III

The Supply Side

6

Productivity

6.1 MEASURING PRODUCTIVITY GROWTH

Output per head

The simplest, and most frequently used, measure of productivity is output per head, shown in figure 6.1. This gives data for both the whole economy and for manufacturing. Manufacturing is picked out for two main reasons. The first is that, for reasons discussed below, it is easier to measure productivity in manufacturing than in some other sectors of the economy. The second is that manufacturing is important for foreign trade and manufacturing productivity is a crucial influence on international competitiveness, which means that more concern is often paid to manufacturing productivity than to productivity in other sectors of the economy.

Four points are worth making about figure 6.1: the strong cyclical behaviour of productivity; the difference between economy-wide and manufacturing productivity growth rates; the poor productivity performance of the mid to late 1970s; and the recovery after 1980.

- Productivity growth exhibits a strong cyclical pattern. Productivity rises fast in booms and falls or rises more slowly in recessions. This can be accounted for simply by variations in utilization rates: in booms factors, both capital and labour, are more fully utilized, so output per head and total factor productivity rise. In recessions the reverse occurs. This 'hoarding' of capital and labour during recessions is usually explained in terms of adjustment costs. It is

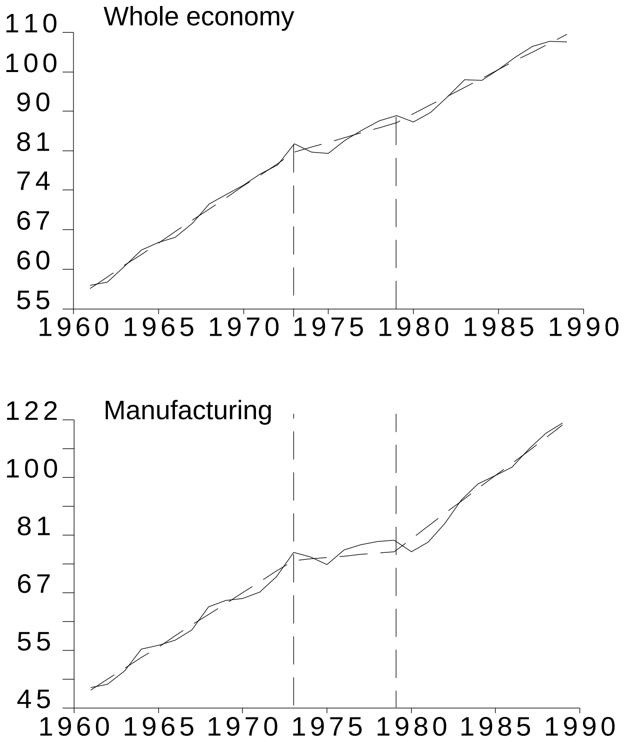

Figure 6.1 Output per head, 1961-89

Source: Economic Trends. Broken lines give trends.

expensive for firms to change both their capital stock and their labour force. There are costs attached to hiring and firing workers and, in addition, if firms were to reduce employment too far during a recession they might find that they were unable to recruit suitable replacements when the boom came.

❏ Productivity has risen faster in manufacturing than in the economy as a whole. This may reflect more rapid technical change in manufacturing, but it probably also reflects measurement problems. Most manufacturing output is directly measurable which means it is fairly easy to observe productivity growth, despite the inevitable index-number problems. In contrast, many services have to be valued at the cost of the inputs used, the reason being that output cannot directly be measured. Education and public administration, for example, may be becoming more efficient without this being reflected in measures of output.

- The growth rate of productivity fell sharply during the 1970s. In the recessions of 1974-5 and 1980 productivity *fell* and in the intervening years (1976-9) it rose very slowly. This poor productivity performance during the 1970s is part of a worldwide phenomenon, usually referred to as the productivity slowdown of the 1970s.

- Finally we have a period of improved performance since 1980.

The reasons for these last two phenomena are considered in the next section.

Total factor productivity

For many purposes it is enough to use output per head as a measure of productivity. When it comes to productivity growth, however, it is important to develop a better measure, for output per head may rise for several reasons. (1) Firms may be using more capital-intensive methods. (2) Capital and labour may be being more fully utilized. (3) There may be systematic measurement errors causing measured output per head to rise even though there has been no 'real' change. (4) Resources may be being used more efficiently. When we talk about productivity growth we are usually concerned simply with the last of these. To measure this, therefore, we have to find a way to separate this from the other three effects.

The way economists most often attempt to disentangle the effects of productivity growth from the other factors which cause output per head to change is to calculate what is usually referred to as the growth of either *total factor productivity* or *multi-factor productivity*. To calculate this we start with output per unit of labour input and then deduct the effects of any change in capital per worker (for more detail see box 6.1). This is done using the formula

$$g_{TFP} = g_{Y/L} - 0.33g_{K/L}.$$

where g_{TFP} is the growth rate of total factor productivity, $g_{Y/L}$ is the growth rate of output per worker and $g_{K/L}$ is the growth rate of capital per worker. The share of profits in output is assumed to be as near 1/3

BOX 6.1 TOTAL FACTOR PRODUCTIVITY

Assume that we have a production function, relating output to inputs of capital (K) and labour (L). Output also rises with time (t) as productivity increases.

$$Y = \mathrm{F}(K, L, t)$$

From this it follows that,

$$\Delta Y = \mathrm{MPK}.\Delta K + \mathrm{MPL}.\Delta L + \mathrm{MPT}.\Delta t$$

where MPK and MPL are the marginal products of capital and labour. MPT is what might be described as the 'marginal product of time': the amount by which output would increase over time if inputs of capital and labour were constant. Dividing by Δt we obtain

$$\Delta Y/\Delta t \quad = \quad \mathrm{MPK}(\Delta K/\Delta t) + \mathrm{MPL}(\Delta L/\Delta t) + \mathrm{MPT}$$

If we divide both sides by Y and rearrange the terms we can obtain

$$g_Y \quad = \quad \mathrm{MPK}(K/Y)g_K + \mathrm{MPL}(L/Y)g_L + \mathrm{MPT}/Y$$

where g_Y, g_K and g_L are the proportional growth rates of output, capital and labour respectively, these being defined by $g_Y = (1/Y)(\Delta Y/\Delta t)$, $g_K = (1/K)(\Delta K/\Delta t)$ and $g_L = (1/L)(\Delta L/\Delta t)$.

