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## Union activity and economic resilience

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**UNION ACTIVITY AND  
ECONOMIC RESILIENCE**

**Assar Lindbeck  
and  
Dennis J Snower**

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Union Activity and Economic Resilience\*

ABSTRACT

The paper analyzes how the influence of labour unions over wage contracts may make an economy less "resilient". Loss of resilience is depicted in two conceptually independent ways: (i) the tendency of exogenous variations in unemployment to become perpetuated and (ii) the possibility that such swings may give rise to a wage-unemployment ratchet. In this manner, the analysis attempts to provide an explanation of why unemployment rates in Europe and the United States have displayed an upward trend over the past fifteen years and why the US recovered much more speedily from the recession of the early 1980s than did most European economies.

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## NON-TECHNICAL SUMMARY

Among the most notable features of the American and European macroeconomic experience over the past one and a half decades have been the secular rise in unemployment rates and the well-documented fact that the US recovered much more speedily from the recessions of the mid-seventies and the early 1980s than did most European countries. Several divergent explanations have been offered: some point to cross-country differences in fiscal and monetary policies; others emphasize "structural" changes affecting labour force composition and job mismatches; The New Classical Macroeconomics focuses on errors in price expectations; and yet another approach associates the American and European unemployment experiences with the degree to which wages have been "excessive".

The "excessive wage" approach has received considerable attention in recent years, focusing especially on the failure of real wages in Europe to adjust downwards in response to oil and commodity price shocks and the productivity slowdown. However, little has been done to give this approach a firm choice-theoretic foundation. For example, the conventional Keynesian wage-rigidity models and labour union models do not explain why real wages are not bid down in the presence of involuntarily unemployed workers. This paper addresses this issue by examining how the influence of unions on wage contracts can tend to make unemployment persist through time.

We argue that unions' power over wage contracts can make an economy less "resilient", in the sense that favourable and unfavourable swings in unemployment tend to persist and, over the long run, these swings lead to an upward trend in both real wages and unemployment. We suggest that union power may provide a possible explanation of why the recession of the early 1980s was more protracted in Europe than in the United States.

The basic argument underlying our analysis is straightforward. We adopt the reasonable assumption that when unions exert

influence over wages; they act mainly on the behalf of their members, the majority of whom are employed. Unions are assumed to take little, if any, account of the interests of the unemployed workers.

In our model, unions exercise power through their ability to manipulate labour turnover costs borne by the firm. These costs can take in a variety of forms in our model:

(a) costs of hiring, training, and firing (including advertising, screening of new employees, negotiation, and litigation costs, as well as severance pay);

(b) cooperation and harassment which may occur when union members cooperate with each other but not with non-union members, thereby raising union members' productivity above that of the non-members; or when members cultivate good personal relations with each other but not with non-members, thereby making work more disagreeable for non-members than for members;

(c) reduced incentives due to higher labour turnover, which may arise when current work effort is rewarded (at least in part) in the future a rise in labour turnover reduces the effectiveness of the incentive.

The existence of labour turnover costs falling on the firm means that incumbent employees generally have a greater chance of retaining their jobs than unemployed workers have of acquiring them. It is these labour turnover costs that give union members market power and allow them to raise their wage above the level at which non-members would be willing to work, without giving the employers an incentive to replace the union members by non-members. In other words, the union members are "insiders", who have an inherent advantage in the labour market over the

(111)

"outsiders", the unprivileged and frequently unemployed, workers.

Consider an economy in which unions play such a role. Labour market decisions are made in two stages: the wage level is set first in the absence of full information concerning the state of labour demand in the current period; given this wage level, firms determine employment levels after more information is available. Unions attempt to maximize the utility of their incumbent members which depends on (a) the level of wages negotiated and (b) the probability of being retained by the firm in the face of shocks to the economy. This probability in turn depends on the size of the incumbent labour force, and the wage level.

Now suppose that a recession occurs, due for example, to an external shock such as an oil price rise, so that at the negotiated wage level employment is lower than it was previously. Suppose furthermore that the long-run employment prospects of the economy are not as bleak as those in the short run. The short-run fall in employment means that the current incumbent insider work force will decrease. The remaining members, however, will perceive the chances of being retained at their jobs to be higher than previously. This smaller group of insiders realizes that they are now able to raise their wage without reducing their job security. Hence, a higher wage is negotiated and this discourages firms from employing as many workers as it might have done.

Thus, even if the short-run fall in employment is reversed at some time in the future, the level of employment will be lower than it was before the shock took place: unions have succeeded in negotiating higher wages in the meantime, and fewer workers are hired. In this sense, unfavourable swings in employment tend to be perpetuated through the influence of unions and their effect on the level of real wages.

