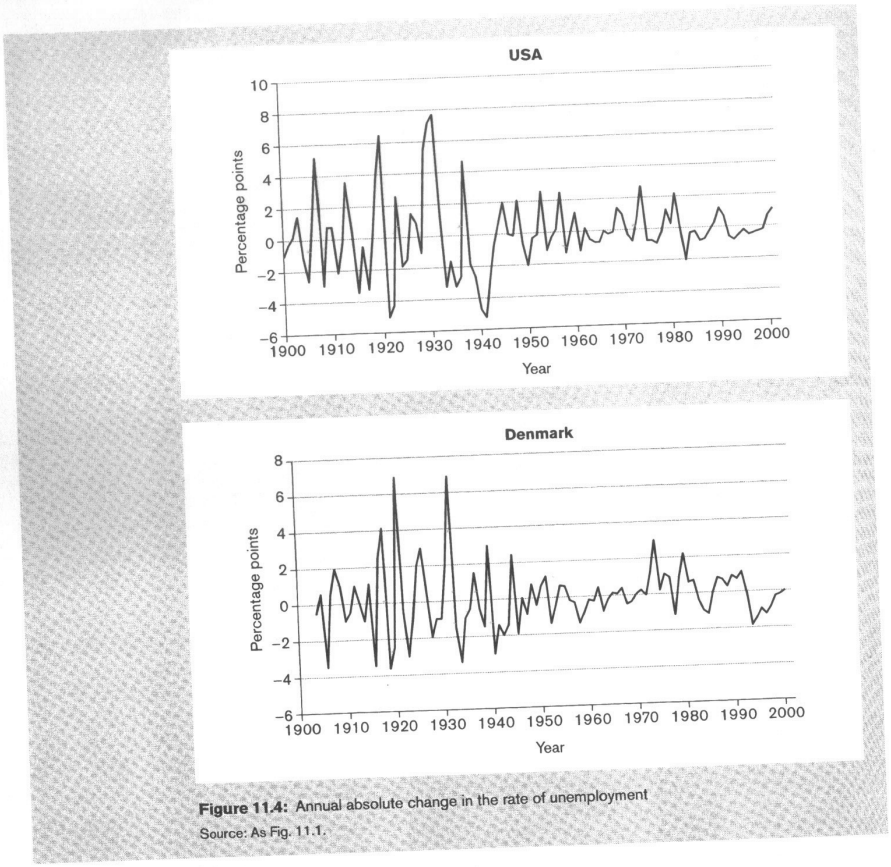


Figure 11.4: Annual absolute change in the rate of unemployment
Source: As Fig. 11.1.

was probably also high the year before (and will be the year after). We can measure this persistence by the coefficient of correlation between the current unemployment rate and its own past values. The coefficient of correlation between two time series, u_t and x_t, running through $t = 1, ..., T$ and with averages $\bar{u} = \frac{1}{T}\sum_{t=1}^{T} u_t$ and $\bar{x} = \frac{1}{T}\sum_{t=1}^{T} x$ is:

$$\rho \equiv \frac{\sum_{t=1}^{T}(u_t - \bar{u})(x_t - \bar{x})}{\sqrt{\sum_{t=1}^{T}(u_t - \bar{u})^2} \cdot \sqrt{\sum_{t=1}^{T}(x_t - \bar{x})^2}}.$$

It should be visible from the formula that the coefficient ρ measures the degree of (linear) covariation between the two series, that is, roughly the degree to which one series is above average when the other is above average. One can show that $-1 \leqslant \rho \leqslant 1$, and $\rho = 1$ and $\rho = -1$ correspond to complete linear covariation along a straight line, $u_t = a + bx_t$, with positive and negative b, respectively. If u_t is the annual rate of unemployment and one lets

$x_t = u_{t-1}$, and computes ρ for the two series u_t and x_t (for $t = 2, ..., T$), one gets the coefficient of correlation between the rate of unemployment in one year and the year before. One can then let $x_t = u_{t-2}$ to get the correlation with unemployment two years before, etc. Figure 11.5 shows such coefficients of correlation in unemployment for the USA and Denmark.

