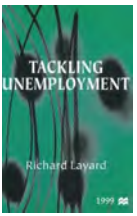
9 Why Does Unemployment Persist? (1989)*

with C. Bean



1 INTRODUCTION AND SUMMARY

Macroeconomics was invented to explain the persistence of unemployment. In thinking about this issue there are three key facts to be accounted for. Fact 1 is persistence itself: if unemployment becomes unusually high, it does not quickly revert to its earlier level, and the same is true if it becomes abnormally low. This is true in all countries and is illustrated for Britain in Figure 9.1. As the figure shows, the history of unemployment, consists of some minor wiggles plus occasional major changes of level. The main movements of unemployment do not correspond to business cycle fluctuations which correct themselves within a few years.[1]

However, Fact 2 is that unemployment is in the long run untrended. In other words there *is* a long-run 'natural' rate of unemployment to which the system tends eventually to return. To avoid the suggestion that this is beyond the power of man to affect we shall call this the long-run NAIRU (Non-Accelerating-Inflation Rate of Unemployment) – meaning the level of unemployment at which there is no upwards or downwards pressure on the inflation rate (or more precisely no 'price surprises'). The fact that the unemployment rate is untrended is quite remarkable, given the large changes in labour force which have occurred in most countries, mainly for demographic reasons. In the long run employment follows the labour force, and any meaningful model of the economy must reflect this tendency.

Fact 3 is that unemployment is often far from the long-run NAIRU without any upwards or downwards pressure on inflation. In the late 1980s European inflation has been very stable despite high unemployment, it was also stable in the 1950's and 1960's despite low unemployment. This means that in any year the prevailing (or short-run) NAIRU can be far away from the long-run NAIRU. In fact very little of the variation in unemployment is associated with changes in inflation (or 'price surprises'). It follows that most of the variation in

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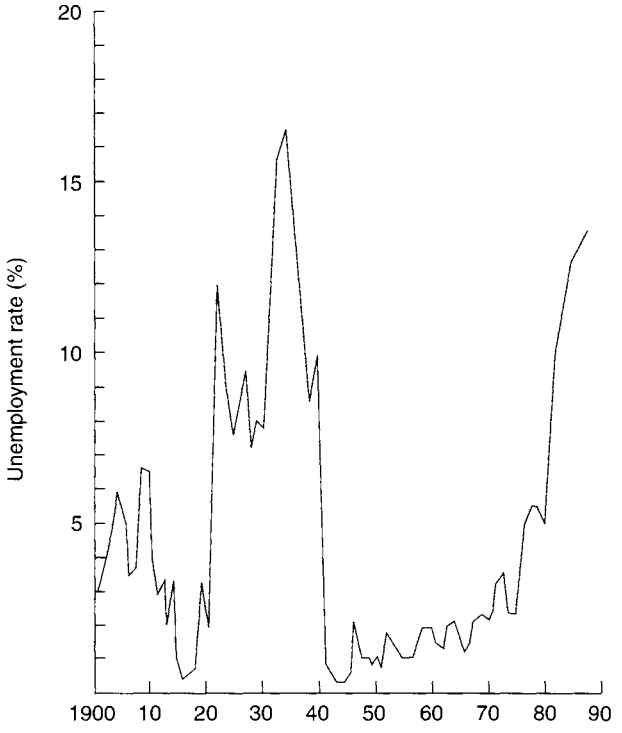

Figure 9.1 Unemployment in the United Kingdom, 1900–85
Source: Layard (1986, Figure 1).

unemployment reflects the evolution of the short-run NAIRU. Thus the short-run NAIRU has to become one of the central concepts in macroeconomics. The aim of this paper is to explain its evolution.

As we shall see, the initial impulse changing unemployment may come either from demand or supply shocks. But after such a shock, the continuing evolution of unemployment is most fruitfully thought of in terms of the evolution of the short-run NAIRU.[2]

This is a story of the supply side of the economy. One then asks: What causes such persistence in the economy's capacity to produce without increasing (or decreasing) inflation? One answer is in terms of the evolution of the physical capital stock; cf. Malinvaud (1982). As Modigliani *et al.* (1987) argue, this is not very plausible. The number of workers per machine, office or restaurant can be

varied on any shift; the number of shifts can be varied; and new capacity can be quite quickly installed. The history of investment also suggests that capacity responds quickly to its rate of utilization. Thus, as Blanchard (1988) also argues, the main supply constraint originates in the labour market itself.

How the NAIRU is determined

To understand how this constraint operates, the first step is to develop the basic theory of the NAIRU. Unemployment is in equilibrium only when there is consistency between the intended mark-up of prices over wages and the intended mark-up of wages over prices; see Blanchard (1986). *The NAIRU brings peace in the battle of the mark-ups.*

Beginning with prices, firms set these on the basis of marginal cost. Thus in general

$$p - w^e = a_0 - a_1 u \tag{9.1}$$

where p is the logarithm of the price of output (value-added), w^e is the logarithm of the expected wage, u is the unemployment rate, and a_0 captures the effects of technical progress, the capital/labour-force ratio, and the degree of monopoly power in product markets. If the elasticity of product demand is constant, unemployment must reduce the price level for given wages if it raises the marginal product of labour. However a_1 could be zero (normal-cost pricing) if the marginal product was constant or if the elasticity of demand rose sufficiently in a boom.

Thus firms are setting prices as a mark-up on expected wages. By contrast wage-setters set wages as a mark-up on expected prices, the mark-up being lower the more unemployment there is. Thus

$$w - p^e = b_0 - b_1 u \tag{9.2}$$

To close the model we can assume an aggregate demand equation of the form

$$u = c_0 - c_1(m - p) \tag{9.3}$$

where m is the logarithm of the money stock. In the very short run (9.1)–(9.3) determine unemployment, wages and prices.

But if there are no nominal surprises ($p - p^e = w - w^e = 0$) then, by adding (9.1) and (9.2), unemployment is at the NAIRU given by

$$\text{NAIRU} = u^* = \frac{a_0 + b_0}{a_1 + b_1}$$

This is illustrated in Figure 9.2. Aggregate real demand is purely passive.

