# 8

# The labour market, II: unemployment, inflation and the NAIRU

## 8.1 INTRODUCTION

In chapter 7 we explored the implications of real wages for unemployment from the point of view of rationing models. Estimates of real wage gaps were used to distinguish between classical and Keynesian unemployment. Such an approach can, however, be no more than a first step towards distinguishing between supply-side and demand-side causes of unemployment, its main weakness being that no attempt is made to explain what determines real wage rates. The level of aggregate demand, for example, may affect wage settlements, and thereby influence real wages and unemployment. Real wages and unemployment interact both with each other and with inflation. Our task in this chapter is to examine some of the links between these variables, and thus to explore more fully the role of supply- and demand-side factors in determining unemployment.

When reading these two chapters on the labour market it is important to note that this chapter is not simply building on what was done in chapter 7: the theory discussed here is not just a more complicated version of the theory used in chapter 7. It is rather that, although they are to a certain extent complementary, these two chapters provide alternative ways of viewing the problem of unemployment that are not completely compatible with each other. The reason for using two

incompatible approaches is that each appears to throw some light on the problem. There is no single approach to the problem of unemployment that deals adequately with everything. Analysis of wage gaps seems to be able to explain something of what happened to unemployment in the mid-1970s after the first OPEC oil price rise, but it fails to shed much light on why unemployment is now so high, or why real wages have continued to rise during the 1980s, despite a period of persistent high unemployment. To explain these we need a different theory involving a wider range of factors.

## 8.2 UNEMPLOYMENT AND VACANCIES

### The measurement of unemployment

Statistics on unemployment in Britain have to be treated with great caution. The reason is that the official definition of unemployment, and the way the statistics are compiled, have changed so frequently as to make it difficult to discern trends with any confidence. Most of the changes to the definition have been perfectly defensible on the grounds of either improving the accuracy of the statistics or making them easier to collect. Virtually all the changes, however, have reduced the measured total of unemployment. The main change was in October 1982, with the move from statistics based on registration at Jobcentres to one based on numbers claiming unemployment benefit. The change was prompted by a decision to make registration at Jobcentres voluntary, and the movement from a manual count to a computer-based one led to improved accuracy in counting, so there was a strong case for making the change. It did, however, reduce the count of unemployed substantially.

Examples of other changes concern the treatment of school-leavers (now no longer able to claim benefit until the September after leaving school) and the provision of special, higher, long-term benefits to a large number of over-sixties, which caused them no longer to be defined as unemployed, though nothing else had changed. There were also changes in the definition of the workforce, needed to calculate the percentage unemployed. The self-employed and members of the armed forces are now included as part of the workforce, whereas before 1986 they were not. Though this did not alter the figure for the number of unemployed, it reduced the percentage substantially.

Changes such as these make it difficult to obtain long series of consistent unemployment statistics. The statistics shown in figure 8.1 for 1971-89 are based on the current definition: the number un-

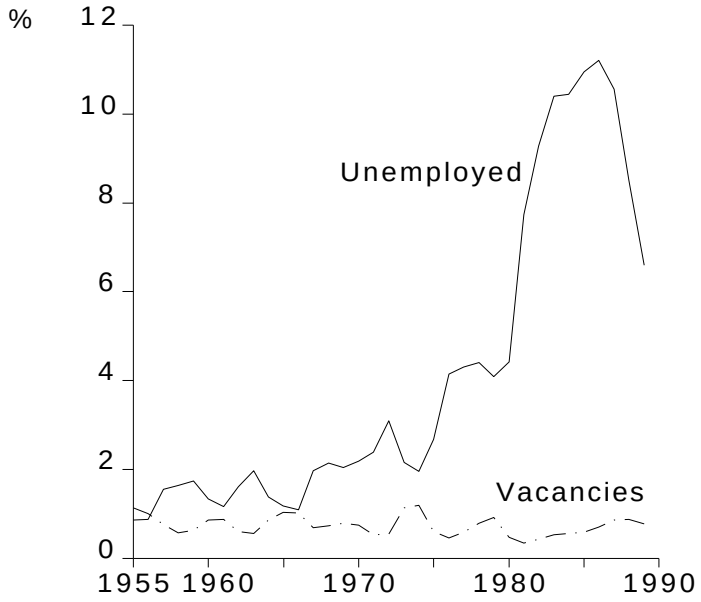


**Figure 8.1** Unemployment and vacancies

*Source*: *Economic Trends Annual Supplement*. Unemployment and vacancies as percentages of the workforce. Unemployment is measured using the current definition since 1971. Figures before 1971 are based on earlier definitions.

employed and seeking benefit. Changes in this measure will reflect changes in the number seeking work only if benefit regulations stay the same, and if the way in which these are enforced does not change. Because the statistics calculated in this way go back only to 1971, the data for the period before 1971 are based on older definitions and are not strictly comparable with the newer figures (they were calculated using the published figures for the workforce and employment). Similarly, there may be large errors in the vacancy statistics which, according to the Department of Employment's estimates, include only about thirty per cent of all vacancies.

## The *U-V* curve

The main device used for analysing the relationship between unemployment and vacancies is the *U-V* curve. The theory here is that


**Figure 8.2** The *U-V* curve

*Source*: as figure 8.1.

there should be an inverse relation between unemployment and vacancies: a rise in the level of aggregate demand will increase the number of vacancies and reduce unemployment. Changes in the level of demand thus cause the economy to move along the *U-V* curve. The position of the *U-V* curve will be determined by supply-side factors (some of which are discussed below). If the labour market is organized in such a way that unemployed workers get matched up with the available jobs very quickly, the *U-V* curve will be relatively close to the origin: if matching of jobs and workers is slower, it will be further out.

Unemployment and vacancies are plotted in figure 8.1 and are graphed against each other in figure 8.2. Throughout the 1960s unemployment and vacancies moved as though they were negatively related to each other. This suggests that fluctuations in unemployment and vacancies were the result of fluctuations in aggregate demand without any major change caused by supply-side factors. During the 1970s and 1980s, however, unemployment increased without any equivalent fall in vacancies, suggesting that supply-side factors had moved the *U-V* curve outwards. This picture of unemployment and


**Figure 8.3** Regional shares of unemployment and vacancies, 1988

*Source*: *Employment Gazette*.

vacancies is thus consistent with the view that supply-side factors were responsible for much of the rise in unemployment in the 1980s.

One important problem in the labour market is that of mismatch between workers and the available jobs. This may take many forms. Workers may not have the skills that employers are wanting, either because they have the wrong educational qualifications or because they are trained to work in one industry, but the available vacancies are in another. In addition, unemployment may be concentrated in certain regions, and vacancies in others. Such effects are likely to be particularly important in times of rapid change, such as the last two decades.

Mismatch in the regional distribution of vacancies and unemployment is shown in figure 8.3, which shows the distribution of vacancies and unemployment across regions. The South East, the South West and East Anglia have a disproportionately large share of vacancies relative to unemployment, whereas Northern Ireland, the North, the North

West and Yorkshire and Humberside have relatively few vacancies compared with unemployment. There is thus a clear regional imbalance in the distribution of unemployment and vacancies: the ratio of vacancies to unemployment is higher in southern regions than in northern ones.

Figure 8.4 shows the balance between unemployment and vacancies in manufacturing relative to the rest of the economy. The main feature here is the sharp fall in manufacturing's share of vacancies after 1977. In 1981 manufacturing still accounted for over 30 per cent of non-agricultural unemployment, but only 16 per cent of vacancies. Thus whilst the ratio of unemployment to vacancies was on average much the same as in the economy as a whole until around 1979, fluctuating between 80 per cent and 120 per cent of the national ratio (see figure 8.4), it rose to over double the national ratio in the early 1980s.

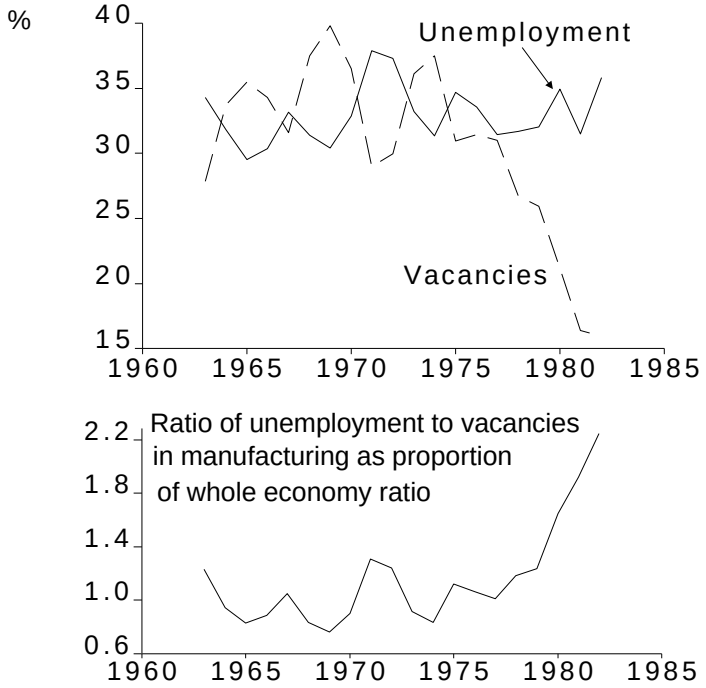


**Figure 8.4** Percentage shares of manufacturing in unemployment and vacancies

*Source*: R. Jackman and S. Roper 'Structural unemployment,' *Oxford Bulletin of Economics and Statistics* 49, 1987, p. 23.

Measuring the extent of mismatch, however, is more difficult. One approach is to use measures based on the difference between unemployment and vacancies in different regions or different industries. One of the simplest measures is to consider each sector of the economy (these 'sectors' may be regions, occupations or industries) and to take the absolute difference between the percentage of total unemployment and the percentage of total vacancies appearing in that sector. If we add these differences across the economy as a whole and divide by two, we get the percentage of the unemployed who would have to move from one sector to another in order to even out the distribution of unemployment and vacancies: to get rid of mismatch. For example, suppose we have just three regions, the South the Midlands and the North. The South has 25 per cent of the unemployed, and 40 per cent of the vacancies, the Midlands has 30 per cent of the unemployed and 35 per cent of the vacancies, with the North having 45 per cent of the unemployed and 25 per cent of the vacancies). The measure of mismatch is thus $[(40-25) + (35-30) + (45-25)]/2 = 20$.

