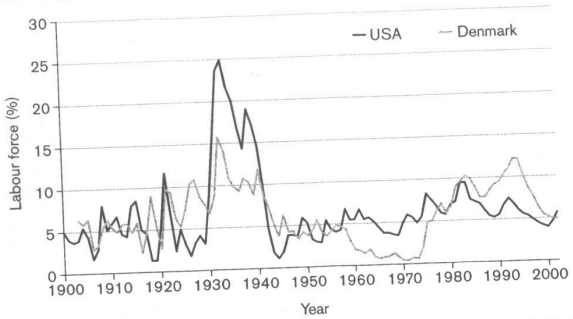


**Figure 11.1:** Rates of unemployment in the USA and Denmark during the twentieth century

Sources: R.B. Mitchell, *International Historical Statistics*, Macmillan, 1998; Bureau of Labor Statistics (US); S.A. Hansen, *Økonomisk Vækst i Danmark*, Bind 2, 1914–83, Akademisk Forlag, 1984; *Statistisk Tiårsoversigt*, Statistics Denmark.

## 11.1 The social cost of unemployment

High unemployment is a major economic and social problem and a concern of economic policy makers mainly for two reasons. At the individual level, when unemployment is high many persons will have to go through long spells of joblessness. They therefore suffer substantial income losses that may force them and their families to move from their homes, change the children's schools, take a cut in their standard of living, etc. Although unemployment insurance is available in most countries, it does not insure a person's income fully, and it only covers a limited period.[2] In addition to the loss of income, longer periods of involuntary unemployment may inflict serious psychological costs on the jobless, because an unemployed person may feel excluded from society and therefore lose self esteem. Unemployment thus gives rise to serious individual problems.

At the level of society, unemployment is a social waste, because income that could have been earned to the benefit of the individual as well as society is forgone. The income that unemployed persons would have earned, had they had jobs, would have been taxed, and the tax revenue could have been used to the benefit of other citizens. When unemployment is high, the associated loss of tax revenues will be substantial. Thus the income loss of an unemployed person is partly suffered by the unemployed himself and partly by other members of society. In any case it is a waste of resources to have people who are both qualified and willing to work at the going wage rates, unable to do so.

2. In Chapter 20, where we discuss the costs of the cyclical part of unemployment, we will go into more detail with the reasons why unemployment insurance typically cannot and does not fully cover the income losses arising from unemployment.



Economists explain the social waste associated with involuntary unemployment in more detail as follows. Let the marginal product of (a particular type of) labour be *MPL*, that is, *MPL* is the increase in production that will arise if one more worker is put to work, or the decrease that will result if one individual is taken out of work. Usually we think of the marginal product of labour as being decreasing in employment because of the presence of fixed factors, e.g. capital or land, or because the most productive workers are hired first.

The marginal product of labour must be held up against the marginal rate of substitution between consumption and leisure, *MRS*, also referred to as the marginal disutility of work. A worker's *MRS* is the amount of goods needed to compensate him for the leisure and the value of the home production he must give up when taking a job. Typically different workers will have a different *MRS*. A person will obviously want to work if offered a real wage above their *MRS*, so the total labour supply induced by a given real wage is the number of workers having an *MRS* below that wage rate.

If a worker's marginal product is larger than his or her *MRS*, then a social loss occurs if he or she does not work, since putting him or her to work gives an additional amount of output sufficient to compensate the worker and to leave a surplus that can be shared with other members of society (through taxation) to the benefit of everybody. A situation where $MRS < MPL$ thus implies inefficiency in the use of labour resources.

Now, if there is involuntary unemployment and firms maximize profits, there will indeed be jobless workers with marginal products exceeding their disutilities of work. An involuntarily unemployed person would like to work at the going real wage rate, $W/P$, so this wage rate must be greater than his or her disutility of work, $MRS < W/P$. Profit maximization implies that the last worker hired has a marginal product at least as great as the going real wage rate, that is, $W/P \leqslant MPL$, since otherwise the firm could increase its profits by firing the marginal worker. On the plausible assumption that the marginal product of labour decreases *gradually* with employment, there will be unemployed workers with marginal products close to that of the last worker hired. In other words, there will be unemployed workers for whom the condition $W/P \leqslant MPL$ is (very close to being) fulfilled. Collecting what we have found, if there is involuntary unemployment, then there must be unemployed workers for whom $MRS < W/P \leqslant MPL$, implying $MRS < MPL$. Hence their joblessness involves a social loss.[3]

For these reasons it is of great interest to know what determines the rate of structural unemployment and what policy measures could bring the natural rate of unemployment down from, say, 8 per cent to 4 per cent. These are exactly the questions to which we now turn. This chapter lays the basis for answering these questions by going through some empirical regularities concerning unemployment and by presenting some introductory theories. The next two chapters will present two main theories of structural unemployment.

