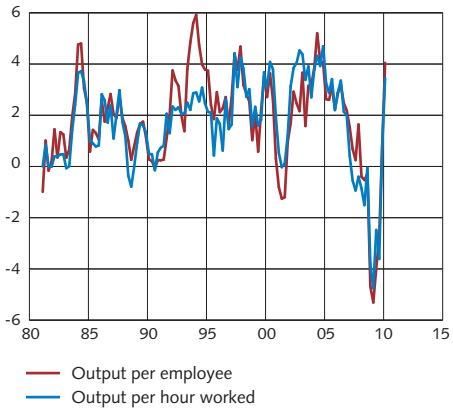
What form does the recovery of productivity usually take?

Over the last three years, labour productivity, measured as output per hour worked or output per employee, has been very low. At times during this period productivity fell to an exceptional degree in an historical perspective. This article discusses some of the conceivable reasons why these changes in the growth of productivity have occurred. Periods in which the growth of productivity has been weak and events following these periods are studied using data for several OECD countries. Such an analysis may be useful for, among other things, the Riksbank's assessments of the development of GDP, the number of hours worked and the number of employed over the next few years.

Figure B4. Two measures of labour productivity in Sweden
Annual percentage change



Sources: Statistics Sweden and the Riksbank

The development of productivity significant for monetary policy

Productivity, that is the quantity of goods and services produced in relation to the input of production factors, can be measured in many different ways. A frequently used measure is labour productivity, which is output per work input measured in terms of the number of hours worked or the number of employees.[20] Figure B4 shows how these two measures of labour productivity have developed in Sweden. According to the figure, the series have covaried relatively well.[21]

The economic literature mentions several different factors that may explain why variations in the development of productivity arise in an economy, for example changes in capital investments, the degree of technological development, various structural factors such as policies, legislation and so on, but also variations in resource utilisation.[22] Productivity growth has consequences for monetary policy because it affects the development of companies' costs, which in turn has consequences for companies' pricing and thus also for the development of inflation in the economy. Changes in productivity growth also have an impact on the development of the real economy, which creates a further link to monetary policy.

Major variations in the development of productivity in recent years

The growth of labour productivity has fluctuated considerably over time (see Figure B4). In the period 2002-2006, labour productivity (measured as output per hour worked) in the Swedish economy increased by over 3.3 per cent per year, while during the period 2007-2009 it fell by 1.5 per cent per year. The development of labour productivity in late 2008 and the first three quarters of 2009 is exceptional in an historical perspective.

20 Another common measures of productivity is total factor productivity, sometimes referred to as multifactor productivity, in which output is related to the input of a combination of several production factors.

21 In one period in particular, however, there is a relatively large difference in the development of the two productivity measures. In the early 1990s, the growth of output per employee was on average higher than the growth of output per hour worked. This can partly be explained by the fact that the number of absent employees fell substantially, which contributed to an increase in the average number of hours worked per employee. Another conceivable explanation is that the number of overtime hours worked at the companies increased.

22 See for example K. Stiroh, "What Drives Productivity Growth?", Economic Policy Review, March 2001, Federal Reserve Bank of New York; the article "Driving forces behind productivity" in Monetary Policy Report 2007:2, Sveriges Riksbank and B. Andersson et al., "Understanding productivity growth", Economic Commentary no. 1 2009, Sveriges Riksbank.

A factor that may have contributed to the higher growth of productivity in the period 2002-2006 relates to the major investments that increased the percentage of ICT (information and communications technology) capital in the Swedish economy. Technological progress in the telecom industry also probably contributed to the higher growth of productivity in this period. Other structural factors, for example deregulation and internationalisation, increased competition in the business sector and thus the incentive to improve the efficiency of production processes, which is probably also a factor that affected the higher growth of productivity in this period.[23]

Productivity is also strongly affected by the business cycle. In the manufacturing industry in particular, there is a clear covariation between the growth of productivity and the business cycle. Productivity usually increases rapidly in the early stages of an upturn. However, when the economy has experienced high growth for a long period of time it is normal that productivity growth slows down. In the period 2006-2007, resource utilisation increased rapidly to higher levels than normal. It is likely that this contributed to the decline in productivity growth during this period. Parts of the manufacturing industry were working at almost full capacity in this period and could therefore not increase production more than marginally in the short term. At the same time, there was a substantial increase in employment in this period and new groups of inexperienced labour entered the labour market. The training of this new labour and an increase in administration and other auxiliary services as the companies expanded may also have contributed to dampening the development of productivity. At some points in the period 2008-2009, it is likely that the very low level of economic activity contributed to negative productivity growth. When demand declines in a downturn, productivity growth normally falls more rapidly than the number of hours worked and the number of employed, which means that productivity slows down or even decreases. There are several reasons for this. The companies may, for example, believe that the decline in demand is only temporary and therefore choose to retain their existing personnel. A high personnel turnover is also expensive for the companies. Laying off personnel and perhaps at a later stage recruiting and training new personnel is costly.[24]

85 periods of weak productivity have been identified in a sample of OECD countries

An important question is how productivity growth will develop in the period ahead given the very weak development of productivity in recent years. It is therefore interesting to study how productivity growth has previously developed following periods of weak or declining productivity. The OECD's productivity database has been used for this purpose.[25]

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23 See for example the articles "Higher trend productivity growth", The Swedish Economy, March 2004, the National Institute of Economic Research and "How persistent is the recent rise in productivity?" Inflation Report 2004:1, Sveriges Riksbank.