If there is perfect competition, the wage rate (w) will equal the marginal product of labour, and the rate of profit (r) will equal the marginal product of capital. Our equation can thus be re-written as

$$g_Y = (rK/Y)g_K + (wL/Y)g_L + z,$$

where $z = \mathrm{MPT}/Y$ is the rate by which output will grow if capital and labour are constant. This variable, z, is the growth rate of *total factor productivity* or *multi-factor productivity*. This equation provides an easy way to measure z, because rk/Y and wL/Y are the shares of profits and wages in output. If we assume that the shares of profits and wages in national income are constant at one third and two thirds respectively (this is a good enough approximation, as small changes would make very little difference to the results), z can be calculated using the formula

$$z = g_Y - 0.33g_K - 0.67g_L.$$

We can also derive the relationship between the growth rate of total factor productivity and the growth rate of output per head.

$$z = g_Y - g_L - 0.33(g_K - g_L) = g_{Y/L} - 0.33g_{K/L}.$$

If we are concerned to estimate trend growth rates of multi-factor productivity, a slight variation in this method is appropriate. It can be shown that, assuming that there is perfect competition, the shares of profits and wages in national income will be constant if and only if the production function has the special form,

$$Y = \mathrm{A}e^{nt}K^{\alpha}L^{1-\alpha},$$

where the parameter α is the share of profits in income, with $1-\alpha$ being the share of wages. Taking logarithms of both sides, this becomes

$$\log(Y) = \log(\mathrm{A}) + nt + \alpha\log(K) + (1-\alpha)\log(L).$$

Given data on Y, K and L we can obtain estimates of A, n and α.

This method has the advantage that, once we have worked out these parameters, we can calculate 'full-employment' output by replacing the labour that is actually employed, L, with the size of the labour force, N:

Using this, we can work out full-employment output, Yf by replacing actual employment, L, with N the total labour force, to obtain:

$$Yf = \mathrm{A}e^{nt}K^{\alpha}N^{1-\alpha}.$$

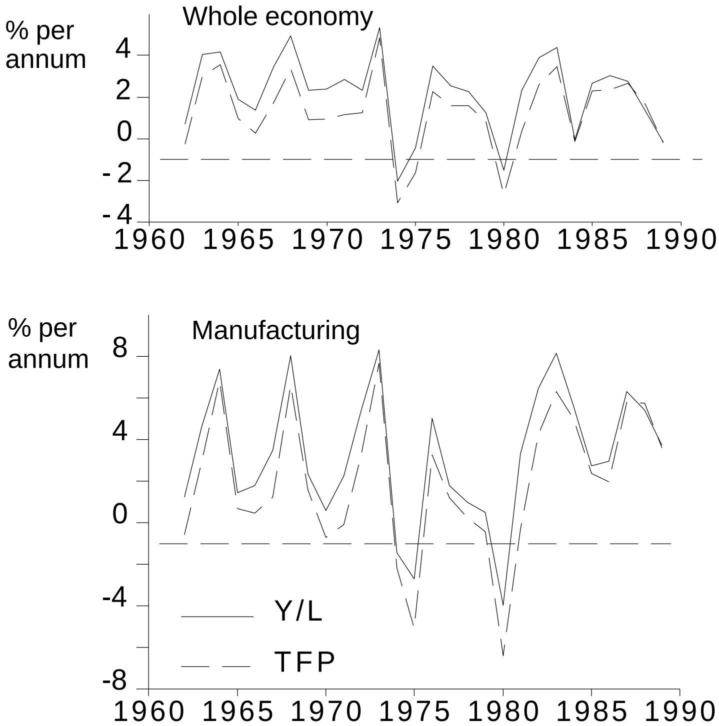

Figure 6.2 Productivity growth rates, 1961-89

Source: see appendix.

Table 6.1 Productivity growth — period averages

	Economy		Manufacturing	
	Y/L	TFP	Y/L	TFP
1961-73	2.9	1.6	3.8	2.4
1973-79	1.3	0.3	0.5	-1.2
1979-88	2.2	1.6	4.4	3.1

Source: as for figure 6.2.

as makes no difference. The results are shown in figure 6.2. The main trends are summarized in table 6.1.

The estimates of total factor productivity growth shown in figure 6.2 and table 6.1 show that the productivity slowdown of the 1970s cannot be explained by the fall in the rate of capital accumulation which took place then. The decline in total factor productivity growth was just as great as the decline in the growth rate of output per worker: the two series move very closely together.

The importance of allowing for changes in the rate of growth of the capital stock is shown by looking at the figures for the productivity growth in the whole economy. Since 1979 output per head has been growing more slowly than before 1973, suggesting that productivity growth, though it has certainly recovered compared with the 1970s, has not even regained its former level. On the other hand, total factor productivity has grown faster since 1979 than before 1973. The explanation is that investment has been low since 1979 and capital per head has been growing more slowly.

Measurement errors

All the estimates of productivity growth discussed so far ignore the problem of variations in capacity utilization and the possibility of systematic measurement errors. If the average growth rates calculated in table 6.1 were for very long periods we might be able to assume that the effects of measurement errors and changes in capacity utilization would be averaged out. For the fairly short periods we are considering this cannot be assumed.

There are several reasons why we might expect there to be systematic errors in the measurement of output per head and total factor productivity during the 1970s. Consider first some of the reasons why there may have been systematic biases in the measurement of output during the 1970s. The Central Statistical Office (CSO), the organization responsible for constructing estimates of the UK capital stock, starts with data on the money value of gross output produced by a large number of firms. To get from this to a measure of output (real value added) it is necessary to do three things: (1) to aggregate data on individual firms to obtain measures for the economy (or sector) as a whole; (2) to convert data on gross output into estimates of value added; and (3) to use price indices to convert values into estimates of real output. During the 1970s there were enormous fluctuations in prices, exchanges rates and output, which caused a number of problems with the last two of these stages.