The greater is the union's bargaining power, the greater the wage increases insiders will be able to achieve in a slump. This will accentuate the tendency for unfavourable swings in the unemployment rate to persist. In addition, union activity may translate cyclical macroeconomic fluctuations into permanent upward movements in real wages and unemployment. Since laid-off workers often lose influence over wage determination faster than newly hired workers gain such influence, an employment slump may reduce the insider workforce by more than an employment boom (of equal magnitude) would increase this workforce. Consequently, adverse employment swings lead to wage increases of greater size than the wage reductions generated by favourable employment swings. In the long run, therefore, real wages drift upwards and as a result the level of unemployment falls.

This analysis suggests that the greater influence of unions in Europe than in the United States may help explain why European economies have found it more difficult to emerge from the early 1980s recession than has the American economy.



## 1. Introduction

Among the most notable features of the American and European macroeconomic experience over the past one and a half decades have been the secular rise in unemployment rates and the well-documented fact that the U.S. recovered much more speedily from the recession of the early 1980's than did most European countries. Several divergent explanations have been offered. Keynesian economists often point to fiscal policies, operating in an environment of wage-price sluggishness (in particular, the increasing unwillingness of governments to engage in pump-priming and the more expansionary fiscal stance of the U.S. than that of Europe in the 1980's). Others, notably Layard and Nickell (1985), emphasize the effectiveness of fiscal policies operating in an imperfectly competitive environment where firms set product prices and unions set nominal wages. Some have emphasized secular rises in the natural rate of unemployment, which have attributed to increased job mismatches (due to structural changes, such as oil price shocks) and to changes in the competition of the labor force and "wage norms" (e.g. Perry 1986)). New Classical macroeconomists have suggested that much of the recent variation in unemployment can be explained in terms of errors in price expectations. Yet others, notably Bruno and Sachs (1985), identify real wage movements as the culprit (e.g. the rise of real wages in Europe relative to those of the United States in the early 1980's).

Among these explanations, the last has perhaps received the least

theoretical attention. The divergent real wage paths in Europe and the U.S. have been ascribed to differences in wage bargaining (in particular, differences in the degree of centralization in bargaining - emphasized by Bruno and Sachs - and in the productivity expectations of workers and firms), but such arguments have received little choice-theoretic foundation. This paper offers a different approach to the real-wage explanation. It suggests that cross-country differences in recovery rates may be due to differences in union power. In particular, our analysis shows how the influence of labor unions over wage contracts may make an economy less "resilient" in two senses: (i) unfavorable (as well as favorable) swings in unemployment tend to be perpetuated and (ii) such swings may give rise to a wage-unemployment ratchet (manifested in an upward trend in real wages and unemployment).

A number of recent studies have explored the influence of unions on wages and employment (or unemployment). For example, Blanchard and Summers (1986a, b), Gottfries and Horn (1986), Lindbeck and Snower (1985), and Horn (1983) provide different analytical contexts in which the existence of unions (or simply, workers with market power) may be responsible for unemployment persistence. Yet these studies do not show how unemployment persistence is related to the degree of union power; nor do they explore how union activity may give rise to wage-unemployment ratchets.

## 2. The Role of Insiders in Wage Determination

Our model of union behavior is an outgrowth of "insider-outsider analysis" (see Lindbeck and Snower (1986) for an overview), which presumes that labor turnover costs give a group of privileged, employed workers ("insiders") more favorable conditions of work than the unprivileged, unemployed workers ("outsiders"). The insiders exercise market power on their own behalf and thus (due to the more favorable conditions above) they raise their wage above the minimum level at which the outsiders would be willing to work, without giving firms an incentive to replace insiders with outsiders.

Applying this approach to labor union activity, let us suppose that the insiders are members of a single labor union which bargains over the wage for the employees of a single firm (viz, we do not consider multi-union firms or multi-firm unions). We distinguish insiders (viz, employed union members) from workers who are also employed but are non-union members and for that reason are assumed to lack influence in wage determination. We call them the "employed non-members". We suppose that they receive the same wage as the insiders, but that this wage is set without taking their interests into account.

The existence of labor turnover costs falling on the firm implies that employees generally have a greater chance of retaining their jobs than unemployed workers have of acquiring them. To be precise, as long as the present value of the differential between the offered wage and the reservation wage is less than the present value of the turnover costs above, employees are not replaced by outsiders.

These assumptions are at variance with the set-up in the traditional union theories (McDonald-Solow (1981), Oswald (1982)),

where only union members are considered for jobs and all union members - regardless of whether they were employed or unemployed in the previous period - face an equal probability of receiving a job in the current period.

Our model of union behavior has two salient, distinguishing features:

- (i) firms must bear some labor turnover costs whenever they fire current employees and hire other workers instead, and
- (ii) insiders exert market power (generated by the above labor turnover costs) in wage determination, without taking other workers into account.

Whereas the second feature has been investigated by a number of recent contributors to the theory of union behavior (e.g. Blanchard and Summers (1986a, b), Gottfries and Horn (1986), Weitzman (1985)), the first feature has received little attention in the union literature thus far (Osborne (1984) being a notable exception). This literature does not explain what gives unions (primarily representing insiders' interests) their clout; it does not deal with the question of why insiders are not replaced by outsiders whenever the insiders' wage exceeds the reservation wage.

