced budget, (28) will be larger than (21) if (but not only if) $\eta_{L,W} < \frac{(1-u)^2 + u}{u^2}$.

$\frac{dU^*}{db} = - M - L - [(1 - u)\ (M - L)\ (\eta_{L,W} - 1) + L\ (\eta_{L,W} - \frac{1}{u})]\ \frac{dW}{db}$ and may be positive or negative. One can show that the sign will be symmetric to the one of $\frac{dW}{db}$. This is in contrast with the previous scenario: on the one hand, an increase in the unemployment benefit may actually decrease union´s welfare; secondly, when it does, we observe a rise in wages – and in the unit tax rate. Yet, $\frac{dU^*}{ds} < 0$ always.

3. Assume that global bargaining is in place. Then, in (17), $W_a = b$ and, considering the budget constraint (22), we can derive:

$$W = \frac{b}{(1-\frac{1}{\eta_{L,W}})(1-u)} \quad ; \ W \geq \frac{b}{1-u} \text{ or } W\ (1 - u) \geq b \tag{29}$$

The wage set in the economy, for given demand elasticity $\eta_{L,W}$ and unemployment benefit b, will vary positively with the unemployment rate in the economy.

Comparing this situation, (29), with the one in section 2, in which unions ignore s, (12), we conclude that, provided labor demand elasticity is constant, wages, are now higher. That is, if we compare two economies with the same unemployment benefit and demand elasticity, even if demands differ in other respects, under global bargaining wages will be higher for the economy with tax funding. (We cannot say the same for the non-coordinated case because there, also u will vary).

Denote by W_G the solution of (12) $L'(W_G)\ (W_G - b) + L(W_G) = 0$ – first-order conditions of problem (1) - and $W_G \geq b$; and W_G^s, the (new) solution of (29) combined with (22), $L'(W_G^s)\ (W_G^s - s - b) + L(W_G^s) = L'(W_G^s)\ [W_G^s - b] + L(W_G^s) - L'(W_G^s)\ s = 0$; at W_G^s, $L'(W_G^s)\ (W_G^s - b) + L(W_G^s) < 0$ and the maximand of (12) is already decreasing: $W_G < W_G^s$ [17]. Gross wages and unemployment are higher under the tax.

Moreover:

$$W - s = \frac{b}{1 - \frac{1}{\eta}} \; \frac{1 - u\,(1 - \frac{1}{\eta})}{1 - u} \tag{30}$$

That is, if η is constant, after-tax wages will be higher than gross wages were in the case in which taxes were ignored or absent.

Simulating the impact of the unit increase in b as before:

$$\frac{dW}{db} = \frac{\frac{1}{1-u}\,L'(W)}{2\,L'(W) + (W - s - b)\,L''(W) + b\,L'(W)^2\,M/L^2} = \tag{31}$$

$$= \frac{\frac{1}{1-u}}{3 + (W - s - b)\frac{L''(W)}{L'(W)} - \eta}$$

If positive, the multiplier is larger than (18) around the same equilibrium and expected to be larger than (26) around the same solution and for b close to W_a; however, the unemployment benefit multiplier may be negative. Net wages respond to the unemployment benefit according to: $\frac{dW - s}{db} = (2 - \eta_{L,W})\,\frac{dW}{db} - \frac{u}{1-u}$, which may be positive or negative.

Under economy-wide bargaining:

$$\frac{ds}{db} = \frac{u}{1-u} + (\eta_{L,W} - 1)\,\frac{dW}{db} \tag{32}$$

The required unit tax rate to insure (22) may increase or decrease with the unemployment benefit and one can show that it has the same sign as $\frac{dW}{db}$. Also,

$$\frac{dW}{ds} = \frac{\frac{1}{u}\,L'(W)}{2\,L'(W) + (W - s - b)\,L''(W) + L'(W)\,\frac{(\eta_{L,W} - 1)\,(1-u)}{u}} \tag{33}$$

$\frac{dW}{ds}$ is always positive and around the solution that insures the budget constraint may be larger or smaller than (18). It is expected to be larger than (28).