This measure can be applied to any type of mismatch. In figure 8.5 we use it to measure three types of mismatch: across occupations,

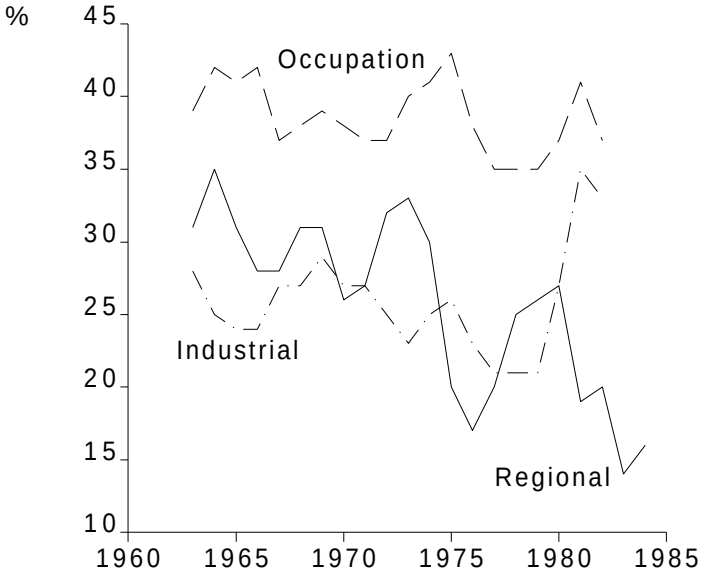


**Figure 8.5** Measures of mismatch

*Source*: R. Jackman and S. Roper 'Structural unemployment,' *Oxford Bulletin of Economics and Statistics* 49, 1987, p. 20.

industries and regions. These three measures suggest that, though mismatch is a serious problem, it has not increased significantly over time. There was a sharp increase in 1981-2, resulting from the recession hitting production industries (especially manufacturing and construction) particularly hard, but this is likely to represent a short-term fluctuation rather than a longer term trend.

A further source of evidence for the existence of mismatch is CBI (Confederation of British Industry) surveys of the percentage of firms that expects output to be limited by labour shortages. Figure 8.6 gives the percentage of firms expecting output to be limited by shortages of skilled labour and by other types of labour. Given the high level of unemployment during this period these figures suggest that there was a significant degree of mismatch.

An even simpler way to obtain a measure of mismatch, very similar to the one used in the Layard-Nickell wage equation equation discussed below, is provided in figure 8.7. This shows the change in the share of production industries (i.e. manufacturing, mining, construction, power and water supply) in total employment. It is thus a crude measure of structural change. The assumption is that if the sectoral composition of output is changing more rapidly there will be a greater degree of mismatch in the labour market. Figure 8.7 suggests that the


**Figure 8.6** Percentage of firms expecting labour shortages to limit output

*Source*: *National Institute Economic Review*.

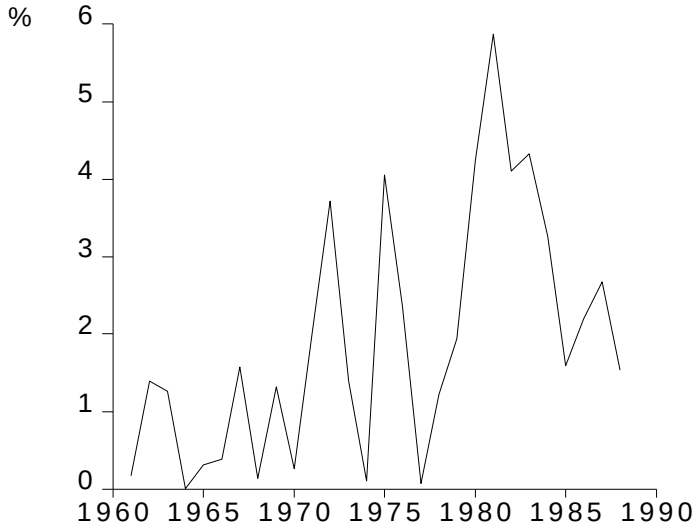


**Figure 8.7** A measure of mismatch, 1956-88

*Source*: percentage change in ratio of manufacturing to total employment.

pace of structural change, and hence the degree of mismatch, has on average been much higher during the 1970s and 1980s than in previous decades. It supports the view that the extent of mismatch in 1981-2 was exceptional.

## 8.3 TURNOVER IN THE LABOUR MARKET

### Inflows and outflows

In all our discussion so far we have focused attention on the stock of unemployment: that is on the number unemployed at any time. This can, however, give a misleading impression, for it neglects the fact that there is continuous turnover in the labour market. Even when unemployment is constant, new jobs are being created, workers are being fired, and unemployed workers are finding jobs. To take account of this, therefore, we need to consider not changes in the *stock* of unemployment, but *flows* into and out of the 'pool' of unemployment. The term *inflows* denotes the number of workers becoming unemployed during a given period of time. The term *outflows* denotes the number of workers who cease to be unemployed during a given period. Outflows and inflows are, of course, related to unemployment by the formula,

Change in unemployment = inflows - outflows.

These flows into and out of unemployment are, in the UK, very large compared with the number unemployed, as is shown in figure 8.8. Inflows and outflows have both been between two and three million per annum, substantially greater than the number unemployed. To put these numbers in perspective, it is helpful to look at what they imply about the average duration of unemployment: namely the average length of time for which people are unemployed. Suppose that outflows and inflows are both three million per annum, and that the stock of unemployment is half a million (as in the late 1960s). This means that on average, people who become unemployed are unemployed for one sixth of a year (two months) — at a rate of three million per annum it will take two months for half a million workers to get jobs (and for half a million to replace them in the unemployment pool). In contrast, in the mid-1980s unemployment was (keeping the numbers simple) about two million, and flows were around 2.5 million. This implies an average duration of 9.6 months. This rise in expected duration is reflected in the rise in the proportion of long-term unemployment, shown in figure 8.9.

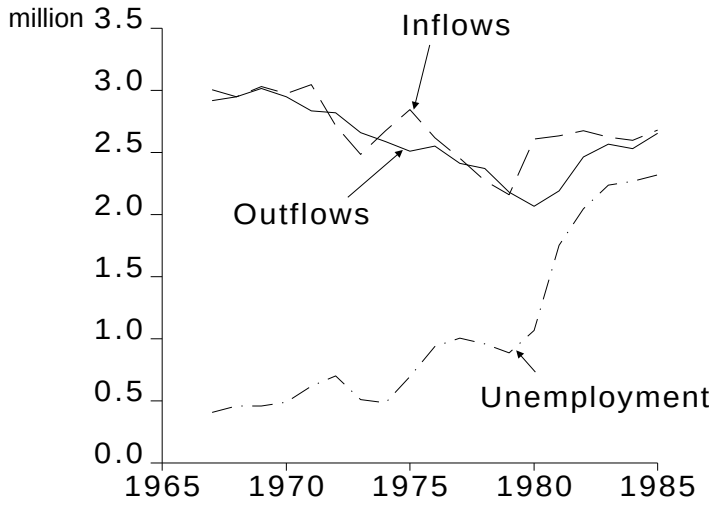


**Figure 8.8** Inflows, outflows and unemployment

*Source:* data provided by Simon Burgess, discussed in 'How does unemployment change?' University of Bristol, Department of Economics Discussion Paper, 1990. Flows are per *annum*.

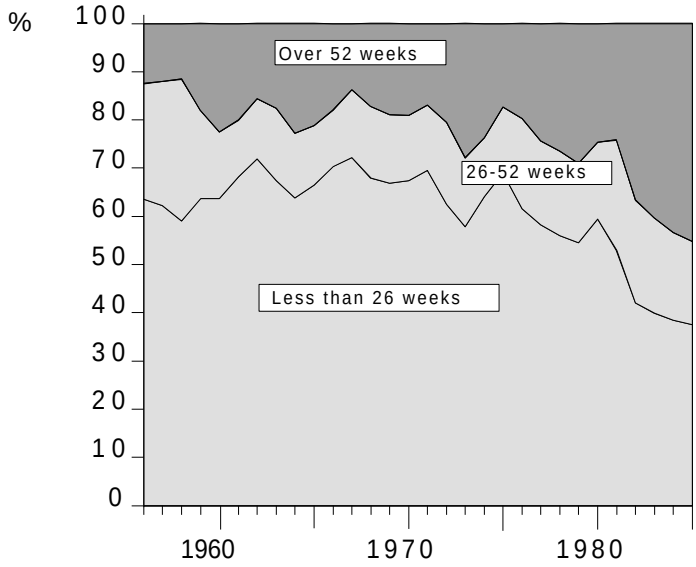


**Figure 8.9** The duration of unemployment

*Source*: Centre for Labour Economics dataset.

## The dynamics of unemployment

It has often been argued that changes in the unemployment rate have been dominated by changes in the outflow rate, changes in the inflow rate being of little significance. Evidence for this is shown in figure 8.10. This shows that if we assume the inflow rate to have been constant, we obtain an unemployment rate very similar to the one which was actually experienced. If, on the other hand, we hold the outflow rate constant, letting the inflow rate vary, we completely fail to predict changes in the level of employment. Given that the outflow rate is the inverse of the average duration of unemployment, this evidence can be used to argue that the key to understanding changes in the unemployment rate is understanding why unemployment duration has changed — in other words, that the problem of rising unemployment is not one of increased job losses, but one of failing to create enough new jobs.

Figure 8.10 would seem to provide very strong evidence in favour of the thesis that outflows dominate inflows as the cause of changes in the unemployment rate. We can, however, present the same information in a different way, as is done in figure 8.11. This shows the close

## BOX 8.1 UNEMPLOYMENT DYNAMICS

To keep the theory as simple as possible, assume that at the start of the year there is a given stock of 'old jobs', $E = (1 - u)L$ (where $L$ is the labour force), a fraction, $\delta$, of which disappear during the year. During the year $nL$ 'new jobs' are created. Assume that fluctuations in the growth rate of demand cause changes in $n$, the number of new jobs being created: $\delta$ does not change. If it is only the unemployed who search for new jobs, unemployment flows are as shown in figure 8.1(a). Changes in the rate at which new jobs are created clearly affect unemployment through changing the level of outflows: they cannot affect the rate of inflows. The outflow rate, $x$, is $n/u$, and the inflow rate is $\delta$.