There is a clear positive correlation between the current rate of unemployment and the rates of unemployment in several previous years, and the degree of correlation decreases as one goes back in time. The tendency for high unemployment in one year to imply high unemployment in several previous and succeeding years is what we mean by the persistence in unemployment.

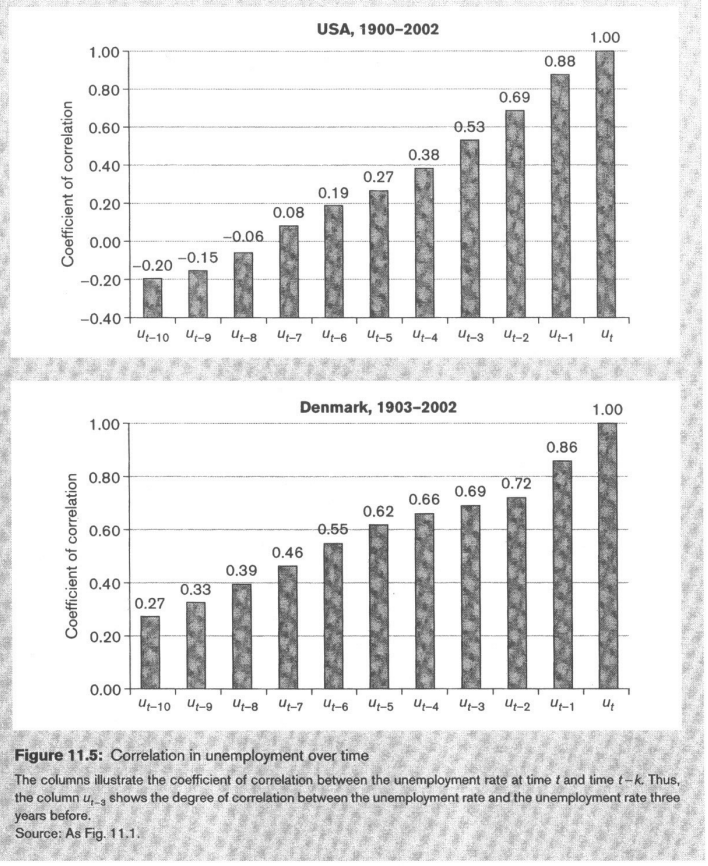
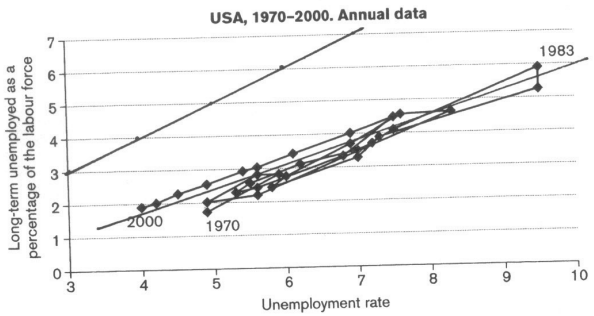


Figure 11.5: Correlation in unemployment over time
The columns illustrate the coefficient of correlation between the unemployment rate at time t and time $t-k$. Thus, the column u_{t-3} shows the degree of correlation between the unemployment rate and the unemployment rate three years before.
Source: As Fig. 11.1.

Stylized fact 4 *There is a lot of persistence in annual rates of unemployment.*

In connection with Table 11.2 we examined the relationship between overall unemployment and long-term unemployment. We can compute the annual rate of long-term unemployment over several years, defining this rate as, for example, the percentage of all people in the labour force who were unemployed for more than half of the year. We can then plot the rate of long-term unemployment against the overall rate of unemployment. This is done for the US and for Denmark in Fig. 11.6.