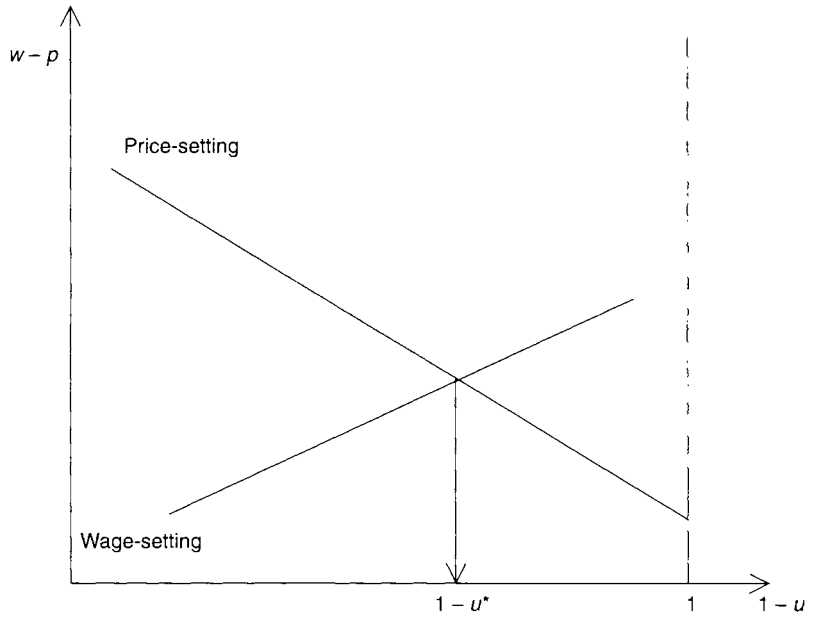

Figure 9.2 The NAIRU (with $p - p^e = w - w^e = 0$)

If however there *are* price surprises, then actual unemployment is

$$u = \frac{a_0 + b_0 - (p - p^e) - (w - w^e)}{a_1 + b_1} \tag{9.4}$$

Low unemployment is associated with positive price surprises and vice versa. However (9.4) is not a Lucas supply curve. It is a relationship obtained from price- and wage-setting behaviour – based in other words on the battle for distributive shares. If unemployment is too low, price-setters will be aiming at a profit mark-up incompatible with the real wage intended by wage-setters. The mechanism by which this inconsistency is resolved is the price and wage surprise (generally associated with changing inflation or changing prices, whichever variable is currently untrended).

If by contrast there are no wage and price surprises, then unemployment is at just the right level to bring peace in the struggle for shares. The leap-frogging of prices over wages and vice versa has been eliminated. We have also eliminated the leap-frogging of wages over wages (not modelled here) by

ensuring that each group settles for the same wage as all equivalent groups, rather than trying to improve its relativity.

In this model pricing behaviour is relatively straightforward, and in equilibrium ensures that each group of labour is employed on the labour demand curve. But will each group also be employed on its labour supply curve? It could be so, in which case (9.2) can indeed be thought of as the labour supply curve. But job-queues exist widely and we shall therefore focus on those cases where more workers are willing to work at the prevailing wage than can find work.

This does not mean that we think all unemployment is involuntary. It may well be the case that everybody could get *some* job. In other words there is a 'secondary' labour market which is market-clearing. But there is also a larger 'primary' sector where job queues exist. Many of those who cannot get primary sector jobs are willing to take lower-paid and nastier jobs in the secondary sector. So unemployment results.[3] And in practice movements in unemployment are mainly the result of movements in primary sector employment. Since most of the action takes place in this sector we shall henceforth ignore the role of the secondary sector.

What stops the wage dropping and what causes persistence?

Two questions immediately arise: (i) What stops the wage dropping in the face of an excess supply of labour? (ii) What causes unemployment deviations to persist?

There are two main mechanisms which can cause wages to be above the supply price of labour. First, employers may voluntarily pay more – the case of efficiency wages. Second, they may be forced to pay more – the case of collective bargaining with unions.

But what causes persistence in each of these cases? Again there are two main mechanisms. First, there is the 'insider' mechanism. If the number of employed people falls due to some shock, the wage pressure at given unemployment will rise as there are fewer workers worried about their jobs. This effect most naturally operates when there are unions who can organize the insiders. Second, there is an 'outsider' mechanism. If the unemployed 'outsiders' are demoralized or stigmatized by, for example, long spells of unemployment, the wage pressure at given unemployment will also rise – because the effective excess supply of labour is reduced. This 'outsider' effect can operate whether wages are set by employers (efficiency wages) or by bargaining with unions.

In the rest of this overview we shall therefore review first the insider mechanism and then the outsider mechanism in a fairly schematic way. Then in the next section we shall explicitly derive the efficiency wage and the bargained wage, and show exactly how insider and outsider considerations operate within each.

Insider power

We begin with the role of insider power in generating persistence. This has been stressed both by Lindbeck and Snower (1988) and Blanchard and Summers (1986). It is convenient to begin with Blanchard and Summers' most extreme version of the story, which (unlike some of their later models) leads to total hysteresis – that is, employment follows a random walk with drift.

The idea is that insiders fix real wages to ensure their continued employment. If a shock reduces the number of insiders, next period's employment (with no further shocks) will be lower by the same amount. Thus the 'natural' level of employment this period (N^*) is simply equal to last period's actual employment (N_{-1}). Allowing for turnover at rate s, employment would be expected to drift down, unless there were positive shocks or sufficient risk aversion for workers to select N^* much higher than $(1 - s)\, N_{-1}$.

The model outlined above is one of 'pure hysteresis', with employment showing no tendency to converge on a given proportion of the labour force. Alternatively one could allow for an independent effect of outside unemployment, giving a model with 'partial hysteresis'. There would then be convergence to a long-run NAIRU but the short-run NAIRU would be much affected by recent levels of employment.

The most obvious source of insider power would come from trade union activity. This might help to explain the greater persistence of unemployment in recent years in Europe than in the USA (though in the 1930s, when unions everywhere were weak, the degree of persistence was the other way round).

Models of unemployment that focus on insider power leave much of the time-series variation of unemployment unexplained:[4]

(a) The *extreme* version of pure hysteresis is inconsistent with our original Fact 2: in the long run the *labour force* clearly affects the level of employment. Furthermore in wage equations for 19 OECD countries over the period 1952–82 the negative effect of the labour force upon wages on average exactly offsets the positive effect of employment suggesting that it is only unemployment that matters; see Layard (1986). This explains *why* the labour force ultimately affects employment, one for one. Indeed Arrow (1974) has emphasized that a major triumph of economics as a social science is that it alone can explain this.

Thus the *extreme version* of insider power with pure hysteresis can be rejected. But does not the insider model still provide the main reason why the short-run NAIRU can diverge so long from the long-run NAIRU? Probably not. For there are two further facts which do not support the exclusive role of the insider mechanism in accounting for persistence.