Now suppose that a fraction, $\theta$, of employed workers choose to engage in 'on-the-job' search. The total number of searchers, is thus $[u + \theta(1 - u)]L$, where $uL$ is the number of unemployed searchers and $\theta(1 - u)L$ the number of workers searching for jobs. To simplify the notation, define $\sigma = [u + \theta(1 - u)]$ as the ratio of searchers to the labour force. If we assume that all job searchers have an equal chance of getting one of the new jobs, a fraction $\theta(1-u)/\sigma$ of the new jobs will go to existing workers, and the rest, $u/\sigma$, will go to the unemployed. This gives rise to the flows shown in figure 8.1(b). Outflows will be $(u/\sigma)nL$, the number of new jobs going to the unemployed, and the *outflow rate*, $x$, will be given by

$$x = n/\sigma.$$

Because of the number of workers moving to new jobs, only $\delta(1 - u)L - [\theta(1-u)/\sigma]nL$ workers will have to lose their jobs: the inflow rate, $i$, will thus be

$$i = [\delta(1 - u) - \theta(1-u)/\sigma n]/(1 -u) = \delta - \theta n/\sigma.$$

The link between outflows, inflows and the change in unemployment depends crucially on the value of $\theta$ and on the elasticity of $\theta$ with respect to $n$.

- If $\theta = 0$ (the standard case) all changes in unemployment derive from changes in the outflow rate.

- If $0 < \theta \leq 1$ and $\theta$ is constant, then both inflow and outflow matter. If $\theta = 1$, for example, all workers stand an equal chance of getting one of the new jobs, and so $x = n$ and $i = \delta - n$.

- If $\theta > n$ and $d\theta/dn > 0$ then, if the elasticity of $\theta$ with respect to $n$ is sufficiently high, $x = n/[u + \theta(n)(1 - n)]$ may vary very little with $n$, and $i = \delta - \theta(n)n/s$ may vary substantially with $n$. Thus changes in unemployment may come about largely through changes in the *inflow* rate. The reason why $\theta$ will vary with $n$ is that when new jobs are more plentiful (when $n$ is high), more workers will find it worthwhile to search for a new job.

In deriving this result, we have made some strong simplifying assumptions. In all cases, however, the simplifications would seem to favour the conventional view linking changes in unemployment to the outflow rate.

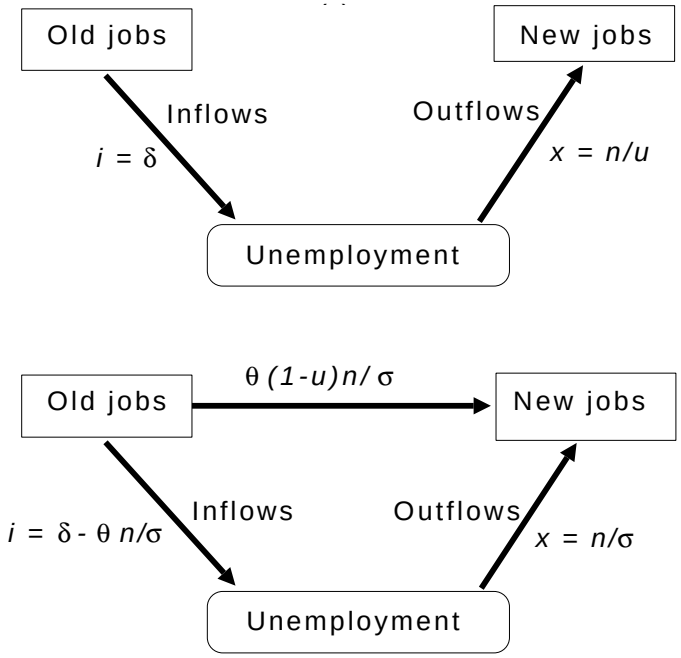


**Figure 8.B1.1** Unemployment dynamics

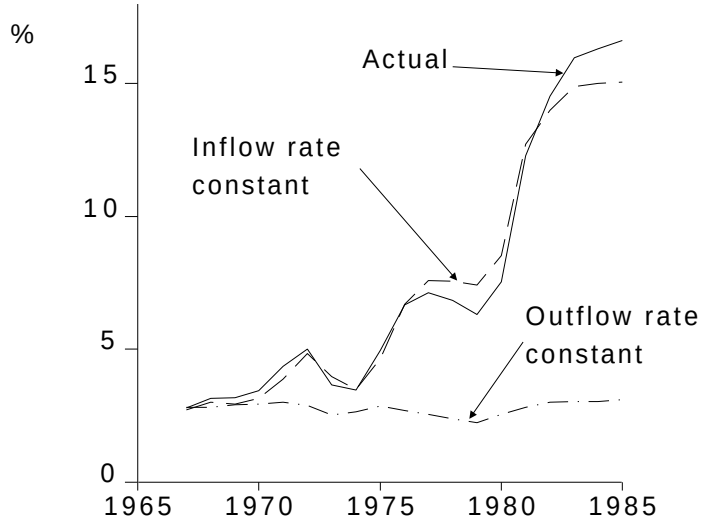


**Figure 8.10** Inflow, outflow and unemployment rates, I

*Source*: as figure 8.8. The constant inflow and outflow series are constructed using the formula in C. Pissarides 'Unemployment and vacancies in Britain', *Economic Policy*, 3, 1986, pp. 499-599.

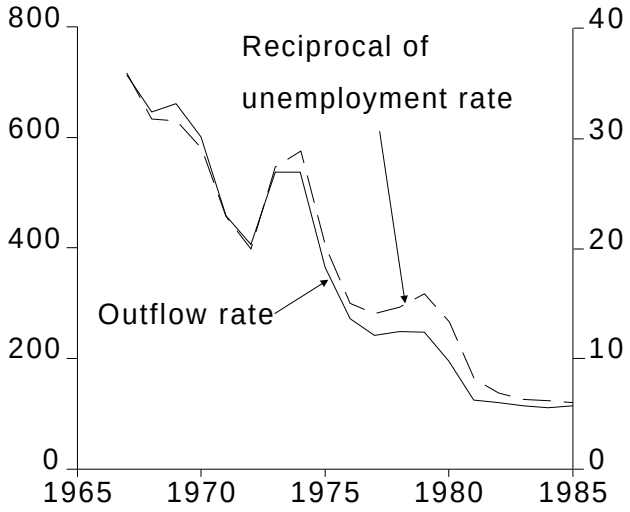


**Figure 8.11** Inflow, outflow and unemployment rates, II

*Source*: as figure 8.8.

correlation between the outflow rate and the unemployment rate. This makes the point that the reason why the outflow rate is highly correlated with the unemployment rate is that it is defined as outflows divided by the number unemployed: over the period covered by figures 8.10 and 8.11, outflows were fairly constant, which meant that the outflow *rate* was highly correlated with the unemployment rate. If we are to draw any conclusions about causation, therefore, we need a theory about how outflows and the outflow rate are determined. Without such a theory we cannot tell whether the correlation between the outflow rate and the unemployment rate arises because there is a causal link, or whether it is simply the result of the way we have defined the outflow rate.

The theory used to justify arguing for a causal link between the outflow rate and the change in unemployment is a job search model in which unemployed workers search for jobs. In such models the outflow rate is equal to the probability that an unemployed person will obtain work. Unemployed job-searchers are assumed to set an optimal reservation wage (the lowest wage for which they are prepared to work), thereby determining the probability of their obtaining a job: if they set the reservation wage very high, they are less likely to become employed than if they set a low reservation wage. It can thus be argued that it is the ratio of outflows to unemployment (the outflow rate) that is determined by the theory. If we assume that all new jobs go to the unemployed, figure 8.10 can be interpreted as suggesting that causation runs from the outflow rate to the unemployment rate.

The problem with this theory is that it ignores the possibility of workers searching for new jobs whilst still working (on-the-job searching). If this is taken into account (see box 8.1), changes in the hiring rate (the rate at which new jobs are created) may affect unemployment through inflows, through outflows or through both, even if the rate at which firms wish to lose existing workers does not change. If the proportion of workers engaging in on-the-job search is sufficiently responsive to changes in the hiring rate, changes in the hiring rate can produce larger changes in the inflow rate than in the outflow rate. In such a case it would make more sense to see the outflow rate as changing in response to changes in unemployment, not the other way round.

There is some evidence (discussed by Burgess, cited in the further reading section) to suggest that the level of job search by the employed is responsive to changes in the hiring rate, and hence that hiring affects unemployment mainly through changing the inflow rate. This is consistent with the data on inflows and outflows shown in figure 8.8,

which suggest that, at least between 1967 and 1980, the cyclical behaviour reflected the cyclical pattern of inflows: during this period there was a downward trend in outflows, but there were no significant fluctuations.

The most important conclusion to be drawn from this is that if we are to establish the links between the hiring rate, the inflow rate and the outflow rate it is necessary to do more than simply look at the correlation between the inflow, outflow and unemployment rates. It is necessary to look very carefully at the theory as well.

## 8.4 SUPPLY-SIDE FACTORS

### Unemployment benefits

Before we get involved with the details of a theory of unemployment it is helpful to consider some of the main supply-side factors that have been used in models of the labour market and how they might be expected to affect unemployment. The most controversial of these is probably the level of unemployment benefits. High unemployment benefits are claimed to make employment less attractive compared with unemployment, encouraging workers to opt for longer spells of unemployment. The variable usually used to measure the impact of benefits on unemployment is the so-called *replacement ratio*. This is the ratio of the income received whilst unemployed to the income received when in work. Such a replacement ratio is shown in figure 8.12. It has to be treated with great caution, the reason being that it measures a notional average replacement ratio for the workforce as a whole. It is based on the benefits to which people are theoretically entitled, making no allowance for the fact that if people's contribution records are incomplete they may not be entitled to full benefits, or that not all benefits are taken up. In addition, it may not measure the replacement ratio for those workers who are likely to become unemployed. Notwithstanding such objections, figure 8.12 shows that unemployment benefits became more generous during the 1950s and 1960s. Since 1970, however, the replacement ratio has fallen slightly, albeit with enormous fluctuations in the mid and late 1970s. Since 1982 the replacement ratio has fallen because of the withdrawal of the earnings-related supplement, until then received by a significant number of the unemployed.

Because unemployment benefits are so widely cited as a cause of high unemployment (and a high NAIRU; see boxes 8.3 and 8.4) and because of their political importance the question of the link between unemployment benefits and unemployment deserves further attention.

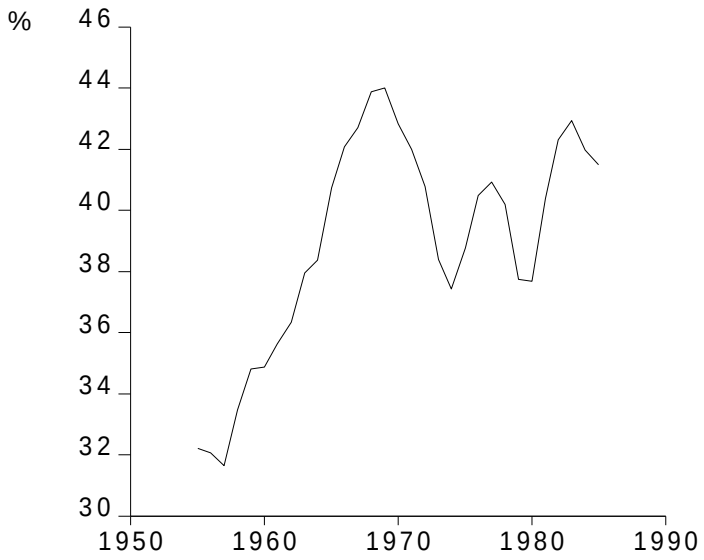


**Figure 8.12** The replacement ratio

*Source*: Centre for Labour Economics dataset.