- It has been argued that when energy and raw material prices rise, as happened during the 1970s, firms will economize on energy and raw materials, raising the ratio of value added to gross output. If the CSO uses the same weights as in previous periods, therefore, rising energy and raw material prices will lead to the growth in value added being under-estimated. The CSO's estimates of productivity will be too low.

- There are problems in obtaining the correct prices with which to convert values into measures of real output. As no suitable deflators exist for export prices, domestic prices are used instead. When exchange rates are changing, export prices are likely to be changing relative to domestic prices, the result being incorrect estimates of output. If the change in export prices is over-estimated, for example, the volume (value divided by price) will be under-estimated. Changes in the exchange rate and the inflation rate also cause problems because of divergences between list prices and the prices at which transactions actually take place. If sterling appreciates, for example, exporters will have to reduce their sterling prices to maintain their competitiveness in terms of foreign currency. List prices will take time to adjust. If it is list prices that are reported, there will be an upward bias in the price index, and downward bias in measuring output. Finally, problems are caused by price controls, which were important between 1973 and 1977. Because firms were subject to price controls they will have had an incentive to keep reported prices low.

For various reasons, therefore, the growth of output during the 1970s may be under-estimated by the official statistics.

A potentially even more serious problem arises with the measurement of the capital stock. Capital stock is estimated by starting with an initial stock, adding new investment and subtracting the capital which is thought to have been scrapped during the year (this gives the gross capital stock; to obtain the net capital stock we subtract depreciation instead of scrapping). To do this we need an estimate of the lifetime of capital equipment so that we can calculate how much scrapping is taking place. The major problem here is that the lifetime of capital equipment is not fixed, but depends on economic factors: capital is scrapped not when it no longer works but when it becomes uneconomic to continue to use it. In a time of rapid economic change the statisticians' estimates of capital goods' lifetimes are liable to become out of date, with the result that scrapping will be wrongly estimated. This is thought to have been a particular problem during the 1970s: for example, sharply rising energy prices made much capital uneconomic earlier than would otherwise have been the case.

Improved estimates of productivity growth

To improve on the estimates of total factor productivity given above we need to adjust for both variations in capacity utilization and possible measurement errors. This is not the impossible task it might seem, for although neither utilization rates nor measurement errors can be directly observed, they are both likely to be correlated with other variables which can be measured.

- ❑ Utilization rates will be linked to overtime hours worked. If overtime hours are being worked we can assume that the labour force is fully utilized. If no overtime is being worked then we do not know whether or not labour is working to capacity. Using information on overtime hours, therefore, it is possible to work out a measure of 'effective hours' worked and to use this in place of actual hours as the measure of labour input.

- ❑ Biases in measuring output can be allowed for by assuming that they varied depended on changes in competitiveness, raw material prices relative to output prices and the intensity of price controls. These variables can therefore be included in a regression equation so as to capture the effects of measurement errors.

Estimates of total factor productivity growth estimated using these methods are shown in table 6.2. The columns give the growth rates of output per head and total factor productivity calculated in the same way as the estimates discussed earlier in this chapter. The only difference is that here the 1979-80 recession is separated from the later period. The data from which these estimates are derived are shown in figure 6.3.

Given the large fall in productivity during 1979-80, the average growth rates for 1980-88 are clearly much higher than those for 1979-88 given in table 6.1. Both sets of figures (i.e. with and without a break in trend in 1980) are provided because it is not clear which is best. If we are concerned with long run productivity trends we should try to avoid changes in productivity which are simply the result of the business cycle. It makes sense, therefore, to go from one cyclical peak to another (i.e. 1979-88). If our trend runs from a depression year to a boom year (i.e. 1980-8) it will include the productivity growth caused by the

Table 6.2 Productivity growth in manufacturing, 1960-89

	Y/L	TFP1	TFP2	TFP3	TFP4
1960-73	3.7	2.3	2.3		
1973-79	1.3	0.0	0.6	0.8**	0.95
1979-80	-3.8	-8.5	-1.9	-1.5	-1.07
1980-88	5.0	4.1	2.76*	3.5***	

*1980-85; **1970-79; ***1980-87.

Source: Y/L — growth rate of output per head. TFP1 — TFP growth rates calculated as $g_{Y/L} - 0.33g_{K/L}$. TFP2 — TFP growth rates allowing for utilization as described in the text, from J. Muellbauer, *Oxford Review of Economic Policy*, 2(3), pp. i-xxv. TFP3 — TFP growth rates allowing for utilization from *Bank of England Quarterly Bulletin* 29(1), pp. 23-6. TFP4 — TFP2 adjusted for capital measurement errors.

upswing of the business cycle and will be an over-estimate of the long term trend (compare figures 6.1 and 6.3). On the other hand, if we believe that the 1979-80 recession was unusual and that there was a change in productivity performance after 1980, then we do need to distinguish these two periods. The only satisfactory solution, therefore, is to provide both sets of figures (i.e. tables 6.1 and 6.2).

Column 3 of table 6.2 contains estimates, labelled TFP2, of total factor productivity growth made by Muellbauer. The regression equations from which these were obtained included overtime hours and various inflation and exchange rate terms, designed to eliminate the effects of measurement errors and variations in capacity utilization. Column 4, labelled TFP3, contains more recent estimates prepared by the Bank of England using the same methods as Muellbauer. These have the advantage of being based on more up-to-date data than Muellbauer's estimates. The disadvantage is that they do not go back to the 1960s and the break is taken in 1970, not 1973.