(b) In microeconomic *panel data studies of firms*, it is possible to examine the independent effect upon wages of (i) lagged employment *within* the firm and (ii) the unemployment rate in the *outside* labour market. The evidence is

that outside unemployment has a powerful effect and inside employment (lagged) a weak effect, if any; cf. Nickell and Wadhwani (1988) and Nickell and Kong (1988). This illustrates a general point about the future of macroeconomic research. There is little power in aggregate time series to discriminate between competing macroeconomic theories. There is, however, a wealth of disaggregated and microeconomic data which can also be brought to bear, both in distinguishing between models and in measuring the magnitude of parameters. Integration of this information should lead to a far better understanding of the mechanisms at work – so that the right policy conclusions can be drawn.

(c) There is a third key fact which is inconsistent with the insider model. This is the *huge movement of the unemployment-vacancy (u/v) curve* in most countries where unemployment has risen sharply. If the insider model were correct, a large rise in unemployment should have no effect on the location of the *u/v* curve but should simply lead to a collapse in the vacancy rate. Yet in Britain there is now the same vacancy rate as in 1959 while unemployment is five times as high (see Figure 9.3). Britain is perhaps an extreme case, but in most high-unemployment countries the *u/v* curve has shifted out; see Johnson and Layard (1986).

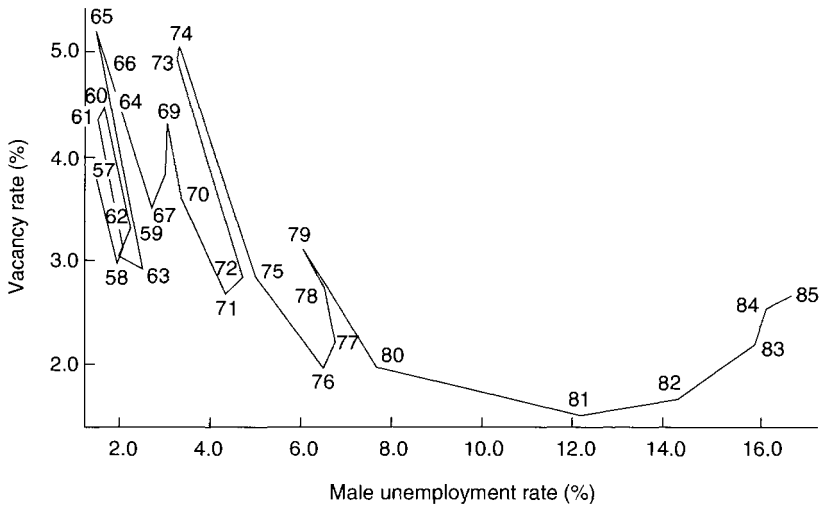

Figure 9.3 Unemployment and vacancies, Britain, 1957–85
Note: The definition of employment differs from Figure 9.1.
Source: Layard (1986, Figure 15).

Outsider ineffectiveness

To explain the shift of the *u/v* curve, one naturally turns to the characteristics of the unemployed. Have they become less well matched to the available vacancies (in terms of location, industry or skill)? There is no clear evidence that mismatch (except perhaps by skill) has worsened; cf. Jackman and Roper (1987). Perhaps they have become more choosy about which jobs they will accept? But there is little evidence that unemployment benefits have suddenly become more generous.

A key fact is that the unemployed have now been out of work for very much longer than in the past. There is also clear evidence that in all countries the rate at which unemployed people find work is at any instant much lower for long-term than for short-term unemployed. In Britain the rate is but one-tenth of its initial value for those who have been unemployed over 4 years. Psychological evidence indicates that this is largely due to the effect of prolonged unemployment, rather than heterogeneity among those who become unemployed (Warr and Jackson, 1985). The time-series evidence on the movement of exit rates at different durations also supports this thesis; see Jackman and Layard (1987).

If this is so, long-term unemployment reduces the 'effectiveness' of unemployed people as job-seekers – lowering their motivation, morale and skills and their quality as perceived by employers. Given this, it is easy to see how the *u/v* curve can shift out if the unemployed include a higher proportion of long-term unemployed. Econometric evidence supports the view that in many countries this has been an important mechanism shifting out the *u/v* curve; cf. Budd, Levine and Smith (1987) and Franz (1987). For the same reason unemployment exerts less downwards pressure on wages if a high proportion of the unemployed have been out of work for a long time; see Layard and Nickell (1987).

We have here a clear mechanism generating persistence. An adverse shock reduces employment. This reduces the outflow from unemployment. In consequence, a higher proportion of the unemployed have experienced long spells without work. This means that wage pressure at given unemployment is lower than it would otherwise be. Since the duration structure of unemployment is itself a function of current and past levels of unemployment, there *is* a long-run NAIRU. But in the short-term the NAIRU will exceed this, due to the high proportion of long-term unemployed.

Our original model therefore has to be modified as follows. We still have the same price equation (9.1) as before, but the wage equation is now

$$w - p^e = b_0 - b_1 \bar{c} u \qquad (9.2')$$

where $\bar{c}$ is an index of the average 'effectiveness' of the unemployed outsiders.

This effectiveness depends negatively on the average duration of unemployment, which in turn is positively related to past levels of unemployment. Allowing first for only one lag, we can approximate 'effective unemployment', $\bar{c}u$, by

$$\bar{c}u = c_0 + c_1 u - c_2 u_{-1} \qquad (c_2 < c_1) \tag{9.5}$$

We can now investigate how the short-run NAIRU evolves in this system, once unemployment has been displaced from the long-run NAIRU. To do this we proceed as usual by setting $w - w^e = p - p^e = 0$, and then add (9.1) and (9.2′), after first substituting in (9.2′) for $\bar{c}u$. This gives an unemployment equation of the form

$$0 = d_0 - d_1 u + d_2 u_{-1} \qquad (d_1 > d_2)$$

where $d_0 = a_0 + b_0 - c_0 b_1, d_1 = a_1 + b_1 c_1$ and $d_2 = b_1 c_2$. This equation governs the evolution of the short-run NAIRU.

Clearly the long-run NAIRU is given by:

$$\text{Long-run NAIRU} = u^* = \frac{d_0}{d_1 - d_2}$$

But the short-run NAIRU is

$$\text{Short-run NAIRU} = \frac{d_0 + d_2 u_{-1}}{d_1} = \frac{(d_1 - d_2)u^* + d_2 u_{-1}}{d_1}$$

Thus in this model the short-run NAIRU always lies between the long-run NAIRU and last period's unemployment. It is a weighted average of the two, with weights depending on the ratio of d_2 to d_1. As d_2 tends to d_1, we tend to the special case of pure hysteresis, with the short-run NAIRU equal to last period's unemployment. But in general we have a system in which (given no further price surprises) unemployment converges monotonically on the long-run NAIRU. Each period the change in unemployment is

$$u - u_{-1} = \frac{d_1 - d_2}{d_1}(u^* - u_{-1})$$

so that a given fraction of the divergence is eliminated each period. This is the semi-comforting story that, if unemployment is high, it can always be reduced somewhat without inflationary pressure, but not by going directly to the long-run NAIRU.

