

Trends in euro area gross fixed capital formation

This article reviews the broad trends in euro area gross fixed capital formation (henceforth also referred to as “investment”) over the past two decades. Understanding these trends and their main determinants is important for the assessment of shorter-term developments, such as the rapid capital accumulation at the end of the 1990s and the protracted decline in 2001 and 2002.

Starting from the mid-1980s, there have been two long-term cycles in euro area gross fixed capital formation, which peaked around 1990 and 2000 respectively. The investment dynamics over these two cycles to a large extent reflect movements in growth expectations. Financial conditions may have played a role at specific junctures. In addition to the impulses from these macroeconomic determinants, special factors associated with German unification, government investment policy and advances in information technology also contributed to the dynamics of capital formation. These factors had an impact mainly on specific types of capital formation and thus help to explain changes in the composition of overall investment growth. While the impact of German unification and government investment policy was most pronounced in construction investment, the impact of technological advances was seen largely in network industries.

I Introduction

Fixed capital formation is a key determinant of both aggregate demand and supply. Understanding its dynamics is thus of great importance for the analysis of macroeconomic developments and the conduct of monetary policy. First, investment is relatively volatile and, while it accounts for only around one-fifth of GDP in the euro area, its developments can thus have a strong influence on the pattern of growth in aggregate demand. Second, net investment is a measure of the change in the capital stock and, thus, a key factor behind the rate of growth of potential output and the speed at which the economy can expand without inducing inflationary pressures.

In order to further understand the dynamics of fixed capital formation, this article reviews its broad trends since the 1980s. The starting point for the analysis is the mid-1980s, when investment began to recover after the retrenchment that followed the second oil shock. Understanding the broad trends in investment helps to put into perspective shorter-term developments, such as the rapid increase in real investment at the end of the 1990s and the protracted decline in 2001 and 2002. In particular, it can help to address the question of the extent to which more recent developments reflect the occurrence and unwinding of specific shocks.

This article follows up on previous analysis of euro area investment in the ECB's Monthly Bulletin (see Box 7 entitled “Factors behind the weakness in investment by type of product” in the March 2003 issue). Analysis of euro area gross fixed capital formation is hampered by the fact that detailed data on investment and some of its determinants are not always available for the euro area as a whole or for sufficiently long periods. The data used in this article are partly official euro area-wide data and partly ECB estimates based on data available for individual countries.

The analysis proceeds as follows. Section 2 briefly describes the broad trends in aggregate euro area investment as reflected in the two cycles starting around the mid-1980s and 1990s respectively. Section 3 discusses some of the main macroeconomic determinants, such as aggregate demand and expectations thereof, that typically play an important role in explaining these trends. At the same time, special factors, such as German unification and the advances in information technology, had a specific impact on individual types of capital formation and thus help to explain the changes in the composition of overall investment growth. Against this backdrop, Section 4 considers the dynamics of investment by type of sectoral activity and relates them to the specific factors at play in the individual investment cycles. Section 5 concludes.

2 Overview of investment dynamics in the euro area since the 1980s

In the past two decades, aggregate real investment in the euro area has grown by 2¼% per annum on average, approximately the same rate as real GDP. However, its volatility, as measured by the standard deviation of the quarterly year-on-year growth rate, was around three times that of real GDP. Investment growth tended to be particularly strong when GDP growth was substantially above its medium-term trend and particularly weak when GDP growth was very low or negative. This “excess” volatility during particular phases of the economic cycle implies that marked movements in the ratio of aggregate real investment to real GDP emerged only over the full course of the cycle (see Chart 1).