The turnover costs may come in various guises, say, costs of hiring, training, and firing (e.g. Lindbeck and Snower (1984a), Nickell (1984)), "cooperation" and "harassment" differentials (see Lindbeck and Snower (1985)), and effort losses due to labor turnover (see Lindbeck and Snower (1984b)). These turnover costs generate economic rent. Let the differential between the reservation wage and the maximum attainable insider wage (viz, that wage which makes the firm indifferent between hiring insiders and hiring entrants) stand

for the size of the pie to be divided among the firm and its employees. By forming a union, insiders may be able to capture a larger slice of this pie, since the union may be expected to have more market power than each of its members individually. The union may also be able to increase the size of the pie by (i) amplifying the impact of the rent-creating tools of its individual members (e.g. coordinating "cooperation" and "harassment" activities or pressing firms to adopt costly hiring, training, and firing procedures) and (ii) generating new rent-creating tools (e.g. the strike and work-to-rule).<sup>1</sup> In short, the manipulation of turnover costs may be considered a rationale for unionization.

### 3. Wages, Employment, and Unemployment

As noted, we focus on a single firm whose insiders belong to a single union. Let work be a discrete activity, with each employee providing one unit of work. The firm's production function is  $Q = \varepsilon \cdot f(L)$ ,  $f' > 0$ ,  $f'' < 0$ , where  $Q$  is output,  $L$  is the number of employees (insiders and employed non-members), and  $\varepsilon$  is a random variable having a time invariant distribution  $G(\varepsilon)$  with zero mean and finite variance.

We assume that, in each period, labor market decisions are made in two stages. First, the wage ( $W$ ) is set before the realized value of  $\varepsilon$  is known (but with full information on  $G(\varepsilon)$ ). Second, the employment decision is made after  $\varepsilon$  is observed. (This sequence of decision making is merely meant to capture the observation that wages are frequently set without full knowledge of their employment consequences.) The wage is assumed to be the outcome of a Nash bargain between the firm and the union, while the employment decision is made unilaterally by the firm.

We call a worker an "incumbent insider" if he is an employed union member in the current period before  $\varepsilon$  is revealed. Since our aim here is to explore the impact of union-supported costs of replacing incumbent insiders by outsiders (an activity which firms commonly avoid doing) rather than the costs of expanding or contracting the workforce (activities which firms do undertake in booms and slumps, respectively), we focus attention on the former costs and ignore the latter. (It is also worth noting that the costs of firing an insider and hiring an entrant to take his place are usually much greater than the costs of temporary layoff and subsequent recall.)

Consider the second stage of decision making first. Given the known values of  $W$  and  $\epsilon$ , the firm sets employment so as to maximize its profit:  $\epsilon \cdot f(L) - W \cdot L$ , which yields the labor demand equation

$$(1) \quad L = \lambda(W/\epsilon), \quad \lambda' \leq 0,$$

and we assume that  $\lambda'' = 0$ .<sup>2</sup>

For simplicity (but without substantial loss of generality), we assume that there is no seniority ranking among incumbent insiders, so that each of them faces the same probability of being retained by the firm. The incumbent insiders are risk neutral. Moreover, suppose that the union is run by a majority voting rule and that the majority of union members are employed. Thus, in the first stage of decision making, the union's objective is to maximize an incumbent insider's expected utility.

To keep the exposition simple, we specify this worker's utility in the following straightforward way: If he is employed in the current period, he gains utility of  $U(W)$ , where  $U' > 0$ ,  $U'' < 0$ ; yet if he is fired, then his utility is zero. Let  $L^I$  be the number of incumbent insiders in the current period. Let  $\lambda(W/\epsilon) = L^I$ . Then  $\sigma$ , the incumbent insider's expected probability of being retained by the firm, may be defined as

$$(2a) \quad \sigma \equiv \int_{-\infty}^{\hat{\epsilon}} [L/L^I] \cdot G(\epsilon) d\epsilon + \int_{\hat{\epsilon}}^{\infty} G(\epsilon) d\epsilon$$

Here we implicitly assume that the union is able to give its members an advantage over the non-members in retaining their jobs, so that when the firm fires incumbents, non-members are fired first. (At the opposite extreme, the union is unable to do so, and thus the retention probabilities of members and non-members are identical. In that case,

" $L^I$ " must be replaced by " $L_{-1}$ " (last period's total labor force) in equation (2a). This amendment does not affect our qualitative conclusions below with regard to the unemployment persistence effect, but it does imply that there is no wage-employment ratchet.)