## 11.2 The rate of unemployment

### Labour force, employment and unemployment

The rate of unemployment is a stock variable that can be measured at a given point in time, say on a specific day. Let the total number of persons who *would like to* work on day

3. An exercise will ask you to restate the explanation of the social cost of unemployment using a standard diagram.

$t$ be $L_t$. This is the labour force, which can be viewed as the size of the population of working age, $P_t$, times the participation rate, $\pi_t$, that is, $L_t = \pi_t P_t$. One can further subdivide into various groups such as women and men, $L_t = \pi_t^w P_t^w + \pi_t^m P_t^m$, where $\pi_t^w$ and $\pi_t^m$ are the participation rates of women and men, respectively. Total employment on day $t$, $E_t$, is the number of persons actually having a job on that day. The number of unemployed is then simply $U_t = L_t - E_t$, and the rate of unemployment is

$$u_t \equiv \frac{U_t}{L_t} = \frac{L_t - E_t}{L_t} = 1 - \frac{E_t}{L_t} \equiv 1 - e_t,$$

where we have denoted the rate of employment by $e_t$. Table 11.1 shows an estimate of the labour forces in the USA and Denmark for the month of January 2002, and it also shows the decomposition of the labour forces into employed and unemployed.

The rate of unemployment contains an element that is not as readily measurable as GDP, employment, inflation, etc., namely the number of persons, $L_t$, who *would like to* have a job. Out of these the $E_t$ employed actually have a job, so we can infer that indeed these people want to work. The $U_t$ unemployed, however, are persons who would like to work and yet do not do so. How do we measure the number of such people?

One way is to limit attention to those covered by unemployment insurance and to assume that individuals who plan to be active in the labour market will want to insure themselves against unemployment. One can then let $L_t$ be the total number of people holding unemployment insurance, and let $E_t$ be the number of insured people who have a job. Another way is to let $L_t$ be the sum of all those who have a job ($E_t$) and all those who are registered at some kind of (public) institution as looking for a job but not having one ($U_t$). A third way is to let $L_t$ consist of all persons who either have a job ($E_t$) or receive unemployment benefits or social assistance benefits motivated by joblessness ($U_t$). A fourth way is to estimate the number of unemployed by survey techniques asking a

**Table 11.1: Labour market data, January 2002**

| (in 1000 persons) | USA | Denmark |
|---|---|---|
| Population in working ages* | | |
| – Women | 92,186 | 1,735 |
| – Men | 88,154 | 1,775 |
| Participation rates | | |
| – Women | 69% | 78% |
| – Men | 83% | 87% |
| Labour force | | |
| – Women | 64,043 | 1,355 |
| – Men | 72,744 | 1,537 |
| Total Labour force ($L$) | 136,787 | 2,893 |
| Employed ($E$) | 128,013 | 2,782 |
| Unemployed ($U = L - E$) | 8,774 | 169 |
| Rate of unemployment ($U/L$) | 6.4% | 6.1% |

*Person between 16 and 64 years of age.

Sources: *Statistisk Tiårsoversigt*, Statistics Denmark, Bureau of Labor Statistics (US).



representative sample of individuals whether they are available for work. The three latter ways are the most common, and all the data for unemployment you will see in this chapter are of these types.

Although the rate of unemployment by definition pertains to a specific day, the data for unemployment most often shown are annual (or quarterly or monthly) rates. Fig. 11.1, for instance, shows annual rates. The annual rate of unemployment is simply the average over all the working days in the year of the daily rates of unemployment as defined above.