However this story is rather too simple. For the evidence is that $\bar{c}$ depends on at least two lags of unemployment; see Layard and Nickell (1987) – a result

which we rationalize formally in Section 3. Hence a more accurate representation of the NAIRU process is

$$0 = d_0 - d_1 u + d_2 u_{-1} + d_3 \Delta u_{-1} \qquad (d_1 > d_2) \tag{9.6}$$

where Δ denotes a first difference. This has the same long-run NAIRU. But after a one-off shock unemployment will now cycle before it converges on u^*. It can easily be the case that, if in one period unemployment is shocked upwards from the long-run NAIRU, the short-run NAIRU in the next period is *higher* than this period's unemployment.[5] This may well have been the case in many European countries after the two oil shocks, which helps to explain why it took so much unemployment to get inflation down.

We have talked so far as if the mechanism of persistence is only due to the ineffectiveness of the outsiders. We do not believe that. We also think the insider mechanism matters. Thus the dynamics in (9.6) in practice reflects both outsider *and* insider mechanisms.

Clearly the parameters of the persistence process in (9.6) depend on labour market institutions. For example the degree of persistence will be higher when unemployment benefits last indefinitely (thus raising c_2). Similarly reducing the role of insiders by limiting union power or alternatively ensuring that the interests of outsiders are respected in the wage-setting process as in the fully corporatist economies of the Nordic countries reduces persistence.[6]

Some concepts

Before going into greater detail we must clarify various matters of terminology. First, equilibrium. Our theory is one in which there is an equilibrium level of unemployment, the long-run NAIRU. This is not a market-clearing situation, nor indeed are most equilibria in natural or social sciences. It is a situation to which the system tends to return. There is also a short-run or temporary equilibrium, corresponding to the absence of price surprises.

Next, rationing. In product markets we shall assume monopolistic competition. Thus all firms are rationed, in the sense that they would like to sell more at the prevailing price. But *they* have fixed the price. By contrast workers without jobs are rationed because someone else has fixed the price (or rather the wage): at the prevailing wage no firm has an incentive to hire more workers. Whether we are in equilibrium or not, there is always rationing of this kind.

If we *are* in equilibrium, the level of employment is determined wholly by the supply side of the economy. Real aggregate demand has adjusted passively to the capacity of the economy to employ workers at constant inflation. Out of long-run equilibrium, there are two possible situations. In one, aggregate demand is extremely active, and forcing the economy to a level of

unemployment different from the short-run NAIRU. In the other case aggregate demand is passive and merely lets the labour market evolve along the path of the short-run NAIRU.

We implicitly assume optimizing behaviour by individual agents at all times. But this does not lead to market-clearing, due to transactions costs and other externalities and imperfections.

Finally, there is the relation of unemployment to real wages. If the real wage implied in price-setting is higher when unemployment is higher (as is assumed in Figure 9.2), then one *could* say that unemployment was high because real wages were too high to sustain employment. This is the line taken by Bruno and Sachs (1985). But this focus can be quite misleading. For, if there were 'normal cost pricing', so that the price line were flat, the story would be quite wrong. Real wages could never be too high. By contrast if the price line had ever so small a slope, one could explain a huge amount of unemployment by a minute displacement of the real wage. The truth is that the whole approach gets us only a little way. For it does not tell us why wages are set as they are. For this we need to bring in the wage-setting line. It is the relationship between the two which *explains* unemployment.

In the rest of the paper we first develop in Section 2 two explicit models of wage-setting – in order to show *how* insider and outsider mechanisms arise. Then in Section 3 we integrate this into a fully dynamic model incorporating labour market flows. Finally Section 4 draws some policy conclusions from our analysis.

2 HELPFUL THEORIES OF UNEMPLOYMENT

Any fruitful theory of unemployment revolves around the battle of the mark-ups: of prices over wages and vice versa. Unemployment has to be high enough to prevent the wage–price spiral *and* the wage–wage spiral. This is so whether wages are set by firms or by union bargaining.

Efficiency wages

Let us begin with the case where firms set wages unilaterally. It has long been a commonplace of personnel management that wages should be set in a way that helps the firm to 'recruit, retain and motivate' staff. There is plenty of evidence that pay can have important effects on all these dimensions of performance. Wages have been shown to affect job queues, cf. Holzer, Katz and Krueger (1988); quits, cf. Pencavel (1972); absenteeism, cf. Krueger and Summers (1988); and output cf. Wadhwani and Wall (1991).

Efficiency wage models trace out the implications of these facts for the behaviour of rational firms, and thus for the equilibrium of the system.

Different models concentrate on different mechanisms. For example Shapiro and Stiglitz (1984) show how firms will pay workers more than their supply price in order to have a credible threat when they wish to discipline the worker. Jackman, Layard and Pissarides (1984) show how monopsonistic competition in hiring and retention of labour will also lead to a wage that prevents market-clearing. In all these stories the essential point is that firms have an incentive to bid up wages against each other (the wage-wage spiral). Only if unemployment is high enough does this incentive vanish, because the pay-off to paying above the going rate is eliminated.

The basic message of all these stories can be seen from the following simple model in which the relative wage affects the worker's effort (e). Hence

$$e = e\left(\frac{W}{\overline{W}}, \bar{c}u\right) \qquad (e_1, e_2 > 0; e_{12} < 0)$$

where $\overline{W}$ is the average outside wage, and $\bar{c}u$ measures the competition for jobs outside the firm.

For simplicity we shall assume that output is given by eN, where N is employment in the firm. Profits are

$$\pi = R(eN) - WN = R(eN) - (W/e)eN$$

which is to be maximized with respect to W and N. This can be done sequentially by first choosing W to minimize (W/e):

$$e - (W/\overline{W})e_1 = 0$$

In a symmetric general equilibrium $W = \overline{W}$. Hence the equilibrium unemployment rate is given by:

$$e_1(1, \bar{c}u) = e(1, \bar{c}u)$$

The lower is $\bar{c}$, the higher is u.

The source of unemployment in this model is that the wage performs two functions: it generates effort and it determines employment. Because firms use the wage to generate effort, it cannot also clear the market for employment. Thus critics of the theory ask why some other instrument could not be deployed to generate effort. Could not workers post bonds which they would lose if they are not efficient, or (if imperfect capital markets prevent that) could they not be underpaid while young and overpaid later, subject to good behaviour? The answer is that in general such schemes can never adequately achieve the efficiency objective; see Akerlof and Katz (1988).