$\frac{dU^*}{db} = (M - L) - L\frac{ds}{db} = -L(\eta_{L,W} - 1)\frac{dW}{db}$: the union´s utility and wages move in opposite direction when the unemployment benefit changes. As under industry bargaining, unions´ welfare moves in the opposite direction of the unit tax rate and $\frac{dU^*}{ds} < 0$.

4. If we consider more or less coordination in union bargaining we see that the comments made in section 2. about the ratio $\frac{W_I}{W_G}$ apply now to the ratio between the aggregate wage bill – u_i, i = I, G, is the unemployment rate in the economy under each bargaining arrangement - in the two cases:

$$\frac{W_I\,(1-u_I)}{W_G\,(1-u_G)} = \frac{W_I\,L_I}{W_G\,L_G} = \frac{1-\frac{1}{\eta_G}}{1-\frac{1}{\eta_I u_I}} \tag{34}$$

It is therefore likely that the wage bill is higher in the decentralized case. Moreover, when comparing different economies – represented by different membership size, or different populations – the relation between the expected wage or gross earnings per member established in (34) is still valid (even if not in terms of the wage bill).

Again, (34) and the previous statement is valid if demand shapes differ in the two cases. Suppose aggregate demand at industry level must be represented by the same function that at global bargaining, i.e., $L_I = L(W_I)$, as $L_G = L(W_G)$. We are working in an elastic portion of demand - or, if isoelastic, L(W) must have wage elasticity larger than one; hence

$$W_I\,L_I > W_G\,L_G \quad \text{implies} \quad W_I < W_G \tag{35}$$

However, as $L'(W_I^s)\,(W_I^s - s_I^s - W_a^s) + L(W_I^s) = 0$ – first-order conditions that drive (24) - and $W_a^s \geq b$, $L'(W_I^s)\,(W_I^s - s_I^s - b) + L(W_I^s) < 0$; if the denominator of the first part of (31) is negative at W_I^s – if equilibrium wages increase with the unemployment benefit -, $W_G^s < W_I^s$. Then, economy-wide bargaining will still lead to a lower wage than industry bargaining – yet, to a higher wage bill, once wage-elasticity of demand is higher than one. (34) is smaller than 1.

If the denominator of (31) is positive, the reverse happens: $W_I^s < W_G^s$, i.e., economy-wide bargaining yields a higher wage and unemployment levels, and (35) holds; (34) is larger than 1.

The intuition behind this second result is that at industry-level bargaining the budget constraint effect is transmitted *ex post* to the alternative wage, W_a. Given that industry unions respond to this wage, if the *ex post* maximand is convex in W around the optimal solution, the larger perceived income alternative is wage depressant because, as labor demand is very elastic, it implies a lower unit tax rate; hence, the solution ends up by not being as employment-reducing as with global bargaining.

Then:

Assuming unions are utilitarian and members are risk neutral:

Proposition 3. If taxes are levied on employed members to pay for the unemployment compensation, and the budget equivalence is not recognized by unions:

3.1. The "bargained real wage curve" may be positively sloped (at high levels of unemployment). It will be positively sloped if there is coordination in union negotiations (corporate or global bargaining).

3.2. Corporate bargaining will lead to a higher after-tax wage than gross wage is in the case where before-tax earnings are considered in union´s optimisation.

3.3. The wage bill in industry-wide bargaining will be higher than with corporate bargaining if

$$\eta_G > \eta_I u_I$$

It is then likely that in this case the industry-wide bargaining wage will be lower than global bargaining one. If labor demand features are preserved under the two bargaining arrangements, this statement is only valid when wages respond negatively to the unemployment benefit; if they respond positively, wages will still be higher under industry-wide bargaining.