One type of evidence is derived from macroeconomic time-series models: variables such as the aggregate replacement ratio shown in figure 8.12 can be incorporated into macroeconomic models and the coefficients estimated. We do this in the following section. A different, and probably more reliable, type of evidence is that derived from microeconomic data. Here economists look at evidence provided by a large sample of households. The basic data come from a survey of a large sample (hundreds or, if possible, thousands) of workers: the survey tells us the worker's replacement ratio and how long he has been unemployed together with a long list of personal characteristics (education, class, family size, spouse's income, etc). The use of 'he' here is deliberate, for most studies concentrate on male unemployment, the reason being that the determinants of male and female unemployment are very different: men and women have different attitudes, the social security system discriminates between men and women and the nature of the opportunities provided by the labour market are different. Furthermore, data on female unemployment are harder to interpret.

## BOX 8.2 BENEFITS AND UNEMPLOYMENT

Most microeconomic studies of the effects of unemployment benefits on unemployment are based on what are called 'search models'. When a worker becomes unemployed he has to decide how intensively to search for a new job. This will depend on the level of unemployment benefits: if benefits are high he will choose to spend longer looking for a job than if benefits are low. Benefits thus affect the *duration* of unemployment. The size of the effect is found by constructing an equation in which the length of each worker's spell of unemployment depends on the replacement ratio and a list, often very long, of personal characteristics (such as age, education, marital status, dependants, health, region, class, wife's income etc.). The result of such studies is usually a figure for the elasticity of unemployment duration with respect to the replacement ratio. Once we have the elasticity of duration with respect to the replacement ratio we can calculate the effect of the replacement ratio on the level of unemployment.

There are several reasons why this method is difficult to apply. One problem is that the data used often come from surveys such as the General Household Survey or the Family Expenditure Survey, where each household is sampled only once. This means that we observe a large number of uncompleted spells of unemployment, where the worker is still unemployed when the survey is

Several conclusions can be drawn from such microeconomic studies. The first is that the elasticity of unemployment duration, and hence unemployment, with respect to unemployment benefits is either zero or small and positive. A few years ago there was some justification for the claim that a consensus had been reached that the elasticity of unemployment duration with respect to benefits was about 0.6: that a 10 per cent rise in benefits would raise unemployment duration by 6 per cent. Translated into aggregate terms, this means that a 10 per cent cut in benefits would reduce unemployment by about 50,000. In other words, it was thought that some unemployment could be attributed to the level of unemployment benefits, but that the numbers involved were very small. Since then, however, it has been argued that when

undertaken, and where we do not know how long the worker is unemployed. This creates technical, econometric problems. To overcome this problem we need a survey in which men are interviewed several times. One such study, the results of which are quoted in the text, was based on taking a group of men who became unemployed at a particular time, and interviewing them after 4, 13 and 52 weeks: the survey is thus of a particular *cohort* of the unemployed. Such data are, however, limited.

A second problem is measuring the replacement ratio. Difficulties here arise for two reasons. The benefits system is very complicated, with a household's entitlement to benefits depending on a large number of factors: benefits change over time whilst someone is unemployed, their level depending on things such as family composition and the worker's contribution record. Earlier spells of unemployment may, for example, have used up a worker's entitlement to unemployment benefit. The other reason is that not all benefits are claimed. This is particularly important with means-tested benefits. For both these reasons it can be argued that aggregate series, such as that shown in figure 8.12, give little idea of what is happening to individuals' replacement ratios. This is a reason for attaching greater significance to properly done micro-economic studies than to aggregate time series ones.

**Table 8.1** Benefits and unemployment

| *Age* | *Duration < 6 months* | *Duration > 6 months* |
|---|---|---|
| Under 20 | -0.74 | -0.44 |
| 20-24 | -0.55 | 0.06* |
| 25-44 | -0.37 | 0.43* |
| 45-64 | -0.13* | -0.10* |

* Not significantly different from zero.

*Source:* W. Narendranathan, S. Nickell and J. Stern 'Unemployment benefits revisited', *Economic Journal* 95, 1985, p. 320.

account is taken of the fact that people do not in practice get all the benefits to which they are theoretically entitled, the effect disappears.

A second result from microeconomic studies is that the effect of benefits on unemployment is far from uniform across different groups of workers. For example, one study produced the results shown in table 8.1. The coefficients in this table give the effect of a rise in benefits on the probability of leaving unemployment: a negative sign means that a rise in benefits increases the duration of unemployment through making the worker less likely to become unemployed. Two conclusions emerge from this table. The first is that the effect of benefits on unemployment is strongest for the young, and that it declines with age. The second is that, with the exception of men under 20, benefits have

**Table 8.2** Unemployment incidence by replacement ratio

| Replacement ratio | Per cent of working population | Per cent unemployed |
|---|---|---|
| 0-49 | 16.6 | 4.0 |
| 50-59 | 19.4 | 3.2 |
| 60-69 | 23.7 | 3.6 |
| 70-79 | 19.5 | 4.6 |
| 80-89 | 11.4 | 6.1 |
| 90-99 | 5.5 | 10.0 |
| 100-110 | 2.5 | 9.9 |

*Source*: S. Nickell 'A picture of male unemployment in Britain', *Economic Journal* 90, 1980, p. 787.

no significant effect on unemployment for men who have been unemployed for more than 6 months.

Such results are consistent with other evidence on unemployment. Table 8.2 shows that, in 1972, high replacement ratios were associated with a higher incidence of unemployment. On the other hand, 90 per cent of those who had little to lose by being unemployed (i.e. with replacement ratios over 90 per cent) were working, despite the absence of any great financial incentive to do so. Furthermore, the proportion of the workforce with such high replacement ratios was very small (8 per cent) and since then is likely to have become even smaller with reductions in benefit levels.

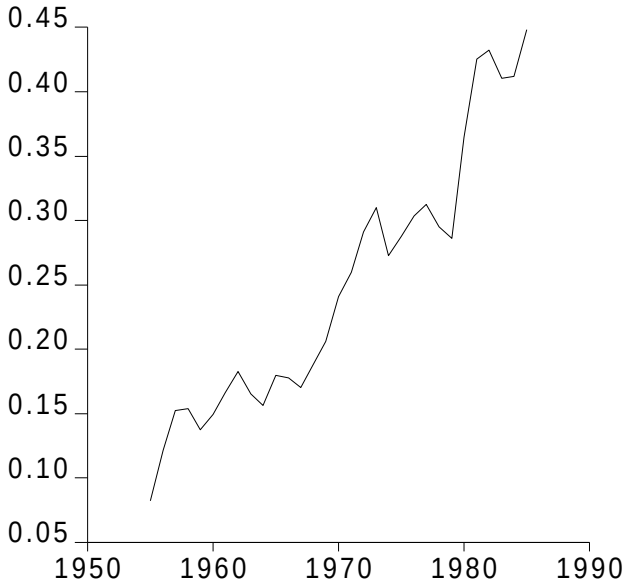


**Figure 8.13** Union power

*Source*: Centre for Labour Economics dataset.

## Other factors

In addition to unemployment benefits, there are several other supply-side factors which have been proposed as explanations of the rise in unemployment since the early 1970s. These include taxes, union power, housing costs, company profits and the proportion of long-term unemployed.

- *Taxation and import prices*. Taxes on labour, whether paid by workers (income tax and employees' national insurance contributions) or by firms (employers' national insurance contributions) insert a 'wedge' between the amount paid by firms and the amount received by workers. If this tax wedge is borne by the workers in the form of lower real wages this may result in higher inflation. The level of unemployment necessary to keep inflation from accelerating may thus be raised. Since the 1960s, employers' and employees' tax rates have increased, but indirect taxation, which can also lower real wages, shows no such trend. Import

prices may have a similar effect: they create a wedge between the prices firms receive for output and prices faced by consumers, and hence between the product wage and the consumption wage.

- *Union power*. Union power has frequently been put forward as an explanation of high wage claims, and hence of high unemployment. Union power is, however, very difficult to measure. The percentage of workers who are in trade unions and the level of strike activity have been used to measure it, but neither is adequate. An alternative measure, discussed here not because it is the best measure of union power, but because it plays an important role in the empirical work considered later in this chapter, is the mark-up of union over non-union wage rates. This is shown in figure 8.13. It is obtained from cross section data on wages in different industries: each industry has different wage rates and unionization rates, and the relationship between wage rates and unionization is calculated, the series shown in figure 8.13 being derived from this. It shows a sharp rise around 1970 (after the events of 1968) and, more surprisingly, a rise in 1981. This might be because of the greater ability of unionized workers to withstand the effects of the depression of 1980-1, in which case it might be regarded as measuring union power. Such an interpretation is consistent with evidence from the 1930s suggesting that the union markup tends to rise in times of recession. An equally plausible explanation, however, is that the recession hit certain groups of workers (for example unskilled workers) particularly hard, and that these groups are less unionized than other groups of workers. In this case, the rise in this index does not correspond to any rise in union power. There is also the problem that the markups shown in figure 8.13 are high compared with estimates obtained from other cross-section evidence, which suggests a mark-up of only 7 to 10 per cent. Results based on this index must, therefore, be treated with *great* scepticism. It is given here because it plays an important role in empirical results which are discussed later on.