But what positive evidence is there in support of these theories? Most businessmen recognize this account of their actions. If asked why they do not drop wages when people are queuing up for jobs, they give explanations of this

kind; cf. Akerlof and Yellen (1986, 1987). We have already quoted evidence on the way in which firms can benefit from raising wages. There is also evidence that wages persistently differ between industries in ways that cannot be explained by worker quality or by union strength. The obvious explanation is that wages affect output differently in different industries and are therefore higher where effort matters more – for example where capital-intensity is high; see Krueger and Summers (1988).

In the model discussed in Section 1 persistence comes from the dependence of $\bar{c}$ on past levels of unemployment. But there may be another source of persistence in efficiency wage models; cf. Johnson and Layard (1986). We have so far assumed that effort depends on the wage relative to the *outside* wage. But workers may also compare their wage with what they think is *fair*, based on past experience. Suppose the fair wage (W_f), defined in real terms, adjusts adaptively to past experience:

$$\Delta W_f = \phi(W - W_f)_{-1}$$

And suppose individual output is given by

$$e = e\left(\frac{W}{W_f}, \bar{c}u\right)\lambda$$

Then, in the steady state, equilibrium unemployment will be independent of productivity λ. But now suppose λ falls, due for example to an oil price shock. The fair wage W_f will not instantly adjust downwards. Employers will therefore find it worthwhile paying a wage that is also out of line with productivity, and unemployment will rise. W will only converge on its long-run level as W_f converges on W at the new lower level.

Thus efficiency wage models can easily generate persistence if (i) outsider effectiveness depends on lagged unemployment, or (ii) the 'fair wage' that people expect adjusts slowly to supply shocks. Nevertheless it is noticeable that persistence has been stronger in economies where firms have to bargain with unions than where they do not. (The exception is some Nordic economies and Austria, where bargaining is highly centralized and the external diseconomies of bargaining can be overcome). This suggests that in most European countries a sensible story of the labour market also requires that we model collective bargaining and thus insider power.[7]

Union bargaining

If firms know that wages affect individual effort, they will take this into account in bargaining. However for simplicity we shall at this stage drop the efficiency wage issue and consider the following simple model of collective bargaining, based on Layard, Nickell and Jackman (1991). It is more consistent with reality

than any other we have found, and does generate an insider effect provided certain key assumptions are satisfied.

Unions bargain over wages, knowing that employers will then determine employment on the basis of the bargained wage; see Oswald (1987).[8] Individual union members want to maximize their expected income (non-linear utility adds no further insight). Union policy is decided by the median voter's preferences.

Does this imply any persistence mechanism involving insider power? In other words, does last period's employment affect current wage demands? The answer is that this only happens if two assumptions hold: (i) It is uncertain how much employment there will be for a given wage, and (ii) It is uncertain which individual workers will be employed in a given total employment.

Suppose first that, once the wage is determined, the volume of employment is known. Under normal circumstances workers know that the outcome of the wage bargain will be similar to what it was last year (relative to productivity). So employment will be similar. Hence with say 30 per cent turnover, none of the existing workers is at risk. The *local* objective of the union will therefore be to maximize the wage.

Now suppose that the volume of employment is uncertain even after the wage is set, but workers know in what order they will be laid off. This order might most plausibly be in inverse order of seniority; see Oswald (1987). In this case the median voter will be far from the firing line. He will be quite happy if the union presses locally for the highest wage it can get – knowing that the countervailing power of the firm will prevent anything substantially different from last year's wage; cf. Layard (1990). Once again the union's local objective function is the wage, and the number of insiders plays no role.

However in reality the order in which workers will be laid off if wages rise is not certain. It is true that there is a general presumption in favour of last in – first out (LIFO), but this only operates within skill groups and (often) within individual plants or workshops. Firms will deliberately try to keep their workers uncertain about which shops or plants will be closed in the event of cut-backs – precisely in order to induce moderation in wage demands.[9] So we can assume for simplicity that, if employment turns out to be less than the number of insiders, lay-off is by random assignment.

In this case, the median voter's expected income is the same as everybody else's. So the union's objective function is this expected income, Ω^e, given by

$$\Omega^e = SW + (1 - S)A$$

where S is the probability of individual survival in the firm and A is expected outside income.

How is the survival probability determined? Each worker (which includes the median voter) knows that, if wages are raised, this reduces expected total employment. Hence there is a higher chance that there will be some layoffs and

thus that any individual will be laid off. Thus the individual probability of surviving in employment depends inversely on the wage. But it also depends inversely on the number of existing employees (N_{-1}), since for given employment the more insiders there are the less likely any one insider is to be employed. Hence an individual's chance of survival is

$$S = S(W, N_{-1}) \qquad (S_1, S_2 < 0)$$

And how is A determined? It measures the expected value of the outside opportunities for someone laid off. These depend on outside wages ($\overline{W}$), benefits (B) and on the chances of getting a job if searching with given effectiveness. If discount rates are small relative to turnover rates, this expected value (in flow terms) is approximately[10]

$$A = (1 - \bar{c}u)\overline{W} + \bar{c}uB$$

We can now examine the outcome of the bargain. This is found by maximizing the Nash expression:

$$\max_W (\Omega^e - \overline{\Omega})^\beta (\pi^e - \overline{\pi}) = S^\beta (W - A)^\beta \pi^e(W)$$

where $\pi^e(W)$ is expected operating profit. We have assumed here that workers' fallback income during any dispute ($\overline{\Omega}$) equals A, that firms' fallback operating profit ($\overline{\pi}$) is zero, and that β is an index of the bargaining power of the union.[11] Differentiating logarithmically, the outcome of the wage bargain is given by

$$\frac{\beta S_1}{S} + \frac{\beta}{W - A} - \frac{N^e}{\pi^e} = 0$$

where N^e is expected employment. Multiplying by W and rearranging gives the partial equilibrium wage equation

$$\frac{W - A}{W} = \frac{1}{\left(\dfrac{WN^e}{\beta\pi^e}\right) + \varepsilon_{SW}} \tag{9.7}$$

where ε_{SW} is (the absolute value of) the elasticity of the survival probability with respect to the wage.

We turn now to general equilibrium. The economy consists of many sectors in each of which the representative bargain has proceeded as described. In equilibrium, unemployment must prevent a wage-wage spiral, so that $W = \overline{W}$.