For the 1960s it makes little difference which method is used to estimate total factor productivity growth. This is not surprising. Comparison of TFP1 with TFP2 suggests that some of the apparent slowdown after 1973 was the result of measurement errors and a fall in utilization rates: when these are taken into account total factor productivity grew at 0.6 per cent per annum, whereas the 'unadjusted' measure shows no growth at all. The main contrast, however, comes during the 1979-80 recession when the 'unadjusted' measure, TFP1,

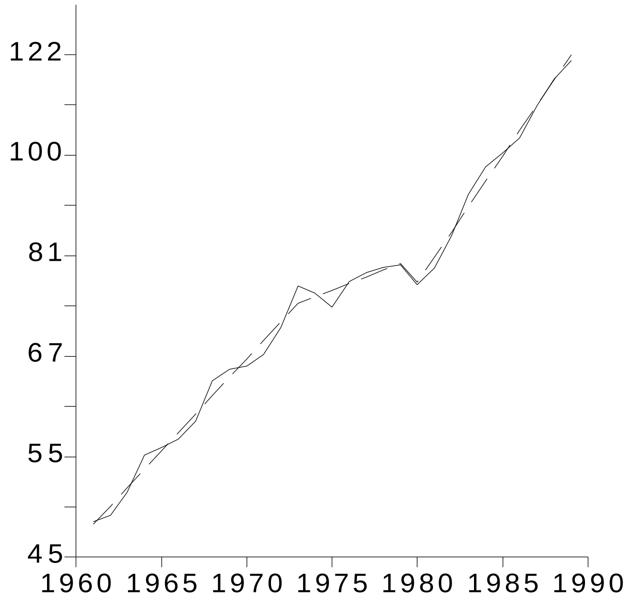

Figure 6.3 Output per head in manufacturing, 1961-89

Source: Economic Trends.

shows an 8.1 per cent per annum fall in productivity. Comparison with either of the other two measures suggests that, though the fall in total factor productivity (either 1.5 per cent or 1.9 per cent) was still substantial, most of this 8.1 per cent was the result of a fall in capacity utilization (measurement errors may have been present but are hardly likely to have been substantial compared with the fall in utilization). For the period since 1980 there is, once again, little difference between the two methods. TFP1 is slightly higher than either of the other measures but this could easily be because the other measures are for earlier periods (ending in 1985 and 1987).

6.2 MEASURING FULL-CAPACITY OUTPUT

In figure 6.4 are three different estimates of full-capacity output. The reason three different estimates are given is to illustrate some of the problems involved in such a seemingly simple concept. The first estimate, shown in figure 6.4(a), is the simplest. It is based on the assumption that full-capacity GDP can be obtained from actual GDP using the unemployment rate: by dividing actual GDP by the level of

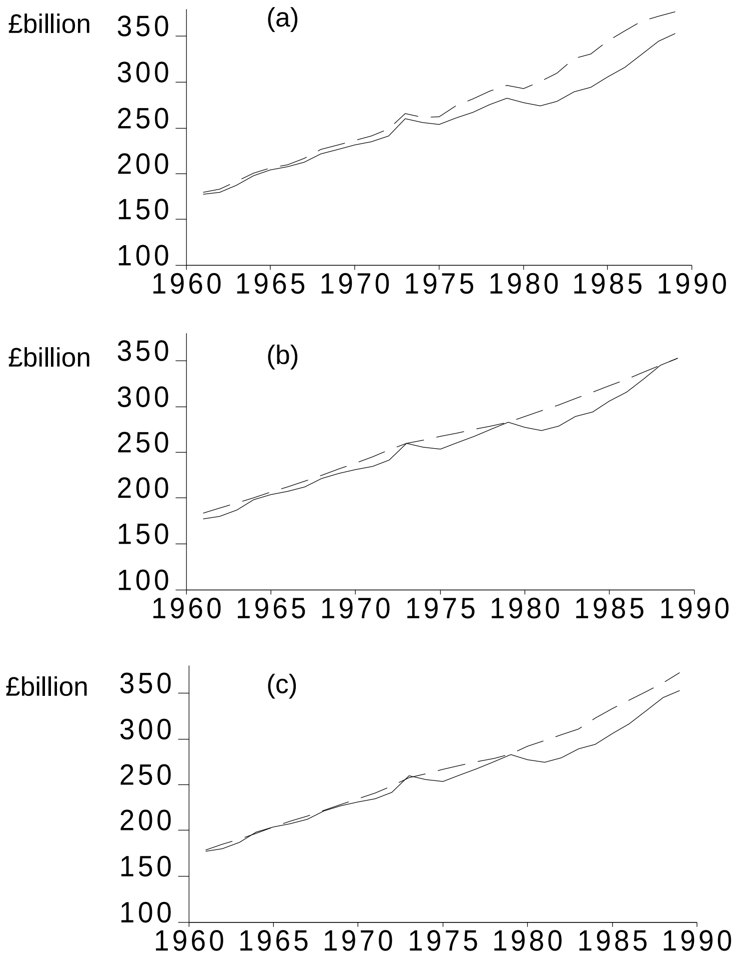

Figure 6.4 Estimates of full-capacity GDP, 1961-89

Source: see appendix. Solid lines give actual output

employment and multiplying by the labour force. There are, however, enormous problems with this method: it assumes that the number of additional people who could be employed is the same as the number of those registered as unemployed and that each of them would produce the same output, on average, as those already employed. We would not expect either of these to be true. There is also the problem that potential output may be limited by the available capital stock (by physical productive capacity). If this is the case, 'full-employment output', in the