3.4. 1.2 of Proposition 1. may still hold, provided gross wages respond positively to the unemployment benefit; this will occur if and only if the required unit taxes to insure the balanced budget move in the same direction of the unemployment benefit. Equilibrium wages and the union´s objective function respond in opposite directions to changes in the unemployment benefit.

5. Note that we did not assume that the union fully internalises the budget constraint in its decision, which is likely with economy-wide bargaining. If we did - and this point can be found in Layard, Nickell & Jackman (1991), p. 129-131 -, the union would act as if maximizing the wage bill, set wages at unitary labor demand, and would not respond to the unemployment benefit [18]. Then, the union acts as if W_a in problem (1) is 0.

As the wage in the economy increases with W_a – according to (3) -, the unions fully internalising the budget constraint works as a decrease in W_a; hence, wages and unemployment will be lower than implied by (29). Or, due to (9), necessarily positive at $W_a = 0$, a lower wage elasticity is chosen, hence lower wages and unemployment level.

6. Conclusions

This article inspects the response of labor market equilibrium aggregates to the degree of coordination in union bargaining by analysing the features of the implicit wage curve.

The research assumes (closed-shop) monopoly unions that maximize collective earnings. It distinguishes the cases of unions responding to before and after-tax wages (or that always respond to after-tax wages and when wages are not and are levied on employed workers), and where (unit) taxes finance the unemployment benefit bill under a balanced budget constraint.

It was shown that if unions respond to gross wages, under plausible conditions (and as some empirical evidence seems to support), economy-wide bargaining will exhibit a lower wage than industry-wide bargaining – resulting from the fact that the probability of employment is perceived as higher under industry-wide bargaining.

If unions respond to net wages and earnings taxes finance the unemployment insurance fund, the reverse can occur. Under a balanced budget constraint, industry-wide bargaining will be consistent with a negatively sloped bargained real wage curve for low levels of unemployment, and positively sloped when unemployment is high – as empirical wage curves based on local disaggregation seem to be. Corporate bargaining will lead to a positively sloped wage curve. Under both bargaining systems, wages and unemployment are higher than when taxes were absent or unions respond to gross earnings.

In any event, a positive reaction of wages and unemployment to the unemployment benefit is magnified with centralized bargaining relative to industry bargaining. However, under a balanced budget - worker financed - unemployment insurance scheme, that response may become negative.

Notes

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2 See, for example, Calmfors & Driffill (1988). Also, Tarantelli (1986). A recent survey of international evidence can be found in Flanagan (1999).

[3] Such theoretical refinements in centralization bargaining have been applied and developed in studies such as those of Calmfors & Driffil (1988), Davidson (1988) and Dowrick (1989 and 1993).

[4] As in Oswald (1982). Holmund & Lundborg (1989) analyse the changes in the equilibrium induced by different unemployment insurance funding schemes.

[5] Efficient bargaining would lead to $P\,F_L = W_a$, with employment being determined by the relative strength of the union with respect to the employer one. We shall always assume monopoly unions.

[6] If labor demand is linear or concave, second-order conditions are always satisfied. For a standard constant elasticity demand, $L(W) = A\,W^{-\eta}$ – which is convex in W -, second-order conditions are satisfied around the optimal solution (i.e., provided $\eta > 1$, required by first-order conditions).

[7] See Carlin & Soskice (1990), page 391, for the derivation of this expression - the "bargained real wage curve".

[8] The empirically observed negative relation between the local unemployment rates and wages - well documented in Blanchflower & Oswald (1994) - is, therefore, consistent with monopoly union models. And, because the local framework is considered, would apply to local (the analog to industry-wide) bargaining.

[9] This is the case for $L(W, \eta_{L,W}) = A\,W^{-\eta}$ provided $W \geq 1$.

[10] When we compare economies with different labor demand schedules, (9) does not apply; (10) and (11) do not apply, in general. Nevertheless, (3) must hold.