What is remarkable is not just that the relationship is positive, but also the strength of the positive correlation. As unemployment increases, long-term unemployment increases



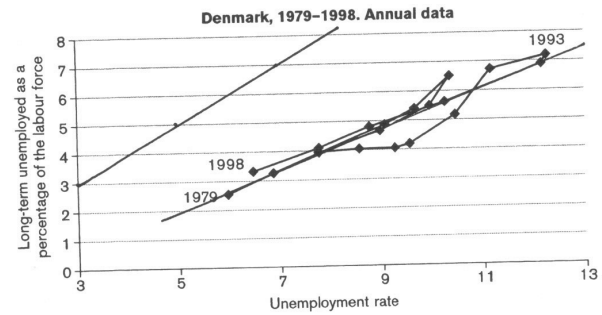


Figure 11.6: Long-term unemployment against overall unemployment
These figures plot the percentage of people in the labour force being unemployed for more than half the year, against the overall unemployment rate. Each dot corresponds to a single year.
Sources: Bureau of Labor Statistics (US); *Statistisk Tiårsoversigt*, Statistics Denmark.

relatively more. From the figure it seems that for both countries a 100 per cent increase in the rate of unemployment implies an approximately 200 per cent increase in long-term unemployment (perhaps somewhat less for the US), pointing to an elasticity of long term unemployment (as defined here) with respect to overall unemployment of around 2.

Stylized fact 5 *Long-term unemployment varies positively and more than proportionally with overall unemployment.*

As noted above the most severe consequences of unemployment are felt by the long-term unemployed. Since higher unemployment means even higher long-term unemployment, this may be one of the main reasons for fighting high unemployment.

Does unemployment tend to be of equal size in different regions of the world? Perhaps it does in the very long run, as suggested by Fig. 11.1, but over substantial periods there can be considerable differences between major regions, as shown in Fig. 11.7. For a long time until the early 1980s, unemployment in Europe was lower than in America, but since then joblessness has been substantially higher in the EU than in the US.

Stylized fact 6 *There can be large differences in unemployment across geographical areas for long periods of time.*

Other systematic variations are also important. Fig. 11.8 shows rates of unemployment across educational groups for the US and Denmark. Although different educational categorizations have been used for the two countries, the general picture is clear:

Stylized fact 7 *There are considerable and long-lived differences in rates of unemployment across educational groups with a broad tendency for higher education to mean lower unemployment.*

Variations across other categories are of importance in different connections, e.g. across race or sex. However, a relatively high rate of unemployment for a particular

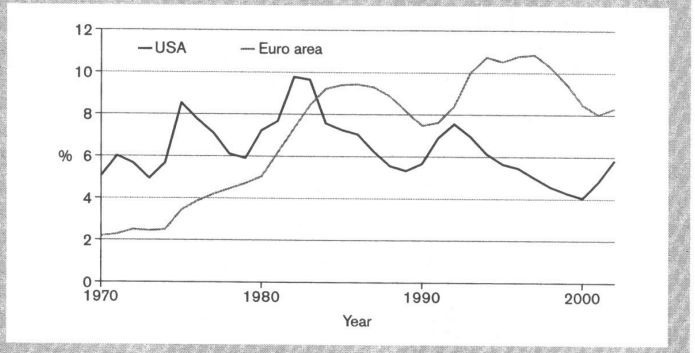


Figure 11.7: Rates of unemployment in the EU and USA
Sources: Statistics Denmark and OECD, Main Economic Indicators.