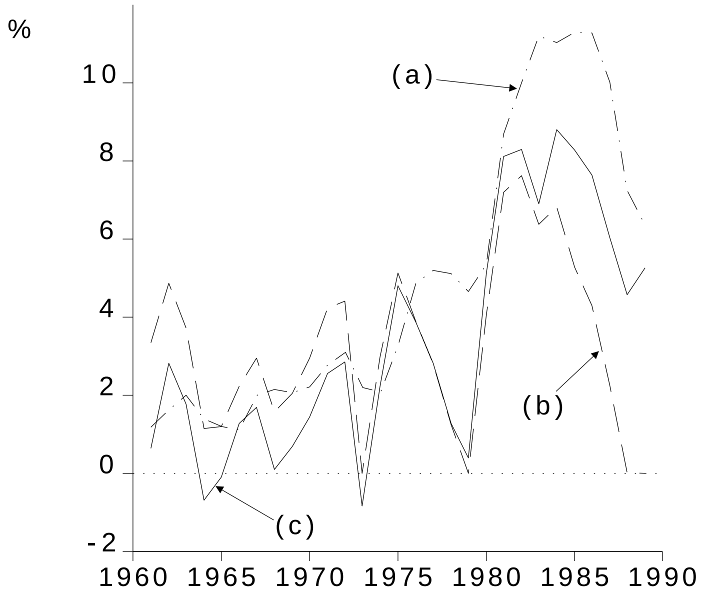

Figure 6.5 Estimates of the output gap, 1961-89

Source: Percentage differences between measures of full-capacity output and actual output shown in figure 6.4.

sense of the output that would be produced if the labour force were utilized as fully as possible given existing resources, may be very different from the level shown in figure 6.4(a).

A second way of estimating full-capacity output is to pick out certain years in which the economy is known to have been operating at roughly full capacity and to assume that full capacity output grew at a constant rate between this years. This is the basis for the estimates of full-capacity output given in figure 6.4(b). In calculating this the years 1950, 1955, 1964-5, 1973, 1979 and 1989 were taken to be years of full-capacity output. In such years firms complain of labour shortages, prices rise more rapidly and so on. For the years before 1973 such a method presents few problems, for the evidence is consistent with the hypothesis that full-capacity output grew at a constant rate from the early 1950s to 1973: a single trend links all these years of full capacity. After 1973, however, the problems become greater, for there is evidence that the long run growth rate has changed. This means that, if we are estimating growth rates by drawing lines between cyclical peaks, each cycle (1973-9 and 1979-89) having its own growth rate, it becomes difficult to extrapolate beyond the latest peak. The advantage of such a measure is that it takes account of important evidence which is neglected by the other two methods.

The final panel in figure 6.4 shows an alternative measure of full-capacity output, this time based on the equation that was estimated to calculate the growth rate of total-factor productivity. The method is to calculate what output would have been given actual capital stock and the estimated growth rate of total factor productivity, if employment had been equal to the total labour force (see box 6.1 for more detail). As with estimate (a), the gap between actual and full-capacity output (shown in figure 6.5) depends on the unemployment rate, but there are two differences in the way this is done. The first is that the measure of full capacity is based on the *trend* level of output (with breaks in the trend in 1973 and 1979, as in figure 6.1), not the actual level. The second is that a 1 per cent rise in employment is assumed to produce a rise in output of only two-thirds of 1 per cent: the elasticity of output with respect to labour is assumed to equal two-thirds.

For the period before 1979, this estimate looks similar to estimate (b) above. This is despite its being derived in a completely different way: in deriving estimate (c) we did not make any assumption about which years were ones of full employment. After about 1983, however, the two measures diverge, estimate (c) looking more like estimate (a), failing to show a return to full capacity by 1989 (though the gap between actual and potential output is, for the reason explained above) much smaller than the gap in case (a). This is particularly clear in figure 6.5.

There are two ways to interpret this difference. One is to believe estimate (c) and argue that, despite all appearances to the contrary, output was still significantly below its maximum in 1989. The other is to accept estimate (c) and to argue that estimate (b) is wrong for at least one of a number of reasons. (1) One reason is that, for reasons discussed above, the capital stock has grown more slowly than the statistics indicate: if the capital stock were lower, estimate (c) would be lower too. (2) Another possibility is that the relationship between employment and output changed during the 1980s: that when output started to expand, firms managed to raise productivity, not increasing employment by as much as they would have done in earlier periods. Such a view is consistent with the failure of employment to fall more rapidly after 1982, despite the rapid growth in output, though with a smaller gap between output and full-capacity output. (3) Finally, it could be argued, as many economists have, that the theoretical basis for the use of an aggregate production function is completely untenable, and that production functions such as the ones used here are not worth the paper they are printed on.

It should now be clear that the concept of full-employment, full-capacity, or potential output is fraught with difficulty. Any estimate must be treated with great caution. Of the three measures proposed here, the second seems less likely to be misleading than either of the other two. It is very clearly based on the assumption that certain years were ones of full-capacity output, and if these benchmarks are disputed, it is clear that our estimate of potential output has to be questioned. The theoretical and statistical basis for the last estimate is insufficiently strong for us to disregard the evidence about 1989 being a year when aggregate demand had raised output as high as it could.

6.3 THE PRODUCTIVITY SLOWDOWN OF THE 1970s

The international perspective

During the 1970s there was a significant slowdown in the rate of productivity growth, both in manufacturing and in the economy as a whole, this slowdown usually being dated from around 1973. Both labour productivity and total factor productivity were affected. Before we consider the causes of this slowdown it is important to note that it was a worldwide phenomenon, as is shown by table 6.3. The USA in particular experienced a productivity slowdown very similar to that of the UK. We would, therefore, not expect to find an explanation of the slowdown that made sense solely in Britain.

Table 6.3 International productivity growth rates

	1960-68	1968-73	1973-79	1979-85
UK	3.4	3.8	0.6	3.7
USA	3.2	3.8	0.9	3.5
Japan	9.0	10.4	5.0	6.3
Germany	4.7	4.5	3.1	2.4
France	6.8	5.8	3.9	n.a.

Source: Meen (1988), p. xxvi. Figures are annual percentage growth rates of value added per person in manufacturing.

Several explanations have been proposed for this widespread productivity slowdown. Of the three explanations considered here the first is relevant to the developed world as a whole and the other two apply to Europe. None is specific to the UK.

Energy prices

The first and most obvious explanation is to link the productivity slowdown to the rise in energy prices which took place during and after 1973. There are a number of ways in which this could have worked: the substitution of labour for energy; the need to switch production to export or import-substituting products; capital having to be scrapped sooner; or the result of a reduction in aggregate demand.

- As the price of energy rises firms substitute labour for energy. If capital and energy are complements they will also substitute labour for capital. This will raise labour per unit of output, and lower productivity.