[11] Tarantelli (1986) explains his findings of a negative relation between the Okun´s misery index (rate of growth of consumer prices plus rate of unemployment) and the degree of neocorporatism as being due to "lower risks of free riding" in a "more centralized system of industrial relations", thus originating "greater price stability". He argues that free riding in less centralized systems leads to a higher real wage level and higher unemployment. Layard, Nickell & Jackman (1991) comparing centralized and decentralized union bargaining also arrive at this relation between the corresponding outcomes - also explaining the fact as being due to the unemployment benefit which is seen as the alternative with coordinated union behavior - and complete coverage - is in place. Their argument differs from ours in that they conclude that for given coverage there is no reason to believe that "intermediate levels of centralization are bad" - we are comparing scenarios with the same (complete) coverage, therefore, we enlarge their conclusions to intermediate centralization. These authors focus on the corner solution - full employment - in the centralized bargaining case.

[12] We could not find any sensitivity of these conclusions to the imposition of (22).

[13] Note that also $W = \dfrac{s}{u - \dfrac{1}{\eta_{L,W}}}$. We assume that the government sets b, its policy target, and endogenously determines the tax rate under (22) to ensure the balanced budget. Hence, the bargained real wage curve is seen as (24) and not this expression in s.

[14] Once wages decrease with the tax rate - see (21) – this was to be expected.

[15] Hart & Moutos (1995), section 5.4, discuss the sign effects of the unemployment benefit increase on the wage rate under efficient bargaining in a two-sector model. They find that the sign of the multiplier on total employment becomes positive as a balanced budget constraint, recognized by unions and firms, analogous to (22) is introduced.

[16] This comparison is always valid around the same equilibrium of the cases of both sections.

[17] This was implied by (18).

[18] In this context, if unions are utilitarian and union members risk averse, Oswald (1982) proves that the wage will move in the same direction as the unemployment benefit (He considers a proportional income tax).

References

Blanchflower, D.G., & Oswald, A.J. (1994). *The Wage Curve.* M.I.T. Press, Cambridge.

Calmfors, L., & Driffill, J. (1988). Bargaining structure, corporatism and macroeconomic performance. *Economic Policy*, 3(6), 13-61. doi. 10.2307/1344503

Carlin, W., & Soskice, D. (1990) *Macroeconomics and the Wage Bargain.* Oxford University Press.

Davidson, C. (1988). Multiunit bargaining in oligopolistic industries. *Journal of Labor Economics*, 6(3), 397-422. doi. 10.1086/298189

Dowrick, S. (1993). Enterprise bargaining, union structure and wages. *Economic Record*, 69(4), 393-404. doi. 10.1111/j.1475-4932.1993.tb02120.x

Dowrick, S. (1989). Union-oligopoly bargaining. *Economic Journal*, 99(398), 1123-1142. doi. 10.2307/2234092

Feldstein, M. (1976). Temporary layoffs in the theory of unemployment. *Journal of Political Economy*, 84(5), 937-956. doi. 10.1086/260491

Flanagan, R.J. (1999). Macroeconomic performance and collective bargaining: An international perspective. *Journal of Economic Literature*, 37(3), 1150-1175. doi. 10.1257/jel.37.3.1150

Hart, R.A., & Moutos, T. (1995). *Human Capital, Employment and Bargaining.* Cambridge University Press.

Holmlund, B., & Lundborg, P. (1989). Unemployment insurance schemes for reducing the natural rate of unemployment. *Journal of Public Economics*, 38(1), 1-15. doi. 10.1016/0047-2727(89)90008-X

Layard, R., Nickell, S., & Jackman, R. (1991). *Unemployment: Macroeconomic Performance and the Labour Market.* Oxford University Press.

Oswald, A.J. (1982). Trade unions, wages and unemployment: What can simple models tell us?. *Oxford Economic Papers*, 34(3), 526-545. doi. 10.1093/oxfordjournals.oep.a041569

Tantarelli, E. (1986). The regulation of inflation and unemployment. *Industrial Relations*, 25(1), 1-15. doi. 10.1111/j.1468-232X.1986.tb00664.x