- *Housing costs*. A notable feature of the UK economy during the 1970s and 1980s has been the enormous rise in the price of housing. This rise has been particularly marked in the South-East, creating enormous regional differences in house prices. Figure 8.14 provides a measure of the extent to which house prices have risen relative to wage rates since 1960-1 (see also figure 3.14 for data

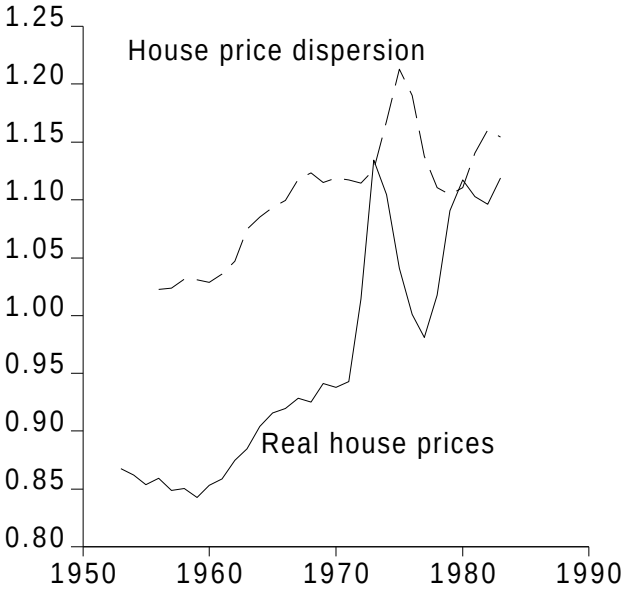


**Figure 8.14** Real house prices

*Source*: Alan A. Carruth and Andrew J. Oswald *Pay Determination and Industrial Prosperity.* Oxford: Oxford University Press, 1989, appendix 3.2.

covering a longer period). It measures the ratio of the rise in house prices since 1960-1 to the rise in wage rates in the same period. In order to measure the significance of rising house prices for household budgets, the series is adjusted to allow for changes in the proportion of houses that are owner-occupied. What stands out from this graph is the sharp rises in real house prices in 1972-3 and in 1979-80, together with the fact that real house prices have remained very high since 1980, though there has been some fall in house prices in 1989-90.

Figure 8.14 also shows a measure of the regional dispersion of house prices. This is defined as real house prices (as defined above) in the South-East divided by real house prices in the UK as a whole. This shows a very similar pattern: much of the rise in house prices has been in the South-East.

There are several reasons why house prices may be important in the wage-determination process. If house prices are rising because of a shortage of land, the cost of living (which includes the cost of housing) may be rising faster than output prices (which do not).

Given that the cost of living affects wage claims, it may be necessary to use housing costs as well as conventional price indices in wage equations. A second reason is that house prices may reflect demand shocks which are not captured by other measures of demand. Both the cost-of-living wedge and demand shocks may vary from region to region, providing reasons why the regional dispersion of house prices may affect wage determination. Finally, the regional dispersion of house prices affects labour mobility between regions. Not only do workers experience difficulty in moving from regions with low house prices to regions with higher prices, but high house prices may provide incentives to home-owners in high-price regions to stay there: if they move they may find it difficult to return. Lack of mobility should raise unemployment rates.

- *Company profits*. There is considerable evidence that wage negotiators use high profits as an argument in favour of wage increases. Furthermore, if we view unions and employers as bargaining over

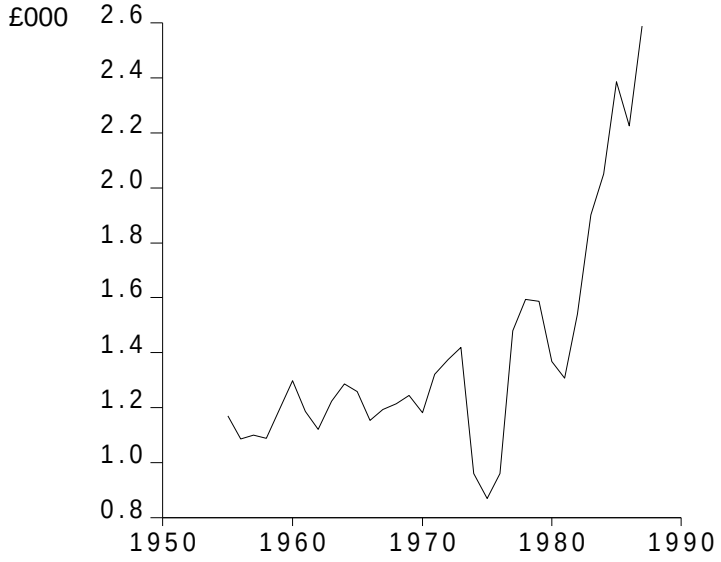


**Figure 8.15** Real company profits per employee

*Source*: *Economic Trends Annual Supplement*. Gross trading profits of companies, deflated by GDP deflator, divided by workforce.

how income is divided between profits and wages, there are good theoretical reasons why high profits should push wages upwards: higher profits mean that the size of the 'cake' to be bargained over is higher, and that labour's share should be higher. Figure 8.15 shows real profits per employee. The main feature of this graph is the extremely low level of profits in 1974-6, and the unusually high level of profits after around 1982. If high company profits do cause wage bargainers to aim at achieving a higher real wage rate, this will, for reasons explained in section 8.5, cause unemployment to rise.

- *The proportion of long-term unemployed*. Figure 8.9 shows how the duration of unemployment has changed since the 1950s. In the late 1950s and the 1960s only about 10-20 per cent of the unemployed had been unemployed for over a year, but during the 1970s this proportion rose to around 30 per cent. Since 1979 the proportion of long-term unemployed has risen to over 40 per cent, a very high level: during the 1930s, for example, the proportion of long-term unemployment did not rise above 25 per cent. If 'long-term' is defined to be unemployment longer than 6 months then it now covers 60 per cent of the unemployed. The duration of unemployment has been argued to affect real wages and hence unemployment because as workers remain unemployed they lose skills and it becomes harder to match them with suitable jobs. As the long-term unemployed become less employable, they exercise less of a restraining influence on unemployment, which tends to raise the unemployment rate.

## 8.5 WAGE DETERMINATION

### The Phillips curve

The simplest framework for analysing the link between inflation and unemployment is the Phillips curve. We could argue that supply-side factors determine the position of the Phillips curve, including the NAIRU (the unemployment rate at which the inflation rate is constant, sometimes called the 'natural' rate of unemployment — for further detail see box 8.3). If we can estimate a Phillips curve we should be able to estimate the NAIRU and hence work out how much unemployment is caused by supply-side factors (causing the NAIRU to rise) and how much is caused by aggregate demand being too low (unemployment rising above the NAIRU). Before we can do this,

however, we have to make a number of decisions about how we are going to estimate the Phillips curve: which inflation rate to use; how to model expected inflation; and what other variables to include.

- ❑ Which inflation rate (wage inflation or price inflation) is to be explained? Either is possible for although the Phillips curve is based on a relationship between wages and unemployment, wages are linked to prices via costs. We would expect the relationship to hold whether we tried to explain wage or price inflation.

- ❑ How do we model expected inflation? One of two approaches is usually adopted: adaptive or rational expectations. With adaptive expectations it is assumed that expectations adjust to actual inflation with a lag. Expectations are thus modelled by incorporating lagged inflation on the right-hand side of the Phillips curve. Rational expectations involve the assumption that people are forming their expectations in such a way as to make the best possible use of all the information available to them. If people are assumed to know how the economy works, this means that rational expectations should be the same as the predictions generated by the model based on these expectations. Such expectations are, clearly, more complicated to model than adaptive expectations.

- ❑ What other variables (besides expected inflation and unemployment) should be incorporated? Candidates here are import prices, real wages and productivity growth. This problem is an important one, for it is clear that if we are to make any sense of a Phillips curve for the UK in recent years we have to allow, somehow, for a rise in the NAIRU since the 1960s.

We start with what is almost the simplest possible expectations-augmented Phillips curve: the previous period's inflation rate is used as a proxy for expected inflation. Changes in the NAIRU are allowed for by a time trend ($t$ = date - 1954) and a dummy variable (*IPD*) to capture the effects of the very severe incomes policy which lowered inflation in 1976 (*IPD* takes the value 1 in 1976, and 0 in every other year). The following equation is estimated over the period 1955-85.

$$\pi_t = \pi_{t-1} + 3.6 - 7.7\log(U_t) + 0.48t - 13.0IPD$$

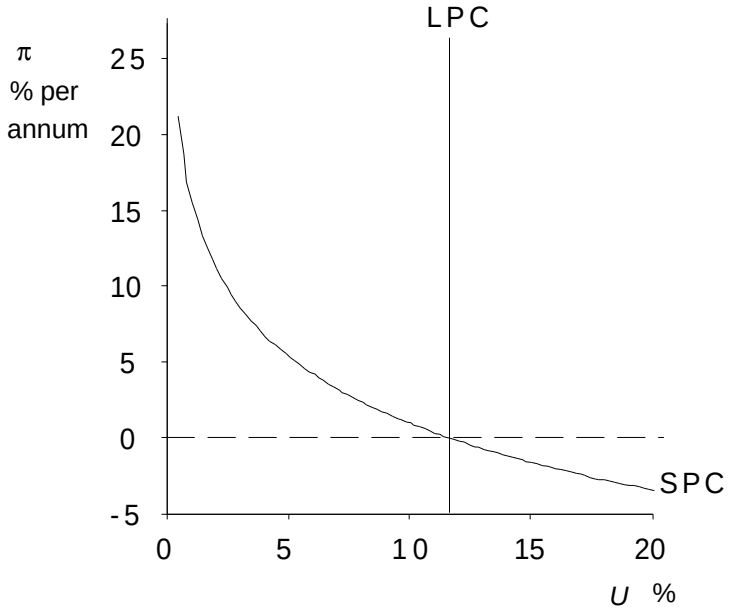


**Figure 8.16** The Phillips curve

The logarithm of unemployment is used simply to obtain a curve of the shape we usually associate with the Phillips curve: at low levels of unemployment we expect the Phillips curve to be very steep and at high levels of unemployment we expect it to be fairly flat. To find the NAIRU we set $\pi_t = \pi_{t-1}$ (*IPD* is, of course, taken as zero). The short-run Phillips curve slopes downwards as expected and because of the time trend the NAIRU is rising over time. For 1986 the NAIRU implied by this equation is 11.7 per cent and the resulting Phillips curves are those plotted in figure 8.16.

Although such an equation might seem to work well, there are major problems with it. One is that it is very sensitive to the choice of period over which it is estimated. To see this, consider the same equation estimated using data for 1965-84:

$$\pi_t = \pi_{t-1} + 8.1 - 14.0\log(U_t) + 1.40t - 12.1IPD$$

This gives a NAIRU of only 10 per cent and it implies that the short run Phillips curve is twice as steep: a 1 per cent fall in unemployment

## BOX 8.3 THE EXPECTATIONS-AUGMENTED PHILLIPS CURVE

The theory underlying the Phillips curve is that the rate of growth of money wages ($\pi^W$) depends on two main factors: the unemployment rate ($U$) and the expected rate of price inflation ($\pi^e$).

- *Unemployment* affects wage inflation because it reflects the state of the labour market: when unemployment is low this means that demand for labour is high relative to supply, with the result that wages will be bid up faster than if unemployment were higher. Similarly if unemployment is very high this means that demand for labour is low relative to the supply and wages rates will not be bid up so fast.