24 See for example the article "Negative productivity growth: Causes and implications for the period ahead", The Swedish Economy, August 2008, National Institute of Economic Research.

25 See the OECD Productivity Database (http://www.oecd.org).

Table B3. A comparison of periods of weak labour productivity development (output per employee) 1970-2009
Number of countries, per cent, number of quarters, annual percentage change

Economic crisis/period	OPEC I (1973-1974)	1977-1978	OPEC II (1979-1980)	1984-1986	1990s crisis (1989-1991)	1994-1996	Asia crisis (1997-1998)	ICT crisis (2000-2001)	Financial crisis(2006-)	Average
No. of OECD countries	12	3	12	8	12	8	5	11	14	9
Percentage of studied OECD countries	85.7	21.4	85.7	57.1	85.7	57.1	35.7	78.6	100.0	64.3
Average duration (quarters)	6.7	5.7	8.6	7.6	10.3	7.8	6.0	10.0	8.9	8.4
Average productivity growth	-0.81	-0.29	-0.12	-0.43	0.19	0.57	-0.26	0.23	-1.06	-0.26
Subsequent periods										
Average productivity grow, Q1-Q4	3.37	3.28	2.85	3.04	2.51	2.07	3.83	2.11	---	2.79
Average productivity growth, Q5-Q8	1.63	0.23	2.65	2.05	2.27	1.45	1.81	1.77	---	1.91

Note. The starting point for the relevant periods with weak productivity occurs in one of the quarters of the years listed in the first line of the table. Productivity growth at the starting point of a period with weak productivity must be under 1.5 per cent as an annual percentage change Thereafter, at least two quarters with a productivity growth of less than 1.5 per cent are required for the period to be counted as a period with weak productivity. When productivity growth is higher than 1.5 per cent as an annual percentage change, the period with weak productivity is considered to be over. When the figures in the second line of the table are totalled (not the average) the figure 85 is arrived at, that is the total number of periods with weak productivity that are starting points for the calculations in the table.

Sources: The OECD and the Riksbank

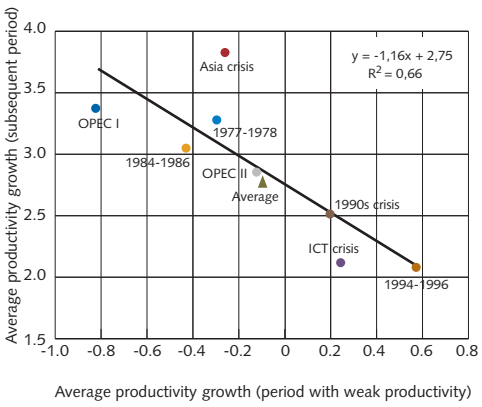
This database contains official statistics for labour productivity (output per employee) for the OECD countries. 14 OECD countries have been selected for the study. Table B3 shows a comparison of periods with low or negative productivity growth since 1970. The selection criterion for a period being counted as a period in which the development of productivity is weak is that productivity growth must be lower than 1.5 per cent as an annual percentage change for at least three consecutive quarters. Since 1970, 9 periods have been identified in which productivity was weak in large or small groups of countries. These 9 periods consist of a total of 85 periods with weak productivity for the different OECD countries.[26]

Periods with weak productivity often coincide with economic crises

The compilation shows that periods with weak productivity often coincide with recessions or economic crises, which can be clearly seen in the table as more countries are affected during such periods. The decline in productivity during the latest financial crisis, when all of the countries in the sample were affected, is the most widespread since 1970. The closest

26 In a couple of cases during long continuous periods with weak productivity, productivity has been allowed to be higher than 1.5 per cent during a single quarter in terms of annual percentage growth. The selection criterion has been chosen on the basis of what has been assessed as a reasonable level to be counted as a period with weak productivity growth. It should perhaps be pointed out in this context that the choice of selection criterion is subjective. As the series for productivity growth are rather volatile, the number of periods with weak productivity falls quite a lot with a tighter selection criterion. With such a criterion, for example that productivity growth must be lower than 0 per cent annual percentage growth for at least three consecutive quarters, 32 periods with falling productivity growth as an annual percentage change can be identified in the sample. The results also change somewhat; the average length is shorter, average productivity growth during the periods with falling productivity is more negative and the recovery after these periods is weaker.