Note that if  $\lambda(W/\varepsilon) < L^I$ , then current employment ( $L$ ) falls short of the incumbent workforce ( $L^I$ ) and hence  $\sigma < 1$ ; yet if  $\lambda(W/\varepsilon) > L^I$ ,  $\sigma = 1$ . Equation (2a) implies that

$$(2b) \quad \sigma = \sigma(L^I, W),$$

where  $\sigma_L = \partial\sigma/\partial L^I < 0$  and  $\sigma_W = \partial\sigma/\partial W < 0$ , for any density  $G(\varepsilon)$  which is strictly positive over  $\varepsilon^{\min} < \varepsilon < \varepsilon^{\max}$  (where  $\varepsilon^{\min}$  and  $\varepsilon^{\max}$  are the highest and lowest attainable values of  $\varepsilon$ , respectively). (In other words, the more incumbents there are in the firm and the higher their wage, the lower is each incumbent's chance of being retained.) Consequently, the union's objective is  $\sigma \cdot U(W)$  and its threat point is 0.

The firm's objective in the wage bargain is to maximize its profit. If an agreement with the union is reached, whereby the wage  $W$  is accepted and no incumbent insiders are replaced by outsiders, the firm's expected profit is

$$(3) \quad \pi(W) = \int_{-\infty}^{\infty} \{ \varepsilon \cdot f[\lambda(W/\varepsilon)] - W \cdot \lambda(W/\varepsilon) \} \cdot G(\varepsilon) d\varepsilon$$

where we assume that  $\pi'$ ,  $\pi'' < 0$ .

Let  $T$  be the firm's turnover cost (i.e. the cost of firing an incumbent insider and hiring an outsider instead), which we assume to be a constant. (For a microeconomic derivations of  $T$ , see Lindbeck and Snower (1984a and b, 1985).) Let  $R$  be the reservation wage (at which a worker is indifferent between employment and unemployment). Then, for simplicity, we specify the firm's threat-point profit as



$\pi = \pi(R + T)$ . (The  $\pi(R + T)$  function may be interpreted as the profit which the firm earns upon replacing, at least temporarily, all its insiders by outsiders.)

Let  $B = \pi(W) - \pi(R + T)$  be the firm's objective in wage negotiation and let  $C = \sigma \cdot U(W)$  be the union's objective. Then the negotiated wage may be expressed as the solution to the following generalized Nash bargaining problem:

$$(4a) \quad \underset{W}{\text{Max}} \quad Q = B^a \cdot C^{1-a},$$

subject to  $W > R$ ,  $\pi(W) > \pi(R + T)$ ,  $\pi(W) > 0$ ,

where  $R$  and  $T$  are exogenously given to both negotiating parties, and the constant  $a$  ( $0 < a < 1$ ) measures the (exogenously given) bargaining strength of the firm relative to that of the union. Note that the turnover cost poses a threat to the firm, without which the union would have no bargaining power. The first constraint of problem (4a) ensures that union members prefer employment to unemployment; the second and third constraints ensure that the firm has no incentive to replace its insiders by outsiders or to close down its operations, respectively. By (3), it is evident that the second constraint implies that

$$(4b) \quad W < R + T.$$

The first-order condition for an interior solution is

$$(4c) \quad A = C_W + \delta \cdot (C/B) \cdot B_W = 0,$$

where  $\delta = a/(1 - a)$ . From this condition, along with some restrictions on the density  $G$  and the production function  $f$  (see the appendix), we can show that the wage depends on the number of incumbent insiders ( $L^I$ ) and on  $(R + T)$  in the following way:

$$(5a) \quad W = \phi \left( \begin{array}{c} L^I \\ (-) \end{array}, \begin{array}{c} R + T \\ (+) \end{array} \right).$$

for values of  $W$  in the range

$$(5b) \quad R < W < \min [R + T, \pi^{-1}(0)] = W^{\max}.$$

(with  $\pi^{-1}(0)$  given by (3)). In other words, the larger the number of incumbent insiders, the lower the retention probability, and thus the lower the wage is set. Also, the greater  $(R + T)$ , the lower the firm's threat-point profit, and the higher the wage.

Having analyzed wage formation, we now turn to the determinants of the firm's current incumbent workforce,  $L^I$ . Let  $r$  be the retirement rate (a positive constant), so that  $r \cdot L_{-1}^I$  of last period's incumbent insiders retire. Let  $h[(1 - r) \cdot L_{-1} - L_{-1}^I]$  be the "entry-exit function", which describes how many of the firm's non-retired, employed non-members  $((1 - r) \cdot (L_{-1} - L_{-1}^I)$  when  $L_{-1} > L_{-1}^I$ ) become union members or how many of the non-retired insiders who have been dismissed  $((1 - r) \cdot (L_{-1}^I - L_{-1})$  when  $L_{-1} < L_{-1}^I$ ) exit from the union. Then the current incumbent insider workforce is

$$(6) \quad L^I = (1 - r) \cdot L_{-1}^I + h[(1 - r) \cdot (L_{-1} - L_{-1}^I)].$$

The entry-exit function has the following properties:

$$(6a) \quad h = 0 \quad \text{if} \quad L^I = L_{-1}^I;$$

$$(6b) \quad h = 1 \quad \text{if} \quad L_{-1} < L_{-1}^I,$$

(i.e. when incumbent insiders are dismissed, they lose their influence in wage determination, since - as noted - union behavior is determined by majority vote, with the majority consisting of the employed members), and

$$(6c) \quad 0 < h < 1 \quad \text{if} \quad L_{-1} > L_{-1}^I$$

(i.e. a fraction of the non-retired, employed non-members enter the union). How many of such workers join the union in the real world

depends on laws, social norms, transactions costs, inertia in non-members' behavior - all of which lie beyond the influence of the union itself (and beyond the scope of this paper).