Hence, substituting for A

$$\bar{c}u(1 - B/W) = \frac{1}{\left(\frac{WN^e}{\beta\pi^e}\right) + \varepsilon_{SW}} \tag{9.8}$$

In general ε_{SW} varies positively with N_{-1}/N^e.[12] For if the number of insiders is very low relative to expected employment, a change in expected employment has a small effect on the expected layoff rate. But, if there are many insiders, any change in expected employment will have a significant effect on layoffs. In fact using the simple Dixit–Stiglitz (1977) model of monopolistic competition with product demand elasticity η and constant marginal product of labour, ε_{SW} can be written as

$$\varepsilon_{SW} = \eta f[N_{-1}/N^e(W)] \qquad (f' > 0)$$

In addition $WN^e/\pi^e = \eta - 1$. Thus the wage equation is given by

$$\bar{c}u(1 - B/W) = \frac{1}{(\eta - 1)/(\beta + \eta f[N_{-1}/N^e(W)]}$$

The real wage is increasing in real benefits and decreasing in unemployment. It is also higher the higher the bargaining power of the union and the lower the elasticity of product demand – monopoly in the product market being a potent source of monopoly power in the labour market.

Since on reasonable assumptions $f(\cdot)$ is twice-differentiable, there is no asymmetry in wage behaviour: it is not true that a small fall in unemployment reduces the wage much less than a small rise in unemployment raises it. Asymmetries of this kind are usually based on models, such as Lindbeck and Snower (1988), without firm-level or individual uncertainty, and thus inconsistent with *any* insider effects (as explained above). Moreover there is no convincing empirical evidence for the existence of asymmetries; see, e.g., Nickell and Wadhwani (1988).

If we now take the replacement ratio as given, we can examine the evolution of unemployment. Ignoring turnover, the long-run NAIRU is given by

$$\bar{c}u(1 - B/W) = \frac{1}{(\eta - 1)/\beta + \eta f(1)}$$

But the short-run NAIRU is given by

$$\bar{c}u(1 - B/W) = \frac{1}{(n - 1)/\beta + \eta f\left(\frac{1 - u_{-1}}{1 - u}\right)}$$

assuming a constant labour force. This is an equation with persistence coming through insider power *and* outsider ineffectiveness (via $\bar{c}$). Linearizing and substituting for $\bar{c}u$ gives an equation of the form

$$0 = e_0 - e_1 u + e_2 u_{-1} + e_3 \Delta u_{-1} + e_4 B/W$$

as in Section 1.[13]

3 A FULLY DYNAMIC MODEL OF PERSISTENCE

We turn now to a more complete dynamic model. This goes beyond the model of Section 1 in two ways. First, it explicitly models the duration structure of unemployment. This requires us to develop a model of the flows into and out of unemployment, which in turn introduces the relationship between unemployment and vacancies. Second, the wage equation needs to be modified in the light of this.

Outflow from unemployment

We begin with the outflow from unemployment. This depends on the 'hiring function'. People are hired when a match is made between a vacancy and a jobseeker. Hirings will be increasing in both the number of vacancies, V, and the 'effective' unemployment level, $\bar{c}U$. Thus the number of hirings per year is given by the *hiring function*[14]

$$H = H(V, \bar{c}U) \qquad (H_1, H_2 > 0)$$

where V, U are the number of vacancies and unemployed, and stocks are measured at the beginning of the period.

For a large enough market the hiring function should exhibit constant returns to scale; see Hall (1977). Empirical evidence supports this; cf. Pissarides (1986) and Jackman, Layard and Savouri (1987). Thus the exit rate for a person seeking with unit effectiveness is

$$\frac{H}{\bar{c}U} = H\left(\frac{V}{\bar{c}U}, 1\right) = h(X) \quad (h' > 0)$$

where X (for excess demand) $\equiv V/\bar{c}$U. We can note in passing that the steady state (constant unemployment) relationship between U/N and V/N is obtained by setting H equal to the inflow to unemployment, sN. This makes it clear that the lower $\bar{c}$ is, the 'further out' is the curve relating U/N and V/N; cf. Jackman, Layard and Pissarides (1984).

For simplicity we shall think of the effectiveness of the unemployed as depending solely on how long they have been unemployed. We shall assume

two categories of unemployed only: (i) the short-term unemployed (U^S) i.e. those who entered unemployment this period, having effectiveness normalized to unity; and (ii) the long-term unemployed (U^L) i.e. those who entered unemployment in earlier periods, having effectiveness c (< 1).

Clearly c will tend to be lower the longer benefits are payable and the less rapidly benefits decline with duration. It follows that

$$\bar{c}U \equiv U^S + cU^L = cU + (1-c)U^S$$

Duration structure of unemployment

The next step is to discover how the distribution of the unemployed by duration moves and unemployment changes. Again for simplicity we shall take the inflow rate into unemployment (s) as constant, since it tends to vary much less than the exit rate from unemployment (at least in European countries). It follows that short-term unemployment equals this period's inflow:

$$U^S = sN_{-1} = s(L - U_{-1}) \tag{9.9}$$

where the labour force ($L \equiv N + U$) is assumed constant. Total unemployment is last period's unemployment plus inflows minus outflows, i.e.,

$$\begin{aligned} U &= U_{-1} + sN_{-1} - (\bar{c}U)_{-1}h(X_{-1}) \\ &= [1 - s - ch(X_{-1})]U_{-1} - (1-c)h(X_{-1})U^S_{-1} + sL \end{aligned} \tag{9.10}$$

Wages and prices

Finally we need wage and price equations. The wage equation now has to be a modified version of our earlier equation. For a fully dynamic wage equation has wages depending not on $\bar{c}u$ as hitherto, but on the chances that a person seeking work with given (unit) effectiveness can expect to find work.[15] As we have seen, these chances depend on $V/\bar{c}U$ (or X as we now call it). Hence, allowing also for an insider effect (via N_{-1}), the *wage equation* is

$$\frac{W}{P} = Zg(X, N_{-1}) \qquad (g_1 > 0; g_2 < 0) \tag{9.11}$$

where Z is a shift factor that reflects *both* supply influences (like variations in benefit levels), *and* the effect of demand shocks (e.g. price 'surprises').[16]

Turning finally to the demand side of the labour market, we follow Dixit and Stiglitz (1977) by assuming that there are n firms producing n differentiated commodities with the aid of a constant returns to scale production technology,

$Y_i = N_i$, where Y_i is output of firm i, $i = 1, \ldots n$. The demand for the firm's product is the constant elasticity function $D(M/P)(P_i/P)^{-\eta}$, with $D' > 0$, and where M is the nominal money stock and P_i/P the firm's relative output price. Finally firm i's hirings are proportional to the share of its vacancies, V_i, in total vacancies: hence its new hires, H_i, are equal to

$$H_i = \frac{V_i}{V}H = \frac{V_i}{V}\bar{c}Uh(X) = \frac{h(X)}{X}V_i$$

For simplicity we shall assume that opening a vacancy is costless. It is easy to generalize the analysis to incorporate costly vacancies, but at the cost of complicating the dynamics. Interested readers should consult Pissarides (1985) for a fully worked out model incorporating costly vacancies (but excluding insider and outsider dynamics); see also Mortensen (1989).