### The duration of unemployment

When you hear that the annual rate of unemployment was 12 per cent in Denmark in 1993, you might think that 12 per cent of the people in the labour force were unemployed during all of 1993. This was not the case. Indeed, many more people than 12 per cent of the labour force experienced some unemployment during 1993, but most of these people were unemployed for considerably less than all of the year. Table 11.2 shows that in Denmark in 1993, the fraction of people in the labour force who experienced some unemployment was 29 per cent, but 21 per cent of these people were unemployed for less than five weeks, 44 per cent were unemployed less than 14 weeks, while 64 per cent were unemployed for less than half the year. A considerable 36 per cent of those affected by unemployment, that is, 10.4 per cent of all people in the labour force, were unemployed for more than half the year.

In the USA the annual rate of unemployment was substantially lower than in Denmark in 1993, namely 7 per cent, and the fraction of people in the workforce who experienced some unemployment was 20 per cent. Of these people, 20 per cent were unemployed for more than half the year, implying that only 4 per cent of the people in the labour force were unemployed for more than half the year.

**Table 11.2: Duration of unemployment**

| 1993 Percentage of people experiencing unemployment during the year, who were unemployed for | USA | Denmark | 1998 Percentage of people experiencing unemployment during the year, who were unemployed for | USA | Denmark |
|---|---|---|---|---|---|
| Less than 5 weeks | 37 | 21 | Less than 5 weeks | 42 | 39 |
| 5–14 weeks | 29 | 23 | 5–14 weeks | 31 | 25 |
| 15–26 weeks | 15 | 19 | 15–26 weeks | 12 | 16 |
| 27 or more weeks | 20 | 36 | 27 or more weeks | 14 | 20 |
| | 100 | 100 | | 100 | 100 |
| Persons having experienced unemployment as a percentage of the labour force | 20 | 29 | Persons having experienced unemployment as a percentage of the labour force | 16 | 23 |
| Unemployment rate, % | 7 | 12 | Unemployment rate % | 5 | 7 |

Sources: Bureau of Labor Statistics (US), *Statistisk Tiårsoversigt*, Statistics Denmark.

This illustrates a general fact that we will return to below. When overall unemployment is high, a greater share of total unemployment is long-term unemployment. The figures for 1998 also confirm this. In Denmark the annual rate of unemployment had come down to 7 per cent, and now only 20 per cent of those affected by unemployment were unemployed for more than half the year, as opposed to 36 per cent in 1993 when the overall unemployment rate was 12 per cent.

When it comes to the individual costs of unemployment, it is long-term unemployment that is most severe. If no people were ever unemployed for more than, say, one month during a year, the individual loss would not be severe. However, those who are unemployed for long periods may be badly hurt by unemployment. A close positive relationship between the overall rate of unemployment and the rate of long-term unemployment provides one of the main reasons for trying to avoid high unemployment in general.

### The Beveridge curve

If there is (involuntary) unemployment, can there be vacant jobs at the same time? At first, one would perhaps say no. If there are unemployed people truly seeking jobs, they should take the vacant jobs until there are no more vacancies. If there is unemployment there should be no vacancies, and if there are vacancies there should be no unemployment. This would correspond to a perfect matching in the labour market between people who want jobs and the employers who offer jobs. However, the matching is never that perfect.

Just as one can define a rate of unemployment at a given time, one can define a rate of vacancies. Let $J_t$ be the total number of jobs offered by employers on day $t$, and let $E_t$ be total employment on that day. The number of vacancies is then $V_t = J_t - E_t$, and the vacancy rate is $v_t \equiv V_t/J_t$.

To obtain data for vacancy rates requires that we can measure the number of vacant jobs, $V_t$. This involves even more practical problems than measuring the number of unemployed people, $U_t$, but one can try in different ways. In the USA a 'vacancy index' is computed as a proxy for the rate of vacancies. The vacancy index equals a 'help wanted' index divided by employment, where the help wanted index measures the number of job advertisements in major US newspapers. In Denmark a vacancy rate can be computed, at least for some years, based on the number of vacant jobs reported by the employers to the public employment agency. None of these ways are perfect, but if the measurement error is the same at different dates, a time series for a vacancy rate or index constructed this way will give a correct indication of the direction of changes in labour market conditions.

The perfect matching between 'people wanting jobs' and 'jobs wanting people' described above would imply that in a diagram with $u_t$ along the horizontal axis and $v_t$ along the vertical axis, only points $(u_t, v_t)$ on one of the two axes would be observed. Fig. 11.2 shows how the points are actually situated in the US for the period 1960–2000, and in Denmark for the period 1974–1988.