Note two extreme cases. On the one hand, there is "free entry", where each of last period's employed non-members becomes a union member in the current period if he retains his job. Here,  $h = 1$  for all  $L_{-1} - L_{-1}^I$ , so that  $L^I = (1 - r) \cdot L_{-1}$ .<sup>3</sup> On the other hand, there is "no entry", where employed non-members have no opportunity of joining the union. Here  $h = 0$  for  $L_{-1} - L_{-1}^I > 0$ , so that  $L^I = (1 - r) \cdot L_{-1}^I$  over this range.

In short, our model of the labor market consists of the labor demand function (1) (pictured in Figure 1a), the wage determination conditions (5a) and (5b) (pictured in Figure 1c), and entry-exit function (6) (pictured in Figure 1d), which specifies the incumbent insider workforce. To characterize the labor market equilibrium in a particularly simple way, we make the following assumptions. First, we suppose that the labor market contains a fixed number of identical firms, union members, employed non-members, and outsiders. Then the wage-employment activity within an individual firm may be seen as a microcosm of that for the entire labor market. Second, we assume that the parameters of our model are such that, for any given value of  $\epsilon$ , there exists a unique, stable, stationary equilibrium  $(\hat{W}, \hat{L}, \hat{L}^I)$ , where  $\hat{L}^I = \hat{L}_{+1}^I$  in the figure. Finally, we suppose that each realization of  $\epsilon$  persists for long enough so that this equilibrium is reached. Such an equilibrium is illustrated by the points  $E_1$  in Figures 1.