The firm's problem is:

$$\max_{(N_i, P_i, V_i)} (P_i - W)N_i$$

subject to:

$$N_i = (1 - s)N_{i-1} + V_i h(X)/X$$
$$N_i = D(P_i/P)^{-\eta}$$

which yields the familiar *price-setting* relationship

$$P_i/W = \eta/(\eta - 1)$$

In a symmetric equilibrium, however, we have $P_i = P$ (and $N_i = N/n$). In that case the price-setting rule above and the wage-setting rule (9.11) may be combined to give a *consistent-mark-ups-equation*

$$(\eta - 1)/\eta = Zg[X, (L - U_{-1}] \tag{9.12}$$

which provides an implicit relationship between labour market tension, unemployment, the labour force and the shift factor in the wage equation (Z). Together (9.9), (9.10) and (9.12) completely describe the dynamic evolution of the economy.

Before analyzing the dynamics in detail, however, it is instructive to examine the determination of steady-state equilibrium. (9.9) and (9.10) imply that in a stationary state the equilibrium unemployment level U^* is given by:

$$\frac{U^*}{L} = \frac{1 - (1 - c)h(X^*)}{1 - (1 - c - c/s)h(X^*)}$$
$$= j(X^*)$$

where $j' = -ch'/s[1 - (1 - c - c/s)h]^2 < 0$. Substituting into (9.12) yields the reduced-form equation for the long-run NAIRU:[17]

$$(\eta - 1)/\eta = Zg[j^{-1}(U^*/L), L - U^*]$$

Let us now examine the effect of a permanent supply shock, raising Z. Since $\partial U^*/\partial Z = g/(g_2 - g_1/j'L)\,Z$, it follows that, provided the insider effect (g_2) is not too large,[18] an increase in Z, due to say increased union pushfulness, raises equilibrium unemployment. Notice, however, that by virtue of the price-setting rule, real wages are unchanged in the long-run equilibrium (and indeed along the transition path as well). This is despite the fact that increased wage push by the workers in a single firm will lead to a rise in their real wages and a fall in the level of employment in that firm. A corollary is that a (policy-induced?) reduction in Z need not be associated with any decline in real wages, and will instead result in an increase in employment alone.

This emphasizes rather starkly the role of unemployment at a macro-economic level as an equilibrating device to reconcile potentially conflicting claims over the division of the output of the economy. Of course, in more general models with variable returns to scale and/or a price elasticity of product demand that varies with the level of activity, equilibrium real wages will as a rule be affected by changes in Z. Nevertheless the basic insight still holds that with imperfect competition in the product market an understanding of the co-movement of real wages and employment requires an understanding of both pricing and wage-setting behaviour.

Let us now return to the issue of dynamic adjustment. Linearizing (9.9), (9.10) and (9.12) and eliminating X yields the system:

$$\begin{bmatrix} 1 - (1 - s - ch)B - aB^2 & (1 - c)hB \\ sB & 1 \end{bmatrix} \begin{bmatrix} U \\ U^S \end{bmatrix} = \begin{bmatrix} bZ_{-1} \\ 0 \end{bmatrix} \tag{9.13}$$

where B is the backward lag operator, coefficients are evaluated at equilibrium, and all variables are now understood to be deviations from equilibrium values. The parameter a is defined as:

$$a \equiv -g_2\bar{c}Uh'/g_1 = \frac{H}{N}\frac{\varepsilon_{WN}\varepsilon_{hX}}{\varepsilon_{WX}} \qquad (a \geq 0)$$

where ε_{WN} is the (absolute value of the) elasticity of the wage-setting function with respect to lagged employment (the insider effect), ε_{WX} is the elasticity of the same function with respect to labour market tension, and ε_{hX} is the elasticity of the hiring function. Thus, if insider considerations dominate in wage setting, a is large, while if external factors dominate a will be small. Similarly b is defined as:

$$b \equiv \bar{c}Uh'g/Zg_1 = \frac{H}{Z}\frac{\varepsilon_{hX}}{\varepsilon_{wX}}$$

Solving (9.13) gives the reduced form relationship for unemployment as:

$$U = \frac{bZ_{-1}}{\{1-(1-s-ch)B-[a+s(1-c)h]B^2\}}$$

Hence unemployment is a second-order autoregressive process in the demand/wage push shocks. Note that if there are no insider effects ($a = 0$) and no outsider effects ($c = 1$) the dynamics become only first order. Thus the dynamics inherent in the matching process – it takes time for people to find jobs and for firms to locate potential workers – automatically introduces a degree of persistence into the behaviour of unemployment. Insider and outsider effects both extend this persistence.

To see this more formally the mean lag, μ, in the effect of Z on unemployment is given by:

$$\mu = \frac{[1+a+s(1-c)h]}{[s+ch-a-s(1-c)h]} - 1$$

and hence $\partial\mu/\partial a > 0$ and $\partial\mu/\partial c < 0$.

It is also instructive to calculate the time series representation of 'effective' unemployment $\bar{c}U$ in terms of past values of unemployment and the forcing variables. This is easily shown to take the form:

$$\bar{c}U = [s(1-c)+c(1-s-ch)]U_{-1} + c[a+s(1-c)h]U_{-2} + bZ_{-1}$$

This provides a justification for the expressions in Section 1.

4 POLICY CONCLUSIONS

There is good evidence (some of it cited earlier) to support the theory that persistent European unemployment is sustained mainly by the ineffectiveness of the unemployed outsiders. This points to two important policy conclusions. First, once long-term unemployment has emerged there is a high return to special measures to re-integrate the long-term unemployed into the effective labour force. Second, it is important not to allow large numbers of people to drift into long-term unemployment in the first place. Here it is striking that long-term unemployment is very much smaller in countries such as the USA, Sweden, Norway, Finland and Austria in which benefits are not available beyond 6–12 months, except for those on special work or training schemes.[19] Targeted training and job programmes for the unemployed, as in Sweden, also

have a crucial role. This whole issue is in no sense marginal, since in the major European countries almost a half of all the unemployed have been out of work for over a year; see Jackman and Layard (1987).

Second, there is some (less powerful) evidence in support of the theory that unemployment tends to remain high because the number of insiders has been reduced. This suggests that steps to reduce trade union power at the work-place could not only reduce the NAIRU but also the persistence of departures from it. Corporatist behaviour by unions could also achieve the same results. In addition policies to reduce firing costs would help to reduce insider power; cf. Lindbeck and Snower (1988).