Figure B5. The link between average productivity growth during a period with weak productivity and average productivity growth during the year following such a period
Annual percentage change



Note. The various points in the figure relate to different averages of a total of 71 periods with weak productivity in the OECD countries. 14 periods are thus missing in the figure compared to Table B3 (85-71 = 14), which is due to the fact that productivity outcomes for the subsequent periods are not available for the latest financial crisis (see Table B3). R^2 is the equation's coefficient of determination; that is 66 per cent of the variations in average productivity growth during the subsequent period (the year after) can be explained in terms of the average productivity growth during the period with weak productivity.

Source: The Riksbank

in terms of extent among the studied OECD countries are the first oil crisis (OPEC I), the second oil crisis (OPEC II) and the crisis of the 1990s.

Table B3 also presents the average duration (measured in quarters) of periods with weak productivity for the different groups of OECD countries. In the crisis in the 1990s and in the ICT crisis in the early 2000s, the average period with low productivity was approximately 2.5 years; these are the two longest periods with weak productivity in the compilation. However, the average duration during the latest financial crisis may be somewhat longer than the almost nine quarters presented in the table, as the latest outcomes in the database for labour productivity in the OECD countries are from the fourth quarter of 2009.

Productivity normally recovers rapidly after a downturn

During the latest financial crisis, average productivity growth was approximately -1.1 per cent as an annual percentage change, which is the lowest compared with the other periods in the table. The closest is the first oil crisis (OPEC I), in which the average fall in productivity was just over 0.8 per cent as an annual percentage change. During the periods with weak productivity, productivity growth has averaged -0.3 per cent, which can be compared to an average of over 1.8 per cent as an annual percentage change for all of the observations in the sample.

Table B3 also shows how productivity has developed following a period of weak productivity. Productivity growth recovers after all such periods. In all cases, the recovery has also been stronger during the first year than in the second year following a period with weak productivity. Average productivity growth during the recovery periods is 2.8 percent as an annual percentage change for the first year and 1.9 per cent for the second year.

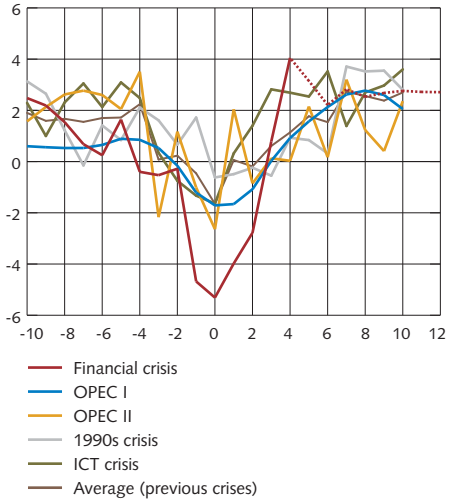
There is also a strong negative link between average productivity growth during a period with weak productivity and average productivity growth during the year following such a period (see Figure B5). This link shows that the weaker the development of productivity is during a period, the higher productivity growth is during the subsequent period. Such a link is not particularly surprising. This is because during recessions or periods with low resource utilisation, which often coincide with periods with weak productivity, there are a lot of unutilised resources in the economy. In the early stages of an upturn, when demand increases and companies begin to use these unutilised resources in production again, output usually increases quickly and this contributes to a more rapid increase in productivity growth than normal.

The Riksbank believes there will be a relatively strong recovery in productivity in the short term following the latest downturn

In recent years, labour productivity in Sweden has fallen over a long continuous period. Studies of how labour productivity has developed previously following such a period may be one of several bases for forecasting. Such studies can indicate the form that a slowdown or

decline in labour productivity usually takes, as well as the normal course of development during the subsequent period. Figure B6 shows the development of the growth of labour productivity (output per employee) during the latest financial crisis compared with four other periods with weak labour productivity in Sweden. The figure shows that the recent decline in labour productivity has been deeper and that the negative growth figures have persisted during a longer continuous period compared to the previous productivity downturns in Sweden.[27] This may indicate that the recovery of productivity will be particularly strong this year. Productivity growth was also strong during the first quarter of this year. Figure B5 also shows that the weaker productivity is during a period, the stronger the recovery tends to be. Given this background, the assessment is that the recovery of productivity following the productivity falls of recent years will be stronger in the short term than in the case of a typical (average) fall in productivity (see Figure B6). Thereafter, the assessment is that productivity will develop roughly in line with development during a typical recovery period.

Figure B6. A comparison of five periods with weak labour productivity
Annual percentage change



Note. The horizontal axis shows the number of quarters before and after the quarter with the lower productivity growth. The broken line represents the Riksbank's forecast.

Sources: OECD and the Riksbank

27 This becomes even clearer if labour productivity is measured in terms of output per hour worked.