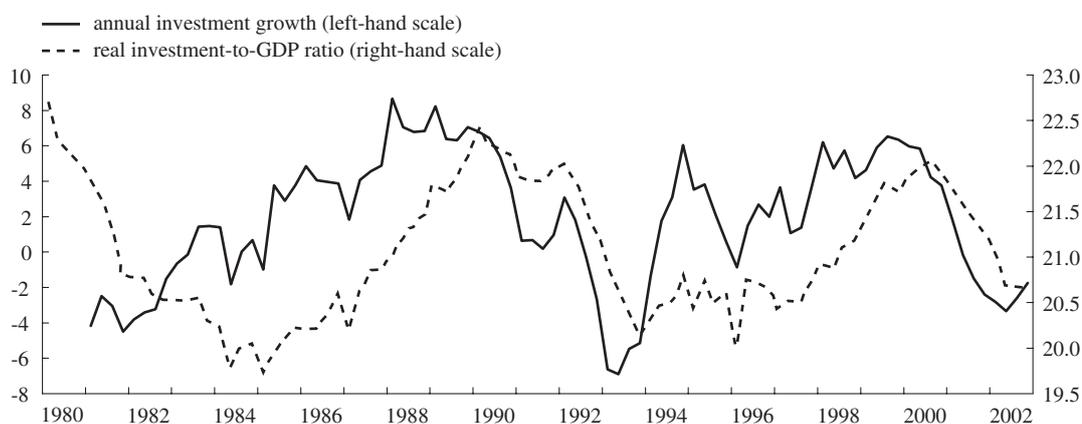
In the period reviewed, the real investment-to-GDP ratio in the euro area went through two long-term cycles, peaking in 1990 and 2000 respectively. The first cycle started after the recession in the early 1980s, from an investment-to-GDP ratio of just below 20%. The dynamics initially remained fairly subdued, but picked up strongly towards the end of the decade. Early in 1990 the investment ratio reached a peak of almost 22½%, following annual rates of growth in

real investment of around 7%. Similarly, the second cycle started after the recession in the early 1990s, from a level of just above 20%; it was also characterised by subdued investment dynamics in the middle of the decade and a strong pick-up towards the end. Following annual rates of investment growth of around 6%, the investment ratio reached a peak of around 22% in mid-2000, i.e. almost the same level as at the peak of the previous cycle. In 2001 and 2002 investment declined and the investment-to-GDP ratio fell to below 21%. Most currently available forecasts from international institutions and private organisations indicate a moderate recovery of the investment ratio in 2003 and 2004.

Two features seem noteworthy when analysing the dynamics in aggregate investment since the mid-1980s. First, the investment dynamics in the two cycles were much less similar when measured in terms of the ratio of aggregate nominal investment to GDP. In particular, the peak in the nominal investment ratio reached in 2000 was well below that of 1990. The Box examines the difference between the dynamics in the real and nominal investment ratios and explains that each measure contains specific information for the analysis of investment.

Chart 1
Real aggregate investment in the euro area

(in percentages)



Sources: Eurostat and ECB calculations.

Note: Calculated from seasonally adjusted data.

Box

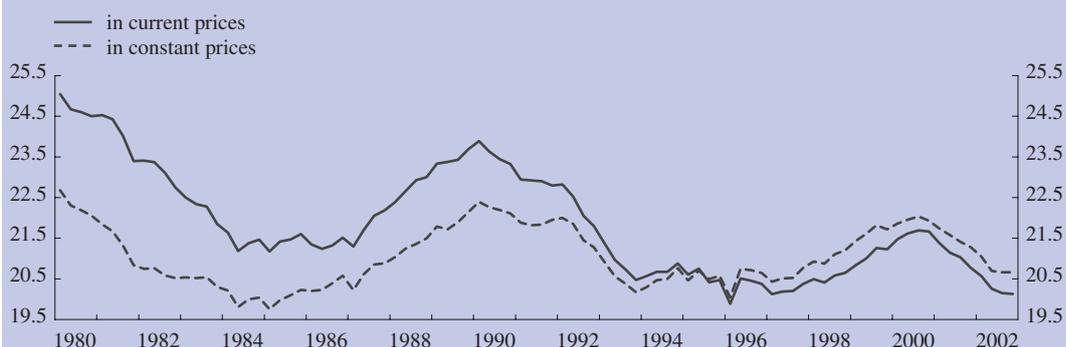
Real and nominal investment: what matters when?

Nominal investment measures the amount of money spent on purchasing capital goods; real investment is estimated by deflating nominal investment with an appropriate price index. In the period from the early 1980s onwards, the annual increase in the deflator of aggregate investment was on average $\frac{1}{2}$ percentage point lower than that of overall GDP. This decline in relative prices reflects, in particular, the fall in the level of prices for certain information and communication technology (ICT) products – such as computers – which accelerated from the mid-1980s onwards (see Box 2 of the article entitled “New technologies and productivity in the euro area” in the July 2001 issue of the ECB’s Monthly Bulletin).