The points for Denmark seem to be situated on a fairly stable downward-sloping curve. This curve is called a Beveridge curve. The fact that the curve does not just follow the axes is an indication of 'mismatch' in the labour markets. The further out to the north-east the curve is situated, the more severe are the problems of mismatch. The position of



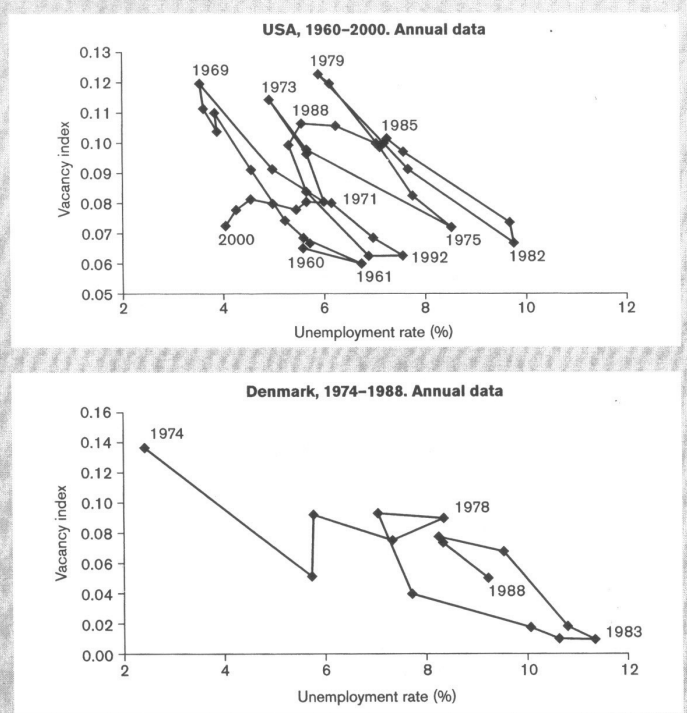


**Figure 11.2:** Beveridge curves

Sources: OECD, Bureau of Labor Statistics (US), and data material for K. Albæk and H. Hansen, 'The Rise in Danish Unemployment: Reallocation of Mismatch?', Working Paper, Department of Economics, University of Copenhagen, 2001.

the Beveridge curve can thus be seen as an indicator of structural problems in the labour market. This is exactly why the Beveridge curve is useful. If the position of the curve shifts over time, this indicates shifts in the matching efficiency in the labour market. Look at the Beveridge curve for the USA based on the vacancy index. Between 1960 and 1970 or 1971 the points are located on a nice downward-sloping curve just as for Denmark. Then there is a shift outwards. The points for 1975 to 1985 are again situated relatively nicely on a downward-sloping curve, but the curve has shifted considerably to the north-east. This indicates that during the decade 1975 to 1985 people and jobs had much greater problems finding each other than during the decade 1960–1970. One would expect this to be part of the reason why there was more unemployment in the latter of these decades. Since 1985 there seems to have been an almost continually ongoing improvement of the basic structures of the American labour market.

## 11.3 Stylized facts about unemployment

We mentioned that the rate of unemployment contains an element that is not easy to measure, namely the number of people who do not have a job but *would have liked to have one*. For this reason there is some disagreement among economists about how much to trust statistics on unemployment rates. Should these be included among the time series that theories are held up against, or should one only include series of 'truly measurable' variables? Yet most economists believe that one can safely trust reported statistics of unemployment to give at least *some* indication of the extent of involuntary unemployment.

To see why, we may start by asking if there is a way to test if those who report that they are involuntarily out of work would actually take a job at the going wages if they were offered one? Assume that due to 'good times' there is a sudden increase in the demand for labour. If this reduces unemployment without driving up real wages too much, it can be taken as a sign that those who reported being unemployed actually did want jobs at the going wages, since they indeed took jobs at these wages when they had the chance. In other words, if we observe a clear relationship between increases in GDP and decreases in the rate of unemployment and, at the same time, do not observe that real wages increase sharply as soon as GDP goes up, then this suggests that the officially reported rates of unemployment indeed contain true information.