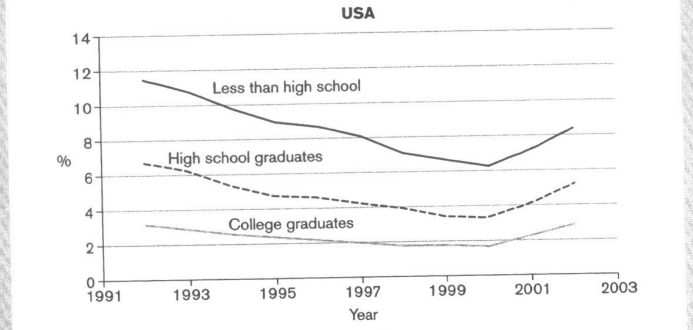


Figure 11.8: Unemployment by educational attainment
Sources: Bureau of Labor Statistics (US), *Statistisk Tiårsoversigt*, Statistics Denmark.

section of the population may, at least partly, reflect that this group contains relatively many unskilled people compared to the general population.

The final 'law' we will focus on here is an important one, and the remainder of this chapter is more or less centred around it. Figure 11.9 shows annual rates of unemployment for four countries for the period from 1965 to 2000. For the USA and Denmark, Fig. 11.9 is thus just a close-up of the most recent part of Fig. 11.1.

We see that (except for a special period in the 1960s and early 1970s), even when the rate of unemployment is lowest, there is still a considerable amount of unemployment with annual rates above 4 per cent. Furthermore, if the rate of unemployment fluctuates around a certain 'gravity level', as Fig. 11.9 and in particular Fig. 11.1 could indicate, this level seems to be somewhere between 5 per cent and 7 per cent in the countries considered. The period in the 1960s and early 1970s, where unemployment rates in some of the countries went all the way down to below 2 per cent, showed many signs that this

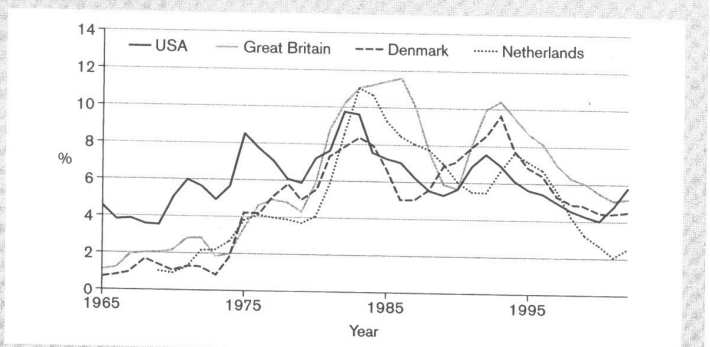


Figure 11.9: Rates of unemployment in Great Britain, Denmark, the Netherlands and the USA
Source: OECD, Economic Outlook.

was not a sustainable or equilibrium situation: inflation rose sharply in the countries in question. Accounting for this, the figures indicate that even in the best of times the lowest possible rates of unemployment are considerable, perhaps around 4 per cent, and gravity rates of unemployment are around 5–7 per cent.

Figure 11.1 indicates a strong similarity in the (very) long-run behaviour of the rate of unemployment between the USA and Denmark. In both countries the rate of unemployment seems to fluctuate around a common 'natural' level of, say, 5 to 7 per cent. However, there may also be some indication, particularly from Fig. 11.9, that the natural rate of unemployment can shift over time, and Fig. 11.7 indicates that the natural rate can differ between countries or regions.

Stylized fact 8 *When rates of unemployment are at their lowest, there is still a substantial amount of unemployment, seemingly around 4 per cent, and the natural unemployment rate that the annual rates fluctuate around is higher, around 5–7 per cent. The natural rate of unemployment seems to shift over time and can be different in different regions.*

11.4 Short-run cyclical and long-run structural unemployment

This section links the various types of unemployment, short-run cyclical and long-run structural, to the different types of wage and price rigidity that economists think are associated with them. The section will therefore contain some repetition of material from Chapter 1.

Unemployment and excess supply of labour

Figure 11.10 illustrates a situation of unemployment in a labour market (disregarding mismatching). The figure assumes that the *individual* suppliers of labour take the nominal