- The oil price rise of 1973-4 meant that the UK, like most developed economies, was faced with large rise in the cost of its oil imports, which caused a large balance of payments deficit (see chapter 5). Borrowing was only a short-term solution, so it became necessary to increase exports or reduce imports. This necessitated a switch in production away from domestic demand to exports. Such a switch in demand would be costly and the result would be lower productivity.

- Rising energy prices may cause capital goods with a particularly high energy-usage to be either scrapped or under-utilized. Plant which is more energy-efficient will be more fully utilized, but the limited supply of such plant means that this cannot compensate for the under-utilization or scrapping of less energy-efficient plant.

- The oil shock, because of the way governments responded to it, produced a large ‘Keynesian’ demand shock, lowering output. Lower output generally causes lower productivity: labour tends to be hoarded (affecting labour productivity), and the incentive to innovate is reduced.

Of these explanations the one that seems most persuasive is the scrapping of energy-inefficient plant. Extensive substitution of other inputs for energy (the first explanation) simply did not occur. Some

Table 6.4 Energy prices and energy-output ratios

	UK		US	
	E/Y	P_E/P_Y	E/Y	P_E/P_Y
1973-81	- 3.4%	+46%	-13%	+220%
OPEC I	0%	27%	0%	82%
OPEC II	- 2.8%	16%	-12%	76%

OPEC I and II denote the oil price rises of 1973 and 1979 respectively.

Source: Ernst R. Berndt and David O. Wood 'Energy price shocks and the productivity slowdown in US and UK manufacturing,' *Oxford Review of Economic Policy* 2(3), 1986, pp. 1-31.

evidence is shown in table 6.4. During OPEC I the energy-output ratio did not change, either for the UK or the US, despite substantial rises in the price of energy relative to the price of output. The explanation must be that switching to more energy-efficient techniques requires new investment and that it is therefore a slow process. Furthermore, because energy use accounts for such a small proportion of costs, it is hard to see how substitution of other inputs for energy could account for such a large fall in productivity growth. The argument about energy and capital being complements, which might explain a large effect, is not supported by empirical evidence. OPEC I was unexpected, energy prices having fallen steadily for 50 years, which meant that firms were not in a position to economize on their use of energy. The option of simply reducing utilization rates for the the least energy-efficient vintages of plant, on the other hand, was something that could happen immediately.

An implication of this view is that what happened during the 1970s was, at least in part, a fall in the effective inputs of capital and, to a lesser extent, labour, rather than a fall in total factor productivity. This is not inconsistent with the estimates presented in table 6.2 which suggest that part of the slowdown could be accounted for by a rise in scrapping beyond that allowed for in the official capital stock figures.

The ending of circumstances favourable to growth

During the 1960s circumstances were, for a number of reasons, particularly favourable to growth in Europe, a situation which changed dramatically during the 1970s. During the 1970s resources became more scarce, concern for the environment increased, scope for technological catching-up with the US was reduced, and export-led growth became more difficult.

- Supplies of resources, including not simply energy (discussed above), but also other natural resources and skilled manpower, became less elastic. This, together with over-ambitious attempts at fine-tuning the economy, created inflationary problems. The need to stop accelerating inflation combined with the reluctance of workers to accept a lower growth rate of real wages led to lower profitability and higher interest rates. Investment, and hence the rate of technical progress, were thus reduced.

- There emerged a greater concern for 'qualitative' rather than simply 'quantitative' growth, with greater concern for the environment than was shown during the 1960s. This made business more uncertain and more pessimistic. Demands for greater protection of the environment (for example, pollution controls) reduced productivity.

- During the 1960s there was still significant scope for Europe to raise productivity by catching up with the United States. By the 1970s many of these opportunities for technological catching-up were exhausted.

- Many countries in Europe, together with Japan, experienced a period of export-led growth during the 1960s, this being made possible, at least in part, by the over-valuation of the US dollar. This came to an end in the 1970s.

These factors could account for the slowdown in growth throughout Europe. The first two could also apply to the United States.

Eurosclerosis

A slightly different argument to the one just presented (though the two are not at all inconsistent) is what has been termed 'Eurosclerosis'. The idea underlying it is that the development of the welfare state inhibited the economic adjustments necessary for rapid growth. There are several ways in which this could work. Generous unemployment benefits reduce the incentives for unemployed workers to find jobs and for those in work to moderate their wage demands. Restrictions on hiring and firing inhibit labour mobility and may reduce employment. The power of trade unions is increased. Social insurance charges raise costs relative to take-home pay. Protection and industrial policy inhibit industrial change.

This hypothesis has much to recommend it but there are serious difficulties with it. (1) It provides no explanation of why the slowdown should have come in the early 1970s rather than at any other time. The explanation that has been given is that as long as there were no serious problems, the precarious nature of the European economies' expansion was not revealed. Only when the world become less friendly did these problems become apparent. (2) It cannot be claimed that there has been an increase in government intervention in the 1980s. Slow growth continued in Europe, if not in Britain, for much of the 1980s. (3) The advent of the single European market in 1992 has produced a dramatic change in outlook, with significant growth being expected. If Euro-sclerosis was the fundamental problem its proponents portray it as being, it is hard to see how such a rapid transformation could have come about.

6.4 UK PRODUCTIVITY PERFORMANCE SINCE 1979

The recession of 1980-1

The second oil price rise, in 1979, produced a recession throughout the developed world. For most countries it can be seen as part of the longer period of low productivity growth which started in 1973. In the UK, however, the recession of 1980-1 was exceptionally severe, mainly because of the sudden introduction of a very tight monetary policy. As table 6.2 shows, productivity fell dramatically (the trends in output per head in manufacturing, which are not the same as those in figure 6.1, are shown in figure 6.3).