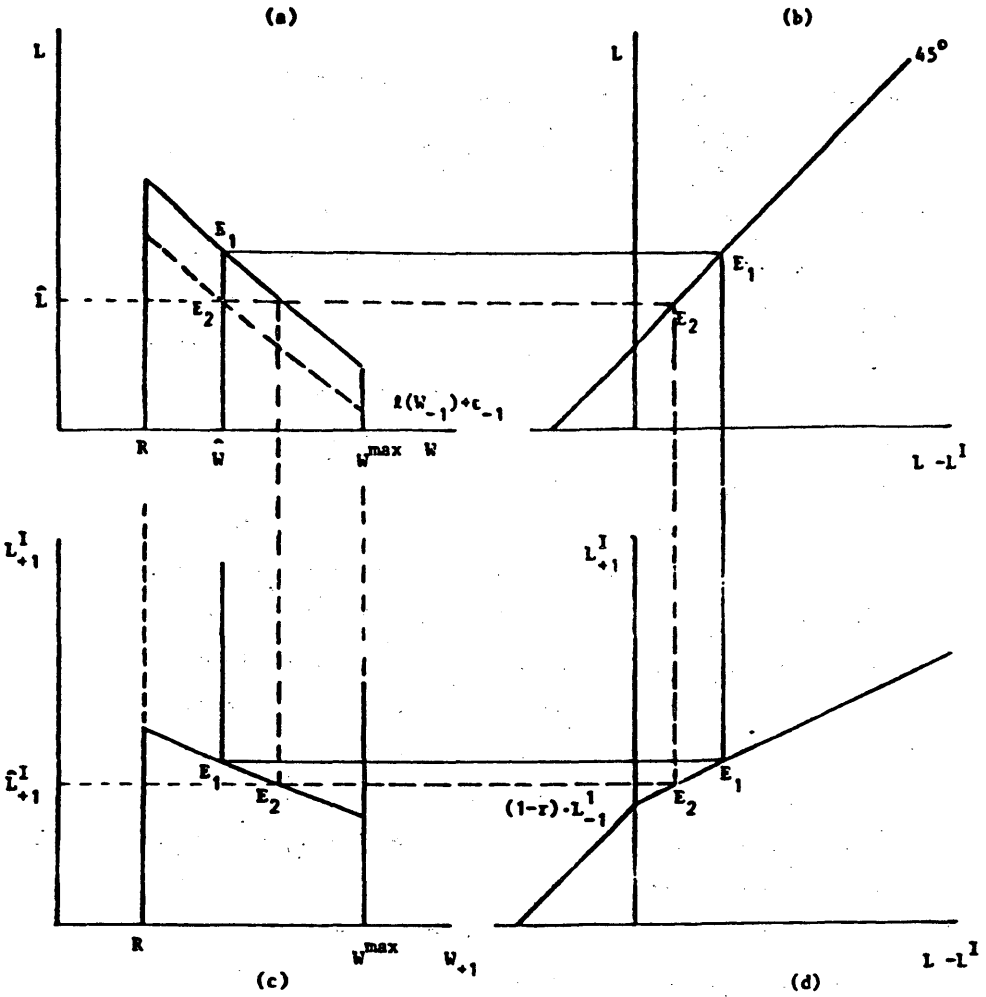


FIGURE 1 Labor Market Equilibrium and Unemployment Persistence Effect

#### 4. The Influence of Union Power on Economic Resilience

We now show how the exercise of union power in wage bargaining may make the labor market less "resilient" in the face of cyclical swings in employment. We specify this loss of resilience in terms of

- (a) an "unemployment persistence effect", whereby the union influences the wage in such a way that any random variation in current employment tends to persist (e.g. an adverse random variation in current employment means that the future employment will be lower than it otherwise would have been, *ceteris paribus*) and
- (b) a "wage-unemployment ratchet effect", whereby random variations in employment through time lead to an upward trend in the wage and unemployment rates (because favorable variations lead to larger wage increases, per unit of employment, than unfavorable variations).

Consider the unemployment persistence effect first. Assume that given the level of  $\epsilon$ , the initial equilibrium wage ( $\hat{W}$ ) lies strictly between the upper and lower bounds given in condition (5b). Now consider what happens when there is a transient adverse shock to labor demand - generated by a fall in  $\epsilon$  - after the current wage  $\hat{W}$  has been negotiated. In other words, the labor demand curve in Figure 1a shifts downwards, so that for the current wage ( $\hat{W}$ ), current employment ( $\hat{L}$ ) is lower (as shown by point  $E_2$  in Figure 1a). Assuming that  $h > 0$  (so that the right-hand segment of the entry-exit function in Figure 1d has a positive slope), the current incumbent insider workforce ( $\hat{L}^I$ ) falls (as shown by point  $E_2$  in Figure 1d). Since a fall in the incumbent workforce (under the same distribution of employment shocks,  $\epsilon$ , as before) raises each incumbent's retention probability, the union

negotiates a higher wage. Thus, the wage rises above  $\hat{W}$ , as shown by point  $E_2$  in Figure 1c (where the new wage is less than  $W^{\max}$ ). The wage increase discourages the firm from employing as many workers as it would otherwise have done. Thus, for any given  $\epsilon_{+1}$ , current employment will be lower than it would otherwise have been.

Given that the economy has  $n$  workers and  $m$  firms and that the negotiated wage ( $W$ ) exceeds the reservation wage ( $R$ ), the level of involuntary unemployment is  $(n - m \cdot L)$ . Then the argument above implies that once an employment slump occurs, the wage-setting activity of unions tends to make it persist, provided that  $h > 0$  and  $W < W^{\max}$ .<sup>4,5</sup>

Note that once the wage hits  $W^{\max}$  (given by (5b)), the unemployment persistence effect disappears, in the sense that no further adverse shock in employment leads to a rise in the wage. (The reason is, of course, that if the union would allow the wage to exceed this maximum level, the firm would respond either by replacing the insiders by outsiders or by closing down.) In other words, the unemployment persistence effect is bounded from above.<sup>6</sup>

We now consider how the magnitude of the unemployment persistence effect depends on union entry conditions (summarized by the function  $h$ ). Clearly, entry conditions are relevant only when entry into the unions is actually taking place, i.e. only when  $h > 0$  and  $L > L^I$ . Under these circumstances, the greater the opportunities for entry (i.e. the greater  $h$ ), the more a given change in employment affects the magnitude of the insider workforce. Consequently, the greater the unemployment persistence effect.

Next, we turn to the influence of union bargaining power on the

unemployment persistence effect. Our analysis suggests that a rise in such power is mirrored in (a) a fall in  $\delta$  in Equation 4c (i.e. a fall in the bargaining strength of the firm relative to that of the union) and/or (b) a rise in the firm's labor turnover cost,  $T$ . It can be shown that each of these phenomena not only raises the wage ( $W$ ), but makes the wage more responsive to changes in the incumbent insider workforce ( $L^I$ ) (i.e. each reduces the value of  $(\partial W/\partial L^I)$  in Equation 5a) and thereby augments the unemployment persistence effect. This proposition is proved formally in the Appendix; here we provide some intuitive interpretation.

Let us view the wage as being set by a "Nashian arbitrator", whose objective function is a weighted average of that of the firm ( $B$ ) and that of the union ( $C$ ) (in Problem (4a)). In this context Equation 4c means that the arbitrator imposes a wage which makes the union's marginal gain from a wage increase ( $C_W$ ) equal to the firm's associated marginal loss ( $B_W$ ), appropriately normalized (by  $\delta \cdot (C/B)$ ). When a fall in  $L^I$  raises the retention probability (as noted above), the union faces a larger marginal gain from a wage increase than heretofore. Thus, the arbitrator raises the wage, making the union better off and the firm worse off.