Third, if hysteresis is important (for whatever reason) an incomes policy could help greatly. The incomes policy would temporarily lower the short-run NAIRU, until it has been permanently reduced by the actual experience of lower unemployment. Thus even if the policy lasted for only as long as the period during which unemployment was being reduced, this could speed the return to the long-run NAIRU without increasing inflation.

Finally, there is a moral about stabilization policy. If higher unemployment raises next year's NAIRU, the returns to preventing higher unemployment in the first place must be that much greater. Countries like Sweden which have used a mixture of stabilization policy and incomes policy to offset adverse supply shocks have been proved far wiser than most economists would have thought 10 years ago.

But demand stabilization is unlikely to succeed without simultaneous efforts on the supply side. It is always best to be ambidextrous.

Notes

1. For formal tests of whether unemployment follows a random walk see Blanchard and Summers (1986). However the results of this type of test depend critically on the time period chosen, suggesting that it may not be helpful to view a hundred years of unemployment as simply the result of a given time-invariant stochastic process.
2. Thus there is no reason to assume (as real business cycle theorists are wont to do) that only technology shocks can have persistent real effects. Our view of the world provides an alternative explanation of high persistence which has the merit of explaining not only output but *also* unemployment.
3. See Bulow and Summers (1986) and Johnson and Layard (1986).
4. This is a *different* issue from whether insider power influences the NAIRU. Obviously trade union power affects the NAIRU – in *any* trade union model. Equally trade union behaviour explains why employers do not hire new workers at less than the insider wage – because the union believes this will ultimately undermine its bargaining strength; cf. Lindbeck and Snower (1988).

5. This requires $d_1 - d_2 - d_3 < 0$. In the Layard and Nickell results this condition does indeed hold when the sum of their equations (5.1′) and (5.2′) is expanded around a 12 per cent male unemployment rate, as prevailed in 1980–1.
6. Such reforms could also be expected to raise b_1, the effect of unemployment on wage setting behaviour, which would reduce the impact effect of a demand or supply shock (see (9.4)). Bean, Layard and Nickell (1986) provide empirical evidence on the link between corporatism and persistence as well as impact effects.
7. The number of insiders would have an effect in efficiency wage models if individual efficiency was reduced when the firm recruited more workers, e.g.,

$$e = e(W/\overline{W}, \bar{c}u, N/N_{-1}) \qquad (e_3 < 0)$$

This seems improbable.
8. Bargaining over employment is extremely rare, bargaining over productivity extremely common. The latter does not radically alter the picture; cf. Layard, Nickell and Jackman (1991).
9. Moreover in the real world of voting behaviour there are many issues on which members vote, so that the wishes of the median number on one particular issue may not be decisive.
10. The present value to being unemployed (V_u) if a person searches with unit effectiveness is

$$V_u = \frac{1}{1+r}\left[B + \frac{\phi}{\bar{c}}V_e + \left(1 - \frac{\phi}{\bar{c}}\right)V_u\right]$$

where r is the discount rate, ϕ the outflow rate from unemployment, $\bar{c}$ the effectiveness of those currently unemployed, V_e the present value of being employed elsewhere and wages and benefits are assumed to be paid at the end of the period. V_e in turn is:

$$V_e = \frac{1}{1+r}(\overline{W} + sV_u + (1-s)V_e)$$

where s is the rate of separation into unemployment. Solving we find that

$$rV_u = (1-\lambda)\overline{W} + \lambda B$$

where $\lambda = (r+s)/(r+s+\phi/\bar{c}) \approx s/(s+\phi/\bar{c})$ since $r \ll s$. Now in equilibrium $\phi u = s(1-u)$. Hence $\lambda \approx \bar{c}u/[1-(1-\bar{c})u] \approx \bar{c}u$.
11. As regards workers, $\overline{\Omega}$ is unlikely to be exactly equal to A but it is certainly affected by both $\overline{W}$ and $\bar{c}u$. Note that the interior Nash solution only applies provided that both Ω^e and π^e exceed the outside option open to workers and firms respectively, assuming no agreement is reached. Unless there is full employment, Ω^e *will* exceed the workers' outside option, but a very high wage cannot be agreed on because the firm would rather sack the whole workforce and hire another one.
12. Some regularity conditions on the distribution function are also required; see Gottfries and Horn (1987).
13. In addition there is at least one other possible source of persistence in models with bargaining. Suppose that when unemployment rises, firms cease to be able

to bargain over productivity. Demanning ensues. In a 2-sector model the NAIRU is now higher, unless the rise in real wages leads to sufficient increase in secondary sector employment; see Layard, Nickell and Jackman (1991).

14. This ignores job-to-job movements. Allowing for this makes no significant difference – see Layard, Nickell and Jackman (1991, Chapter 7).

15. Suppose for example wages are set by bargaining, as in (9.7). With the Dixit–Stiglitz specification of the product market, and a proper intertemporal evaluation of expected income we get

$$\frac{W - rV_u}{W} = \frac{1}{(\eta - 1)/\beta + \eta f[N_{-1}/N^e(W)]}$$

From the third equation of n. 10 above

$$rV_u/W = (1 - \lambda + \lambda B/W)$$

where $\lambda = (r + s)/(r + s + \phi/\bar{c})$ Thus

$$W = W\left(\frac{\phi}{\bar{c}}, B, N_{-1}\right) \qquad (W_1, W_2 > 0; W_3 < 0)$$

By contrast, (9.2′) can be justified as follows. By definition $\phi = H/U$ and, in equilibrium, $H = sN$. Thus

$$\frac{\phi}{\bar{c}} \approx \frac{s}{\bar{c}u}$$

16. In this case one might wish to make wage settlements a function of X^e rather than X.

17. As written, this leaves the NAIRU, U^*/L, depending on the size of the labour force. This could be rectified by assuming the number of firms grows with the size of the economy so the wage equation becomes

$$\frac{W}{P} = Zg\left(X, \frac{N_{-1}}{L}\right)$$

18. The ambiguity arises because on the one hand higher equilibrium unemployment reduces the chances of finding a job and hence reduces wage pressure, but on the other hand is associated with a lower employment level for a given labour force, a smaller group of insiders and hence an increase in wage pressure. Thus an exogenous increase in wage pressure could require either an increase or a decrease in unemployment to equilibrate the reduced form NAIRU equation. However, for the system to be stable the 'outside' effect must dominate, i.e., $g_1 > g_2 j'L$ is a necessary condition for the stability of (9.13).

19. An important research project would attempt to correlate our parameter c with the benefit regime.

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