Output per head in manufacturing, the sector hardest hit by the recession, fell dramatically (see table 6.2). Output and employment fell sharply and, because there was no significant change in the capital stock, the capital-labour ratio rose (see figure 6.6). The result was that total factor productivity, calculated using the simple formula discussed above, fell by 8.1 per cent. What was happening, of course, was that capacity utilization fell sharply, this fall accounting for most of the fall in productivity. When we allow for changes in utilization, the fall in total factor productivity comes down to just under 2 per cent. This is large for total factor productivity but is much smaller than the change attributable to the fall in utilization rates.

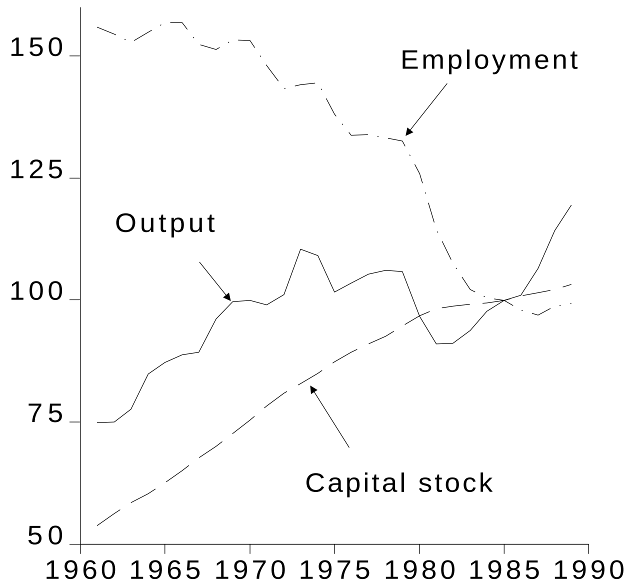

Figure 6.6 Output, employment and capital in manufacturing, 1961-89

Source: Economic Trends and *United Kingdom National Accounts*. Note that capital stock is the stock at the beginning of the year.

One consequence of this enormous fall in utilization was a large increase in scrapping (scrapping can be seen as an extreme case of low utilization) and a fall in the average age of capital equipment. Though there is some evidence which suggests that this may not have been the case, it is natural to assume that it was the least efficient capital that was scrapped. This would have raised the productivity of the capital stock that remained and may account for some of the increase in productivity which has since taken place. The 1980-1 recession has thus been called 'the great shake-out' in UK manufacturing.

Recovery since 1981

Since 1981 there has been a significant improvement in productivity growth, with rates exceeding those observed before 1973 (see table 6.2). This is in sharp contrast to the rest of Europe where productivity growth rates have, on the whole, remained similar to those experienced during the 1970s (see table 6.3 — note that the UK's relative performance would improve if 1980 or 1981 rather than 1979 were taken as the dividing line).

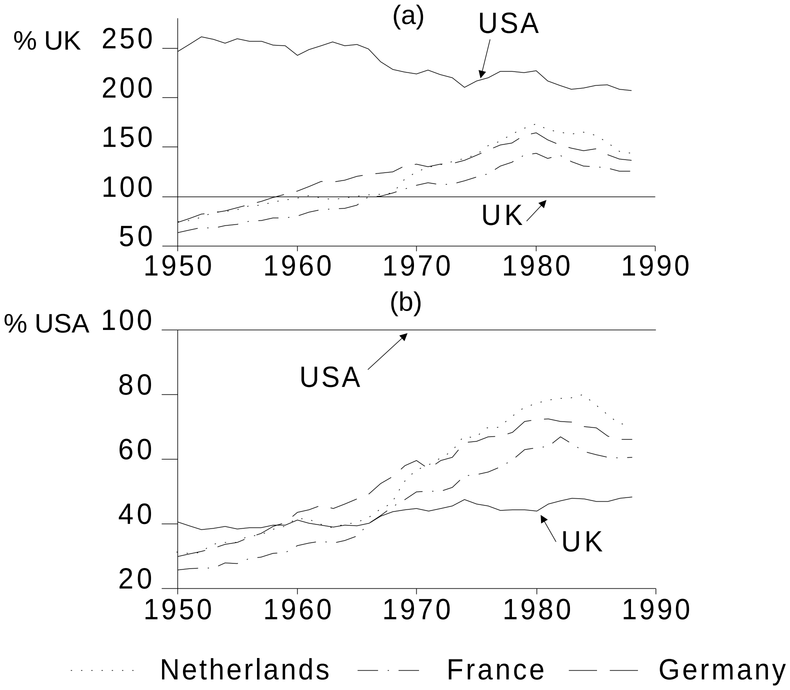

Figure 6.7 Gross value added per person hour, 1950-88

Source: B. van Ark 'Comparative levels of manufacturing productivity in postwar Europe' *Oxford Bulletin of Economics and Statistics*, 52(4), Special Issue, pp. 343-73.

UK productivity levels are compared with productivity levels in the USA and three European countries in figure 6.7. This shows that UK performance was worse than that of France, Germany and the Netherlands from 1950 to 1980, but that after 1980 the UK's relative decline ceased and the UK began to catch up quite rapidly, as is shown in part (a) of figure 6.7. Part (b), however, which shows productivity levels as percentages of US levels, suggests that this catching-up is as much due to European growth being low as to UK growth rates being high.

Several reasons have been put forward to account for this improvement: that it is simply a normal, cyclical phenomenon; that it is because of the scrapping of inefficient plant during the 1980-1 recession; and that it is because of the government's supply-side policies.

- The first explanation of the recovery since 1980 is that it is a cyclical phenomenon. The 1980-1 recession was very deep, the strength of the post-1981 boom merely reflecting the depth of the recession. Manufacturing output is still below its 1979 peak. One of the problems with taking 1980 as a starting point, which is essential if we believe productivity performance did change then, is that our estimates include the effects of a strong cyclical recovery.

- During the 1980-1 recession, an enormous amount of capital was scrapped. It is natural to assume that plant which is scrapped is of less than average productivity. Though the capital stock would have been reduced by high scrapping, it would have become more modern, permitting a higher growth rate of productivity.

- Finally, we have the 'Thatcher effect', with factors such as improved industrial relations, reductions in union power, privatization and deregulation, reductions in direct tax rates and so on.