But when the union's bargaining strength increases (i.e.  $\delta$  falls), then the given drop in  $L^I$  calls forth a larger rise in  $W$ , because now the firm's loss from a wage increase is weighted less heavily in the arbitrator's objective function. Similarly, when the union raises the turnover cost  $T$ , it raises the firm's threat-point profit and thus, once again, the arbitrator weights the firm's gain from a wage reduction less heavily. As above, the wage becomes less responsive to changes in  $L^I$ .

The larger the wage response to a given change in  $L^I$ , the flatter the  $W - L^I$  schedule in Figure 1c. Thus, when there is an adverse employment shock (as shown in Figure 1a) leading to a fall in the incumbent insider workforce (in Figures 1b and d), the resulting wage increase is larger than it would otherwise have been, and therefore the downturn in employment is amplified. In this way, a rise in union power strengthens the unemployment persistence effect.<sup>7</sup>

Figures 1 also indicate how union influence on wage bargaining may generate a "wage-employment ratchet effect". In order for this effect to operate, it is necessary that there is less than "free entry" (i.e.  $h < 1$ ) and that the random variations in employment are "large" relative to the incumbent insider workforce (i.e. adverse swings cause  $L_{-1} < L_{-1}^I$  and favorable swings cause  $L_{-1} > L_{-1}^I$ ).

To see this, observe that when  $h < 1$ , the left-hand branch of the entry-exit locus of Figure 1d is steeper than the right-hand branch. In other words, all insiders who are dismissed relinquish their influence on wage determination (since the union is assumed only to represent the interests of employed members), but all entrants who are hired do not gain influence on wage determination (because when  $h < 1$ , some entrants do not promptly join the union). Consequently, the random variations in employment lead to a downward trend in the incumbent workforce and, by implication, an upward trend in the wage and unemployment rates. The greater union power (viz, the lower  $\delta$  or the greater  $T$ ) and the smaller  $h$ , the larger this wage-employment ratchet effect, ceteris paribus. The ratchet is bounded from above by  $W < W^{\max}$ . Once the wage hits  $W^{\max}$ , adverse swings reduce employment while the wage remains rigid.



## 5. Concluding Remarks

Our analysis indicates that (a) unions' power over wages may, to some extent, hinder an economy in recovering from a recession and (b) the greater the unions' power (as reflected in their bargaining strength and the magnitude of labor turnover costs), the bleaker the economy's recovery prospects may become. In this light, the more widespread and intensive influence of unions in Europe than in the United States may help explain the drastically different product wage trajectories in these two parts of the world and Europe's comparative lack of success in reducing its unemployment after the recession of the early 1980's.

The same may be said of sectors within these economies. For example, unions play a comparatively important role in wage determination of the steel and automobile industries in the U.S., and it has been these industries that have witnessed relatively low employment rates.

It is worth noting that the unemployment persistence effect also works in reverse: union wage setting tends to perpetuate favorable random variations in employment, and the stronger the unions are, the more pronounced this effect will be. Thus, it may be argued that whereas a rise in union power generally leads to higher wages and lower employment (both in comparative static terms and via the bounded ratchet effect), union wage setting is more harmful in a recession than in a boom on account of the unemployment persistence effect.

Most importantly, our analysis may help explain why unemployment rates in Europe and the U.S. have had an upward trend over the past

one and a half decades. It also provides some microeconomic underpinning for the notion that European unemployment is more closely related to "excessive wages" than American unemployment.

APPENDIXThe effect of the incumbent workforce on the wage:

Rewriting Equation 4c,

$$A = [\sigma \cdot U' + \sigma_{\lambda} \cdot \lambda' \cdot U] + \delta \cdot (\sigma \cdot U/B) \cdot \pi'(W) = 0$$

In order for the second-order condition for optimality to be fulfilled, we need to assume that  $[(\sigma_{\lambda\lambda} \cdot \lambda' / \sigma_{\lambda}) - (\lambda'' / \lambda')]$  exceeds some negative critical value. For the sake of algebraic simplicity below, however, we suppose that  $\lambda'' = 0$ ,  $\sigma_{\lambda\lambda} < 0$ , and  $\sigma_{\lambda L} = 0$ . These conditions may be derived by imposing the appropriate restrictions on the density  $G$  and the production function  $f$ .