In Chapter 14 we return to the empirical facts of the business cycle. One fact reported is that real wages are not strongly correlated with GDP over the cycle, and in particular there is no strong tendency that increases in GDP are associated with increases in real wages. At the same time there is a clear tendency that increases in GDP are accompanied by decreases in unemployment, as shown in Fig. 11.3 for USA and Denmark.

The relationship illustrated by Fig. 11.3 is both important and useful. It shows, for instance, that at a constant rate of unemployment, economic growth in the US is around 3 per cent per year, while a one-time increase in the growth rate of GDP of two percentage points reduces unemployment by about one percentage point. For Denmark, a one percentage point reduction in unemployment seems to require only an additional one percentage point of economic growth. The relationship reported in Fig. 11.3 has a name: Okun's Law.

**Stylized fact 1** **(Okun's Law).** *There is a clear negative relationship between the rate of growth in GDP and the absolute change in the rate of unemployment.*

The rate of unemployment is a fraction and by definition it has to stay between 0 and 1. Therefore it cannot increase by a certain percentage each year over many years, since this would eventually make it larger than 1. It could, of course, have an increasing trend in other ways, for example it could tend to increase from one level to another higher level. Figure 11.4 (as well as Fig. 11.1) indicates that nothing like that is true. The figure uses the same data as Fig. 11.1 and shows the annual absolute change in the rate of unemployment for the USA and Denmark. Over time spans of 100 years, increases and decreases seem to offset each other so that there is no upward or downward long-run tendency.

**Stylized fact 2** *There is no upwards or downwards trend in the rate of unemployment in the (very) long run.*

Note, however, that over quite substantial periods there can be a tendency for unemployment to rise or fall. Consider Fig. 11.1 again and assume that for the US you only



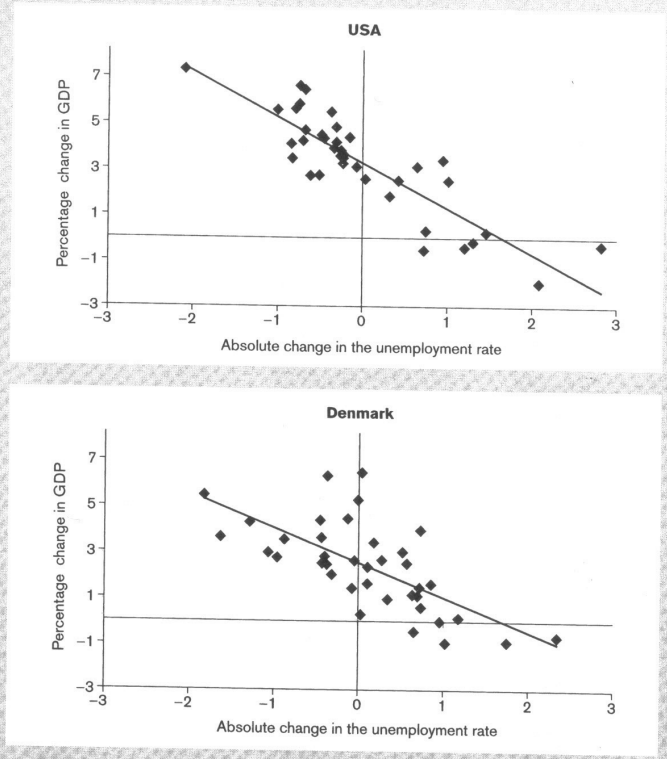


**Figure 11.3:** Okun's Law

The scatterplots show the annual percentage change in GDP (1995 PPP US dollars) against the annual absolute change in the rate of unemployment in the period from 1965 to 2002. Each dot corresponds to a single year. For the statistically proficient, the regression line for the USA has $R^2 = 0.74$ and $t = -10.15$, while the line for Denmark has $R^2 = 0.45$ and $t = -5.47$.
Source: OECD, Economic Outlook.

had the data from the early 1940s to the early 1980s, a period of about 40 years. For this long period there seems to be a sustained upward movement in the rate of unemployment. Something similar is true for Denmark for the period from the early 1970s to the early 1990s.

Figures 11.1 and 11.4 also bring evidence of another fact which is well known:

**Stylized fact 3** *There is a lot of variability in the rate of unemployment in the short run.*

A fact that is perhaps not so directly visible from Figs 11.1 and 11.4 is the persistence in the rate of unemployment: if the rate of unemployment is high in a specific year, then it