- *Expected inflation* is important because both firms and workers are concerned with real wages, not money wages. If firms and workers both expect a higher rate of inflation not only will workers demand higher wage increases, but firms will offer higher wages as well.

The simplest version of the expectations-augmented Phillips curve is

$$\pi = \pi^e - \beta(U-U^*),$$

where $U^*$ is the so-called 'natural' rate of unemployment, or NAIRU (non-accelerating inflation rate of unemployment). If $U = U^*$ the actual rate of inflation will equal the expected rate, which means that there is no reason for the inflation rate to change.

Given the expected inflation rate we can draw a downward-sloping curve relating inflation and unemployment: this is the *short-run Phillips curve*. Note that in this box a linear relationship is assumed in order to keep the theory as simple as possible. The short-run Phillips curve is usually assumed to have the shape depicted in figure 8.13. If the expectations of inflation change the curve will shift. To see this, consider figure 8.B3.1. If expected inflation is zero ($\pi^e = 0$) the short run Phillips curve is $SPC_0$, a line with slope $-\beta$, cutting the horizontal axis at $U^*$. If, on the other

hand, expected inflation were $\pi^e_1$, the short run Phillips curve would be $SPC_1$: $\pi^e_1$ higher than if expected inflation were zero.

It follows from this that if expectations are to be correct (if $\pi = \pi^e$) unemployment must be equal to $U^*$. This can easily be seen if we re-write the Phillips curve equation as

$$\pi - \pi^e = -\beta(U-U^*).$$

If $U > U^*$ then $\pi < \pi^e$ and vice versa. If we make the quite reasonable assumption that if expectations are incorrect then they will be changing, it follows that the inflation rate can be constant only if $U = U^*$. This is the natural rate hypothesis: th hypothesis that the inflation rate can be constant only if unemployment equals $U^*$. This is important because if we assume that in the long run the inflation rate cannot either increase or decrease indefinitely, it follows that in the long run unemployment cannot permanently diverge from $U^*$.

$U^*$ is thus sometimes called the *natural rate of unemployment*. Economists who prefer a more neutral name for $U^*$ refer to it instead as the NAIRU: the *N*on *A*ccelerating *I*nflation *R*ate of *U*nemployment.

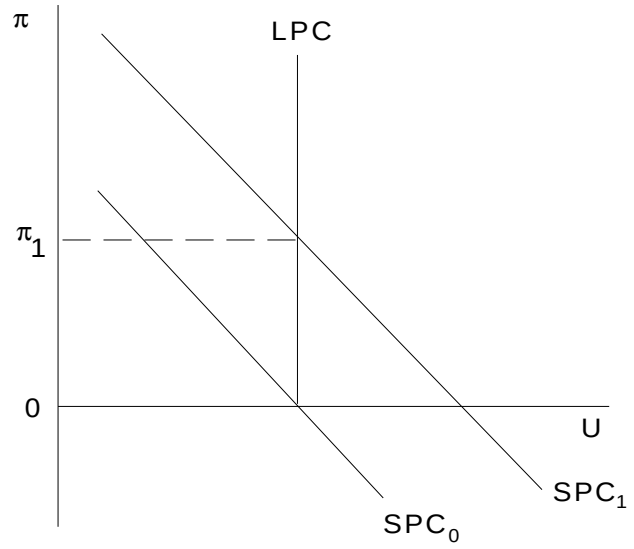


**Figure 8.B3.1** The Phillips Curve

produces a 14 per cent rise in inflation, compared with an 8 per cent rise in the previous equation.

A second problem with this equation concerns inflationary expectations. To see how much difference the adoption of rational expectations might make replace $\pi_{t-1}$ by $\pi^*$, where $\pi^*$ is determined by regressing inflation on $\pi_{t-1}$ and $\pi_{t-2}$. This is, more or less, the best prediction that people could make if they knew simply past inflation rates. In practice we would expect that people might do better than this. Estimating such an equation we obtain

$$\pi_t = \pi^e + 11.9 - 14.1\log(U_t) + 1.58t - 6.0IPD$$

where $\pi_e$ is the best prediction of $\pi_t$ that can be obtained from information on $\pi_{t-1}$ and $\pi_{t-2}$ (i.e. it is the result of regressing $\pi_t$ on $\pi_{t-1}$ and $\pi_{t-2}$). Predicting inflation on the basis of just two previous periods' inflation rates is a long way from full rational expectations, but it is a step in the right direction. The lesson to be drawn from this equation is that it gives yet another, very different, estimate of the NAIRU: namely 15.5 per cent in 1986. The fact that such small changes in the way we specify the Phillips curve lead to such large differences in our estimate of the NAIRU suggests that such a simple Phillips curve is inadequate. The major problem with this approach, however, is that it models changes in the NAIRU using a time trend, assuming it is rising remorselessly. We therefore need a theory of how the NAIRU is determined, and a better model of what determines the inflation rate.

## Real wages and the Phillips curve

Before turning to a theory of what determines the NAIRU it is worth considering an alternative version of the Phillips curve which brings in the real wages. In addition to providing a link, even if only a weak one, with the ideas discussed in chapter 7, this illustrates an issue that several economists have seen as important. This time we consider a Phillips curve which explains wage inflation, $\pi^W$. In addition to unemployment the equation has the following terms on the right-hand side:

- Last period's wage inflation, to capture inflationary expectations in the simplest way possible.

- ❑ The growth in the real wage rate during the previous period ($\pi^W_{t-1} - \pi_{t-1}$). The theory underlying this is that wage bargainers have a target real wage rate which only changes slowly over time. If real wages fell in the previous period, therefore, wage increases will be higher as bargainers attempt to restore real wages to their former level. Similarly, rapidly growing real wages reduce the pressure on wages.

- ❑ Time trends.

**Table 8.3** Estimates of the NAIRU, I

| | UK | | EC | |
|---|---|---|---|---|
| | NAIRU | $U$ | NAIRU | $U$ |
| 1966-70 | 2.4 | 1.9 | 3.2 | 2.4 |
| 1971-75 | 4.0 | 2.8 | 3.6 | 3.2 |
| 1976-80 | 4.7 | 5.5 | 4.8 | 5.4 |
| 1981-83 | 9.2 | 10.8 | 7.7 | 8.8 |

*Source:* as described in the text.

The resulting equation is

$$\pi^W_{t-1} = -0.79(\pi^W_{t-1}-\pi_{t-1}) - 2.01U_t + 0.74t + 3.1t^2 + 0.09$$

The negative coefficient on $\pi^W_{t-1}-\pi_{t-1}$ provides some support for the idea that wages increase in response to reductions in real wages (if $\pi^W_{t-1}-\pi_{t-1} < 0$ real wages are falling).

To solve for the NAIRU we need to make some assumption about what would have happened to real wages had the inflation rate been constant. We could, for example, assume that the real wage grows at its 'warranted' rate (see chapter 7). In table 8.3 the NAIRU is calculated by setting $\pi^W-\pi$ equal its average for the period being considered (the results are very similar to using the warranted growth rate of real wages). To provide a comparison, equivalent figures are provided for the European Community as a whole.

Though the dependence of these results on the use of time trends means they must be treated with caution, they suggest the following conclusions.

- From 1966 to 1975 unemployment was below the NAIRU and inflation was accelerating, both in the UK and in the European Community as a whole.

- From 1976 to 1983 the actual unemployment rate was above the NAIRU, this resulting in falling inflation.

- The NAIRU has risen substantially in both the UK and the EC. The experience of the UK has been similar to that of the EC as a whole, the main difference occurring since 1981, when the NAIRU and actual unemployment in the UK have risen well above the EC average.

The problem with such equations is that they do not provide any independent evidence on the NAIRU. The NAIRU is in effect calculated in such a way as to ensure that, as far as possible, it is below actual unemployment when inflation is falling, and above actual unemployment when inflation is rising. To get more solid evidence on the NAIRU we need to bring in other evidence, and to do this we need a theory of what determines the NAIRU. This is done in section 8.5. Before doing that, however, we need to consider wage equations.

## Wage equations incorporating supply-side factors

The wage equation that is used in the estimates of the NAIRU discussed in the following section is the one estimated over the period 1956 to 1983 by Layard and Nickell (R. Layard and S. Nickell 'Unemployment in Britain,' *Economica* 53, supplement, 1986, pp. S121-70).

$$\log(W/P) = -0.062\log U + 0.039MM + 0.18RR + 0.50IMP + 0.42\Delta IMP + 0.085UP + 0.18TAX + \text{constant and other terms.}$$

The variables in this equation are *MM* (mismatch as in figure 8.7), *RR* (the replacement ratio, figure 8.12), *IMP* (the ratio of import prices to domestic prices), *UP* (the union mark-up, figure 8.13), *TAX* (employment taxes borne by employers) and *IPD* (an incomes policy dummy variable for 1976-7). The incomes policy dummy variable is a way of capturing the once-for-all effects of the very effective incomes policy imposed at this time. No account is taken of the incomes policies in force at other times, the effects of these being much less clear-cut than in 1976-7.

Although this equation may look fairly complicated, it is easy to interpret. Note that the logarithm of $W/P$ is used simply to get a suitable non-linear relationship between real wages and the variables on the right-hand side: there is no economics behind it. The equation implies a negative relationship between unemployment and real wages: when unemployment rises, real wages fall. This is the 'target real wage' curve discussed in box 8.4. This equation shows that it is shifted up by rises in mismatch, the replacement ratio, the union mark-up, taxes on employment and import prices (the reason that both the change in and the level of import prices appear is simply that it makes the equation fit the data better).

A major problem with wage equations such as this is that they cannot explain why wage inflation should have been so high during the mid to late 1980s, despite the persistence of high unemployment. The only way to explain this would be to argue that the NAIRU has risen enormously, something for which there seems little evidence. It is thus necessary to bring other factors into the wage equation. Three factors which have been brought in are long-term unemployment, real house prices and profit levels (all discussed above). We will consider two such equations. The first, estimated by Muellbauer and Bover (J. Muellbauer and O. Bover 'Housing, wages and UK labour markets', *Oxford Bulletin of Economics and Statistics*, 1988) is

$$\log(RW_t) = -0.031\log(U_t) - 0.075\Delta_3\log(U_t) + 0.067\Delta MM_t + 0.15\log(UD_{t-1}) + 0.38HP_{t-1} + 0.0085UCH_{t-1} + 0.57RDHP_{t-1} + \text{constant and other terms}$$

where $RW$ is real wages adjusted for the trend growth rate of productivity, $MM$ is the index of structural change, $HP$ is house prices relative to wages, $RDHP$ is the regional dispersion of house prices (both these are as in figure 8.14), and $UCH$ is an estimate of the user cost of housing (the cost of mortgage payments, repairs and so on). $UD$ is union density, the proportion of the labour force that is in a trade union. This measure was used instead of the union mark-up because of the problems associated with the latter that are discussed above. The 'other terms' include import prices and competitiveness as well as lagged values of different variables. Note that several of the variables are included as two or three year moving averages.