$$(\partial W / \partial L^I) \Big|_{A=0} = - A_L / A_W, \text{ where}$$

$$A_W = (\partial A / \partial W)$$

$$= -\lambda' \cdot [\sigma \cdot U' + \sigma_{\lambda\lambda} \cdot \lambda' \cdot U + \delta \cdot \pi'(W) \cdot \sigma_{\lambda} \cdot U/B]$$

$$+ \sigma \cdot U'' + \sigma_{\lambda} \cdot \lambda'' \cdot U' + (\delta \cdot \sigma/B) \cdot [\pi'(W) \cdot U' - (\pi'(W) \cdot U/B) - U \cdot \pi''(W)]$$

which must be negative in order for the second-order condition for optimality to be fulfilled. We assume that  $\sigma_{\lambda\lambda} < 0$  to ensure this; furthermore, assuming  $\sigma_{\lambda L} = 0$  for simplicity,

$$A_L = (\partial A / \partial L^I) = \sigma_L \cdot [U' + (\delta \cdot U \cdot \pi'(W)/B)] < 0$$

Thus,  $(\partial W / \partial L^I) \Big|_{A=0} < 0$ .

The effect of (R + T) on the wage:

$$[\partial W / \partial (R + T)] \Big|_{A=0} = - A_{R+T} / A_W, \text{ where}$$

$$A_{R+T} = [\partial A / \partial (R + T)] = -\delta \cdot (\sigma \cdot Y/B^2) \cdot \pi'(W) \cdot [\partial B / \partial (R + T)] > 0.$$

Thus,  $[\partial W / \partial (R + T)] \Big|_{A=0} > 0$ .

The effect of  $\delta$  on the wage:

$$\left. \frac{\partial W}{\partial \delta} \right|_{A=0} = -(\sigma \cdot U \cdot \pi'(W)) / B \cdot A_W < 0.$$

The effect of T on the responsiveness of W to  $L^I$ :

Note that

$$(A_W / A_L) = -\lambda' + (\tau / A_L) \equiv D, \text{ where}$$

$$\tau = \sigma \cdot U'' + \sigma_\lambda \cdot \lambda' \cdot U' + (\delta \cdot \sigma / B) \cdot [\pi'(W) \cdot U' - (\pi'(W) \cdot U / B) - U \cdot \pi'(W)]$$

Then

$$\frac{\partial D}{\partial \delta} = \frac{\tau_\delta \cdot A_L - A_{L\delta} \cdot \tau}{(A_L)^2}, \text{ which is positive because}$$

$$A_{L\delta} = \sigma_L \cdot \pi'(W) \cdot U / B > 0,$$

$$\tau_\delta = (\pi'(W) \cdot \sigma / B^2) \cdot [U' \cdot B - \pi'(W) \cdot U] + (\sigma \cdot U \cdot \pi''(W) / B) < 0$$

and thus

$$\begin{aligned} \tau_\delta \cdot A_L - A_{L\delta} \cdot \tau &= \tau_\delta \cdot [\sigma_L \cdot U' - \sigma'' \cdot \lambda' \cdot U] \\ &\quad - A_{L\delta} \cdot [\sigma \cdot U'' + \sigma_\lambda \cdot \lambda' \cdot U'] > 0 \end{aligned}$$

$$\text{Hence } \left. \frac{\partial (\partial W / \partial L^I)}{\partial \delta} \right|_{A=0} > 0.$$

### Footnotes

1. On a national level, unions often lobby for further "job security legislation", which raises the hiring, training, and firing costs.
2. In order for the second-order condition for the optimization problem (4a), below, to be fulfilled, we only need to assume that  $[(\sigma_{\lambda\lambda} \lambda' / \sigma_{\lambda}) - (\lambda'' / \lambda')]$  exceeds some critical, negative value.
3. In many countries (e.g. Great Britain), it is illegal for unions to refuse membership to employed workers (in the appropriate jobs) who wish to join. In that case,  $h < 1$  whenever (as frequently happens) new entrants' desire to join is not universal or prompt.
4. Of course, insider market power is not the only conceivable rationale for such an effect. Other rationales include the depreciation of human and non-human capital during prolonged periods of unemployment, changes in workers' tastes and job search behavior over such periods (in particular, an increased preference for leisure relative to work and a loss of self-confidence in job search).
5. Observe that this result is superficially similar to that of Blanchard and Summers (1986a). However, their unemployment persistence rests on a fundamentally different relation between wages and labor demand: in our model, unions may be responsible for "excessive" real wages and "deficient" employment due to production processes characterized by diminishing returns to labor; in their model, unions may give rise to excessive nominal wages, implying excessive product prices and thereby leading to deficient product demand and thus to a deficient derived demand for labor.
6. Observe furthermore that if  $h < 1$  when  $L_{-1} > L_{-1}^I$  and if adverse employment swings lead to shrinkage of the labor force while favorable swings lead to net hiring, then the unemployment persistence effect tends to be weaker in a boom than in a slump. Blanchard and Summers (1986b) find empirical confirmation of this phenomenon.
7. As the Appendix shows, these are not the only channels whereby a fall in  $\delta$  or a rise in  $T$  may influence the relation between  $W$  and  $L^I$ . Suffice it to say that the other channels pull in the same direction.

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