It is still too early to assess these different explanations. Cyclical factors and the 'shedding of the sub-average' could certainly account for a lot, but the improvement in productivity performance has proved quite long-lasting. Furthermore, if the recession of 1980-1 did result in a large shake-out of old plant it is likely that capital is now increasing *faster* than the figures suggest (capital which is being recorded as being scrapped now was in fact scrapped during 1980-1). This would make total factor productivity growth appear faster than it is. If capital is growing more rapidly the prospects for rapid growth continuing are better. The test of whether the improvement in UK productivity performance is permanent or not is likely to come with the next recession.

FURTHER READING

One of the classic papers on the productivity slowdown is M. N. Baily 'Productivity and the services of capital and labour', *Brookings Papers on Economic Activity*, 1981(1), pp. 1-66, which argues that much of the slowdown in the USA can be explained in terms of a reduction in the effective supply of factor services. Possible errors in the measurement of the UK capital stock are investigated by S. Wadhwani and M. Wall 'The UK capital stock — new estimates of premature scrapping,' *Oxford Review of Economic Policy* 2(3), 1986, pp. 44-55. The role of energy costs in causing the slowdown is analysed in Ernst R. Berndt and David O. Wood 'Energy price shocks and the productivity slowdown in US and UK manufacturing,' *Oxford Review of Economic Policy* 2(3), 1986, pp. 1-31. A wider range of issues is examined in the *Economic Journal* symposium comprising: A. Lindbeck 'The recent slowdown of productivity growth', *Economic Journal* 93, 1983, pp. 13-34; H. Giersch and F. Wolter 'Towards an explanation of the productivity slowdown: an acceleration-deceleration hypothesis', *ibid*., pp. 35-55; E. F. Denison 'The interruption of productivity growth in the United States', *ibid*., pp. 56-77; D. J. Morris and S. J. Prais 'The recent slowdown in productivity growth: comments on the papers', *ibid*., pp. 78-88.

An important reference on UK productivity growth rates during the 1980s is J. Muellbauer 'Productivity and competitiveness in British manufacturing,' *Oxford Review of Economic Policy* 2(3), 1986, pp. 1-25, where data on overtime hours worked are used in an attempt to eliminate the effects of changes in capacity utilization from estimates of total factor productivity growth in manufacturing. A favourable verdict on recent productivity performance also emerges in Bart van Ark 'Comparative levels of manufacturing productivity in postwar Europe', *Oxford Bulletin of Economics and Statistics* 52(4), 1990, pp. 343-74, where British performance is viewed alongside that of Germany, France the Netherlands and the USA. These comparisons are notable because they are based on appropriate purchasing power parity data. A slightly older comparative study is A. Steven Englander and Axel Mittelstädt 'Total factor productivity: macroeconomic and structural aspects of the slowdown,' *OECD Economic Studies* 10, 1988, pp. 7-56. A more pessimistic view is found by emphasising GDP per capita rather than manufacturing productivity, as is done by Charles Feinstein and Robin Matthews 'The growth of output and productivity in the UK: the 1980s as a phase of the post-war period', *National Institute Economic Review*, 133, August 1990, pp. 78-90. International comparisons of productivity levels can be found in many places: Bart van Ark 'Comparative levels of labour productivity in Dutch and British manufacturing,' *National*

Institute Economic Review, 131, February 1990, pp. 71-85; Bart van Ark 'Manufacturing productivity levels in France and the United Kingdom', *National Institute Economic Review*, 133, August 1990, pp. 62-77. The role of educational differences in explaining productivity levels in different countries is explored in a series of papers: A. Daly, D. Hitchens and K. Wagner 'Productivity, machinery and skills in a sample of British and German manufacturing plants: results of a pilot inquiry,' *National Institute Economic Review* 111, 1985, pp. 48-61; S. Prais and K. Wagner 'Productivity and management: the training of foremen in Britain and Germany,' *National Institute Economic Review* 123, 1988, pp. 34-47; H. Steedman 'Vocational training in Britain: mechanical and electrical craftsmen,' *National Institute Economic Review* 126, 1988, pp. 57-70; H. Steedman and K. Wagner 'A second look at productivity, machinery and skills in Britain and Germany,' *National Institute Economic Review* 122, 1987, pp. 84-96.

Cross-section evidence, analysing productivity differences across industries, is provided in R. E. Caves 'Productivity differences among industries', in R. E. Caves and L. B. Krause *Britain's Economic Performance* (Washington DC: Brookings Institution, 1980); S. Prais *Productivity and Industrial Structure* (Cambridge: Cambridge University Press, 1981). Nicholas Oulton 'Labour productivity in UK manufacturing in the 1970s and in the 1980s', *National Institute Economic Review*, 132, May 1990, pp. 71-91. Labour relations are examined as a cause of productivity differences in E. Batstone 'Labour and productivity', *Oxford Review of Economic Policy* 2(3), 1986, pp. 32-43; and William Brown and Sushil Wadwhani 'The economic effects of industrial relations legislation since 1979', *National Institute Economic Review*, 131, February 1990, pp. 57-70. See also Nicholas Oulton 'Plant closures and the productivity miracle in manufacturing,' *National Institute Economic Review* 121, 1987, pp. 53-9; and Nicholas Oulton 'Productivity growth in manufacturing, 1963-85: the role of new investment and scrapping', *National Institute Economic Review*, 127, 1989, pp. 64-75.

Estimates of productive capacity obtained using a CES production function (more general than the one used here) are provided in R. Torres and J. P. Martin 'Measuring potential output in the seven major OECD countries', *OECD Economic Studies* 14, Spring 1990, pp. 127-49. The importance of raising productive capacity is investigated in C. Bean 'Capital shortages and persistent unemployment', *Economic Policy* 8, 1989, pp. 1-53; and Franco Modigliani *et. al*. 'Reducing unemployment in Europe: the role of capital formation,' in Richard Layard and Lars Calmfors (eds.) *The Fight against Unemployment* (Cambridge, Mass. and London: MIT Press, 1987).