This equation, especially when written out in full, looks very complicated, but it can be interpreted fairly easily. All three aspects of house prices in the equation have the expected effect, raising wages, as do the change in mismatch and union density. More complicated is the second term on the right-hand side, $-0.075\Delta_3\log(U)$. This states that in

addition to a higher *level* of unemployment lowering wage increases, *rises* in unemployment keep wages down. Thus if unemployment rises sharply, as in 1979-81, this will have a strong effect on wage increases. But once unemployment has stopped rising, wage increases will rise again, despite a continuing high level of unemployment. To reduce the real wage growth we may need not a high level of unemployment, but a *rising* level of unemployment. This is a phenomenon sometimes known as *hysteresis*: it means that once unemployment has risen it tends to stay high. This could easily be rationalized by arguing that once people become unemployed they lose their skills and become harder to employ. Thus there may be mismatch between workers and jobs, even though this may not appear in measures of mismatch such as those discussed above.

Including the change in unemployment in the wage equation is one way to allow for hysteresis effects. This is the notion that the longer unemployment persists, the smaller is its effect on inflation. This arises because the long-term unemployed have less impact on the labour market: they are less active, having failed to find work for a long time, and they are less likely than people who have been unemployed for a shorter period to have the skills that employers are demanding. An alternative (related) approach is to include long-term unemployment in a wage equation. This is done in the following wage equation, taken from Carruth and Oswald (Alan A. Carruth and Andrew J. Oswald *Pay Determination and Industrial Prosperity*. Oxford: Oxford University Press, 1989).

$$\log(W/P)_t = -0.07\log(U_t) - 0.05\log(PE_{t-2}) + 0.1PLTU_t - 0.17\Delta LTU_t + 0.22HP_{t-2} + \text{constant and other terms}$$

where *PE* is real profits per employee (see figure 8.15), *PLTU* is the proportion of long-term unemployment (see figure 8.9) and *LTU* is the stock of long-term unemployed. The 'other terms' include import prices and a tax rate but, interestingly, neither the replacement ratio nor any measure of union power. These figures suggest that profits, house prices and long-term unemployment all have significant effects on real wages. The elasticity of real wages with respect to profits per employee (5 per cent) may seem small, but profits are *extremely* volatile, whereas real wages fluctuate very little. The elasticity of real wages with respect to unemployment is very low, implying that a doubling of the unemployment rate would lower real wages by only 7 per cent. This effect is very close to that in the Layard and Nickell equation, discussed above.

These last two equations have important implications for the behaviour of real wages in the early 1990s. A major policy issue concerns what needs to be done about the high level of wage increases. If wage increases have been rising either because of rapidly rising house prices, or because of rising company profits, then wage inflation should, if the relationship is reversible, and provided that nothing else changes, moderate of its own accord as both house prices and company profits have started to fall. The importance of the proportion of long-term unemployed also has policy implications, for it suggests that the long-term unemployed do not exert as great a downward pressure on wage increases as do the short-term unemployed. This has two implications. If higher unemployment involves a higher proportion of long-term unemployed, then it may have little effect on wages. In addition, the fact that the long-term unemployed have a small effect on wages means that policy measures can be targeted at them without there being any increase in wage inflation.

In this section, we have considered a number of competing, though related, wage equations. Though it is difficult to disentangle the effects of different supply-side factors from each other, these equations suggest a number of factors which may be important in determining real wages. Thus although it seems very plausible that factors such as the duration of unemployment, house prices and company profits affect real wages, the results should be treated cautiously, and this should be taken into account when formulating policy.

## 8.6 THE NAIRU

### The determinants of the NAIRU

When we use a simple Phillips curve to determine inflation it is simple to solve for the NAIRU. When we start using wage equations such as those discussed at the end of the previous section, however, we need to bring in other equations as well. In this section, which is based on Layard and Nickell's work, we use the theory outlined in box 8.4 according to which the NAIRU is explained as the outcome of a bargaining process in which wages are determined by a wage bargaining process, and wages are determined by the first of the wage equations discussed above. To complete the empirical model we need to introduce labour demand and price-setting equations.

The labour demand equation is

$$\log(N_t) = AD - 2.9\log(W/P)_{t-1} + \text{constant and other terms}$$

where, once again, the other terms are lagged variables, capturing the fact that employment takes time to respond to disturbances. *AD* is a measure of the level of aggregate demand, and is an appropriately weighted average of the level of world trade, the government deficit and international competitiveness (the ratio of the price of world exports, converted to sterling, to the UK price level). The only economically interesting term not listed is the capital stock, which clearly affects demand for labour.

This demand curve has the conventional slope, and shifts to the right when aggregate demand increases. The latter effect is something that can be explained only if competition is imperfect: if there were perfect competition we would expect demand for labour to depend simply on the real wage rate (and the capital stock), not on the level of aggregate demand. The short run elasticity of demand for labour with respect to the real wage rate is 2.9. Because of the lags involved (these are not reported here) the long run elasticity is smaller (-0.9).

The price setting equation is

$$\log(P/W) = 0.38AD + \text{constant and other terms}$$

where the other terms are mostly lagged values of $P$, $W$ and $P/W$, included to capture lagged adjustments in expectations. This equation implies that increases in the level of aggregate demand raise the profit margin and reduce the 'feasible' real wage rate (see box 8.4 for an explanation).

Before we can use these equations to estimate the NAIRU one further decision has to be made. The reason is that when we estimate the NAIRU we are concerned with estimating the equilibrium rate of unemployment, but the wage-setting equation contains import prices and, in addition, competitiveness is one of the factors used to calculate aggregate demand. The level of competitiveness (the ratio of import prices to domestic prices) is subject to large short term variations. We therefore want a way of calculating the equilibrium level of competitiveness. The way to do this is to estimate an equation relating the trade balance to competitiveness and to use this equation to calculate the level of competitiveness that is consistent with a zero balance of trade. The trade balance equation is,

$$B/Y_t^P = 4.68 + 361.0WP_{t-1} + 135.8IMP_{t-1} - 39.8AD_{t-1} + 24.6OIL_{t-1}$$

where $Y^P$ is a measure of permanent income and *OIL* is North Sea oil production. *WP* is a is the world price of manufactured exports relative

## BOX 8.4 A MODEL OF THE NAIRU

The model of the NAIRU that we shall consider here is based on the notion that wages and employment are the outcome of bargaining between employers and workers. There are three elements in the model: price and wage setting equations, and a demand for labour function.

- *Price setting*. Firms determine prices relative to costs. To keep the model simple assume that firms set prices on the basis of a mark-up on variable cost (this makes sense only if firms are imperfectly competitive). If wages are the main element in costs, it follows that

$$\frac{W}{P} = \frac{1}{\text{normal mark-up of prices over wages}}.$$

- We will call this the 'feasible real wage rate'. In applying their mark-up firms set prices on the basis of expected wage costs. Thus if firms' expectations are incorrect, the real wage may diverge from this level. If they under-estimate wage inflation, for example, they will set prices too low, with the result that real wages will be higher than they planned: the real wage will be higher than the 'feasible' real wage.
- *Wage setting*. The nature of the labour market determines what can best be called the 'target' real wage rate. This depends on unemployment (which reduces the target real wage) and various supply-side factors, such as unemployment benefits, mismatch and so on. This target real wage is the real wage that results from the wage bargaining process. Because people bargaining over wages are concerned about real wages, the money wage that results from the bargaining process will depend on what people expect to happen to prices. If inflation is under-estimated, for example, wages will be set too low and as a result the real wage will end up being below the target real wage.

- *Demand for labour*. This depends on the real wage and the level of aggregate demand. The level of aggregate demand is included to allow for the possibility of imperfect competition, where the level of aggregate demand affects the position of firms' demand curves. Under perfect competition, where firms face horizontal demand curves, demand for labour should depend only on the real wage rate.

These three things are put together in figure 8.B3.1. The NAIRU is the level of unemployment at which the feasible real wage equals the target real wage. To show this, labour demand curves are drawn corresponding to three levels of aggregate demand. $L^d_1$ corresponds to a high level of demand, $L^d_2$ to a low level of demand, and $L^d_0$ to an intermediate level of demand. If demand for labour is given by $L^d_0$ equilibrium is at $E_0$. The target real wage equals the actual real wage and there is no reason for inflation to change. This is the NAIRU. Suppose instead that aggregate demand is high and demand for labour is determined by $L^d_1$. Equilibrium will be at a point such as $E_1$, with accelerating inflation causing both firms and workers to under-estimate the inflation rate. Because firms under- estimate inflation they set prices too low and as a result the actual real wage exceeds the feasible real wage. Because workers under-estimate inflation they set money wages lower than they would otherwise have done, the result being that the actual real wage falls short of the target real wage. Similarly, if aggregate demand is too low, giving labour demand $L^d_2$, the result will be an equilibrium such as $E_2$, with a falling inflation rate, resulting in both firms and workers over- estimating inflation.

to the UK price level, a measure of competitiveness. The terms in this equation are all self-explanatory: the balance of trade will improve if competitiveness improves (both *WP* and *IMP* measure foreign prices), if aggregate demand falls or if oil production increases.

Table 8.4 gives the resulting estimates of the NAIRU. Two estimates are shown, one using the actual level of real import prices in the periods in question, the other using the level of import prices that would, using the above equation, give a zero trade balance. Both estimates show a substantial rise in the NAIRU, especially during the

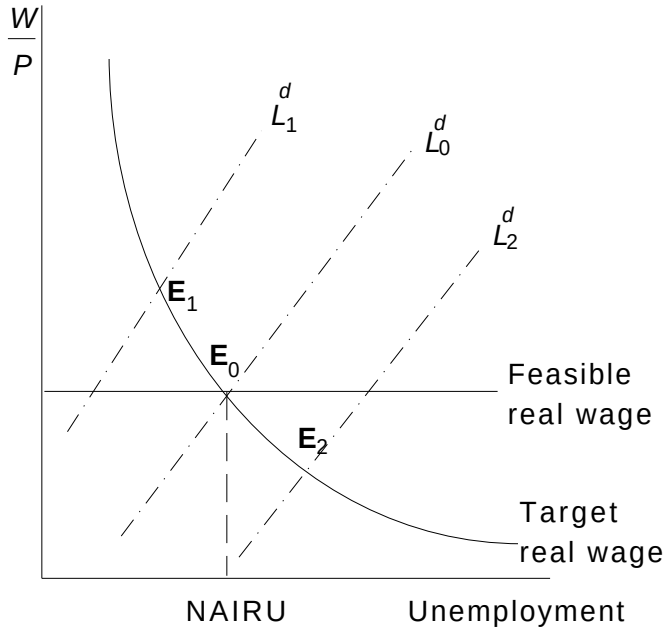


**Figure 8.B4.1** The determination of the NAIRU

1970s. These figures are compatible with those shown in table 8.3, derived using a different method. They suggest that during 1967-74 and 1975-79 the NAIRU rose above the actual unemployment rate. This is consistent with the acceleration in inflation during both periods. Since 1979, however, though the NAIRU has risen further, unemployment has risen above the NAIRU, the result being a fall in the inflation rate.

**Table 8.4** Estimates of the NAIRU, II

| | 1956-66 | 1967-74 | 1975-79 | 1980-83 |
|---|---|---|---|---|
| Given real import prices | 1.96 | 4.02 | 8.20 | 10.47 |
| Given trade balance | 1.96 | 4.19 | 7.63 | 9.07 |
| Actual unemployment rate (percentages) | 1.96 | 3.78 | 6.79 | 13.79 |

*Source*: R. Layard and S. Nickell 'Unemployment in Britain,' *Economica* 53 (supplement), 1986, p. S158.

## Accounting for the rise in unemployment

The advantage of using the relatively complicated theory discussed in this section is that in addition to estimating changes in the NAIRU we can work out what caused it to rise. This is done in table 8.5. Several conclusions can be drawn from these figures.

- ❑ Increases in the union mark-up have had an important impact on raising the natural rate in all three periods.
- ❑ The benefits variable contributed to the rise in the NAIRU up to 1967-74, but since then the fall in the replacement ratio has served to lower the NAIRU.
- ❑ North Sea oil production has kept the NAIRU down in the last two periods.
- ❑ The rise in raw material prices in 1973-4 had a large effect on the NAIRU.
- ❑ Incomes policy succeeded in keeping the NAIRU down in 1976-7.

Another way of using these equations is to calculate the influence of various factors on the actual level of unemployment. This is done in table 8.6. Note that when the contributions of the different factors are added up the total is not the same as the actual unemployment rate. The reason is that there is a certain random component which the equations cannot account for. The main feature to stand out from

**Table 8.5** Causes of the rise in the NAIRU

| Given trade balance | 1956-66 to 1967-74 | 1967-74 to 1975-79 | 1975-79 to 1980-83 |
|---|---|---|---|
| Employers' labour taxes (TAX) | 0.29 | 0.51 | 0.69 |
| Benefit replacement ratio (RR) | 0.64 | -0.12 | -0.15 |
| Union mark-up (UP) | 1.40 | 1.58 | 1.25 |
| Oil production (OIL) | - | -0.32 | -1.73 |
| Import prices/world export prices (IMP/WP) | -0.29 | 2.02 | -0.17 |
| Mismatch (MM) | 0.19 | 0.27 | 0.77 |
| Incomes policy (IPD) | - | -0.50 | 0.78 |
| Total | 2.23 | 3.44 | 1.44 |

*Source*: Layard and Nickell 'Unemployment in Britain', p. S159.

**Table 8.6** Causes of the rise in unemployment

| | 1956-66 to 1967-74 | 1967-74 to 1975-79 | 1975-79 to 1980-83 |
|---|---|---|---|
| Employers' labour taxes (*TAX*) | 0.25 | 0.38 | 0.44 |
| Benefit replacement ratio (*RR*) | 0.54 | -0.09 | -0.10 |
| Union mark-up (*UP*) | 1.18 | 1.17 | 0.80 |
| Real import prices (*IMP*) | -0.58 | 1.47 | -0.93 |
| Mismatch (*MM*) | 0.16 | 0.20 | 0.49 |
| Incomes policy (*IPD*) | - | -0.36 | 0.49 |
| Demand factors (*AD*) | 0.12 | 0.54 | 6.56 |
| Total | 1.67 | 3.31 | 7.75 |
| Actual change | 1.82 | 3.01 | 7.00 |

*Source*: Layard and Nickell 'Unemployment in Britain', p. S158.

table 8.6 is the importance of supply factors in causing the rise in unemployment during the 1970s, and the importance of demand factors during the 1980s. Of this fall in demand, 46 per cent was due to fiscal policy, 42 per cent to a reduction in competitiveness and 12 per cent to a decline in world trade. Most of the other entries in table 8.6 correspond to entries in table 8.5 that have been discussed already.

## FURTHER READING

A good, very simple, introduction to the issues discussed in this chapter (and many others) is Richard Layard *How to Beat Unemployment* (Oxford: Oxford University Press, 1986). Shorter and more technical, though still very accessible, is R. Layard and S. Nickell 'The labour market,' in R. Dornbusch and R. Layard (eds.) *The Performance of the British Economy* (Oxford: Oxford University Press, 1987). A book which should, based on the authors' track record, be very useful is R. Jackman, R. Layard and S. Nickell *Unemployment* (Oxford: Oxford University Press, forthcoming). Peter Fallon and Donald Verry *The Economics of Labour Markets* (Oxford and New Jersey: Philip Allan, 1988), chapter 8, provides a very helpful survey of empirical evidence on the structure of the labour market — particularly on inflows and outflows and on the relationship between aggregate durations such as used here, and the durations observed in microeconomic surveys.

The model on which much of this chapter is based has been expounded in several places. The easiest is in Richard Layard *How to Beat Unemployment* (Oxford: Oxford University Press, 1986); more thorough than this is P. R. G. Layard and S. J. Nickell 'The causes of British unemployment', *National Institute Economic Review*, 111, 1985, pp. 62-85; most thorough is P. R. G. Layard and S. J. Nickell 'Unemployment in Britain', *Economica* 53 (supplement), pp. S121-70. The wage equation is extended to incorporate house prices in O. Bover, J. Muellbauer and A. Murphy 'Housing, wages and UK labour markets', *Oxford Bulletin of Economics and Statistics*, 1988; and profits are introduced in Alan A. Carruth and Andrew J. Oswald *Pay Determination and Industrial Prosperity* (Oxford: Oxford University Press, 1989). The role of the housing market is also investigated in John Ermisch (ed.) *Housing and the National Economy* (Aldershot and Brookfield, VT: Avebury, 1990). A European perspective is provided in: R. Layard

'European unemployment: cause and cure', LSE Centre for Labour Economics Discussion Paper No. 368, November 1989; *Economica* supplement on unemployment, 1986, reprinted as C. Bean, R. Layard and S. Nickell (eds.) *The Rise in Unemployment* (Oxford and Cambridge, Mass.: Basil Blackwell, 1987).

Though microfoundations have not been discussed in this chapter, the bargaining model used is based on the assumption of imperfect competition. As most textbooks on macroeconomics, if they deal with microfoundations at all, assume perfect competition, it is worth mentioning that Wendy Carlin and David Soskice *Macroeconomics and the Wage Bargain* (Oxford: Oxford University Press, 1990) analyses a model of imperfect competition similar to the one used by Layard and Nickell. Another interesting recent attempt to construct a macroeconomic model based on imperfect competition is Robin Marris *Reconstructing Keynesian Economics with Imperfect Competition* (Aldershot: Edward Elgar, 1991).

Many other explanations of unemployment have been offered. There follows a selection of these: Olivier J. Blanchard and Lawrence H. Summers 'Hysteresis and the European unemployment problem,' *NBER Macroeconomics Annual* 1986, pp. 15-78; R. Cross (ed.) *Unemployment, Hysteresis and the Natural Rate Hypothesis* (Oxford and Cambridge, Mass.: Basil Blackwell, 1988); David Metcalfe 'Labour market flexibility and jobs: a survey of evidence from OECD countries with special reference to Europe', in Richard Layard and Lars Calmfors (eds.) *The Fight Against Unemployment: Macroeconomic Papers from the Centre for European Studies* (London and Cambridge, Mass.: MIT Press, 1987). L. Calmfors and J. Driffil 'Bargaining structure, corporatism and macroeconomic performance,' *Economic Policy* 6, 1988, pp. 13-62; Richard B. Freeman 'Labour market institutions and economic performance', *Economic Policy* 6, 1988, pp. 64-80; Michael Burda '"Wait unemployment" in Europe', *Economic Policy* 7, 1988, pp. 391-426; George S. Alogoskoufis and Alan Manning 'On the persistence of unemployment', *Economic Policy* 7, 1988, pp. 427-69; C. Bean and A. Gavosto 'Outsiders, capacity shortages and unemployment in the United Kingdom,' in J. Drèze, C. Bean and R. Layard (eds.) *Europe's Unemployment Problem* (Cambridge, Mass.: MIT Press, 1989); A. Newell and J. Symons 'Corporatism, laissez-faire and the rise in unemployment,' *European Economic Review* 31, 1987, pp. 567-614; G. Burtless 'Jobless pay and high European unemployment', in R. Z. Lawrence and C. L. Schultze (eds.) *Barriers to European Growth* (Washington, DC: Brookings Institution, 1987). A different perspective on recent European experience is provided in Robert J. Gordon 'Back to the future:

European unemployment today viewed from America in 1939,' *Brookings Papers on Economic Activity* 1988, 1, pp, 271-304. Many of the references cited in chapters 6 and 7 are also relevant here.

The argument that it is outflows from unemployment that are critical in determining the unemployment rate is clearly put forward in Christopher Pissarides 'Unemployment and vacancies in Britain', *Economic Policy*, 3, 1986, pp. 499-559. The contrary view is proposed in S. Burgess 'How does unemployment change' (unpublished paper, University of Bristol, 1990), on which much of the section on flows is based. Discussion of the $U/V$ curve can be found in Pissarides (*ibid.*) and in A. Budd, P. Levine and P. Smith 'Long term unemployment and the shifting *U/V* curve: a multi-country study', *European Economic Review* 31, 1987, pp. 296-305. The problem of structural unemployment is covered in R. Jackman and S. Roper 'Structural unemployment,' *Oxford Bulletin of Economics and Statistics* 49, 1987, pp. 9-36. A good example of evidence from microeconomic survey data is S. Nickell, W. Narendranathan, J. Stern and J. Garcia *The Nature of Unemployment in Britain: Studies of the DHSS Cohort* (Oxford: Clarendon Press, 1989). Also useful is K. G. Knight *Unemployment: an Economic Analysis (London and Sydney: Croom Helm, 1987)*, especially chapter 6.

An article that was published too late to be taken into account here is R. Jackman, C. Pissarides and S. Savouri 'Labour market policies and unemployment in the OECD', *Economic Policy* 11, 1990, pp. 449-90.