When adjusted for price changes, the investment performance is considerably more impressive than when measured in nominal terms (see the chart below). For example, in 2000 the real investment-to-GDP ratio in the euro area almost reached the level recorded in 1990, while this was clearly not the case for the nominal ratio. It is nevertheless important to note that the nominal investment-to-GDP ratio also increased in both the late 1980s and the late 1990s. This shows that the higher contributions to growth from strong fixed capital formation in the cyclical peaks of 1990 and 2000 were not simply a product of price measurement methodologies but actually reflected higher spending in relation to overall resources.

Investment-to-GDP ratio in the euro area

(in percentages)



Sources: Eurostat and ECB calculations.

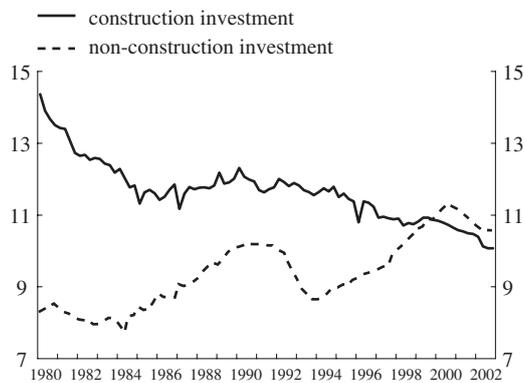
Note: Calculated from seasonally adjusted data.

Focusing on the real investment-to-GDP ratio is appropriate when, for instance, assessing the impact of capital accumulation on developments in labour productivity and thus overall growth. In this context, what matters are the services that a particular investment good supplies in the production process and not the amount of money spent on it. Owing to technical progress in the production of high-tech products, the services provided by ICT goods (services such as memory and speed in the case of computers) improved considerably, even though buyers did not have to pay more for these goods. On the other hand, focusing on developments in the nominal investment-to-GDP ratio is appropriate when assessing businesses’ ability to finance their investment. In this context, what matters are the actual outlays needed to purchase investment goods, as there might be constraints with regard to the availability of internal and/or external funds.

In particular, looking at the investment dynamics of the late 1990s, there were mutually reinforcing improvements in actual growth, in expectations of future growth and in stock market prices towards the end of the decade. In this favourable environment, financing constraints appear to have been of relatively limited importance at the aggregate level, and the focus of the analysis was typically on developments in real investment. In 2001 and 2002, the economic environment deteriorated, and the financing aspect of investment – and thus the information contained in nominal investment spending – came more to the fore. Thus, depending on the focus of economic analysis, both the real and the nominal investment ratio contain important specific information.

Chart 2
Real construction and non-construction investment

(as a percentage of real GDP)



Sources: Eurostat and ECB calculations.
 Note: Calculated from seasonally adjusted data.

Second, underlying the dynamics of aggregate investment in the past two long-term cycles were opposite trends in construction investment (comprising dwellings, other buildings and infrastructure) and in non-construction investment (essentially

comprising the various types of equipment investment and other investment). In the last two decades construction investment declined by around 2½ percentage points as a share of real GDP. This was more or less offset by a corresponding increase in the ratio of real equipment investment (see Chart 2). The cyclical upturns in the aggregate investment-to-GDP ratio starting in the 1980s and 1990s were both driven by the dynamics in equipment investment.

These features underline the fact that investment dynamics reflect a variety of different influences, many of which are unlikely to be adequately captured in models of aggregate investment. Against this background, the main determinants of investment discussed in the next section help to explain the broad pattern of aggregate investment over the economic cycle, while special factors of particular relevance to individual components of investment are examined in Section 4.

3 Main macroeconomic determinants of investment in the euro area

Investment decisions are made by a variety of decision-makers and are based on different economic considerations. Enterprises decide upon their investment projects by comparing expected future profits from investing in new capital with the (user) cost of buying and holding it. Households investing in dwellings compare future income flows with the costs of a mortgage-backed loan, the cost of renting, or the alternative of a financial investment. Similarly, governments also have to consider the cost of financing their investment projects, and are subject to budget constraints. Cutting across these different decision processes, there are three broad sets of macroeconomic variables that affect aggregate investment, namely expectations for future growth (of demand, income and profits), financial conditions and the price of capital goods.

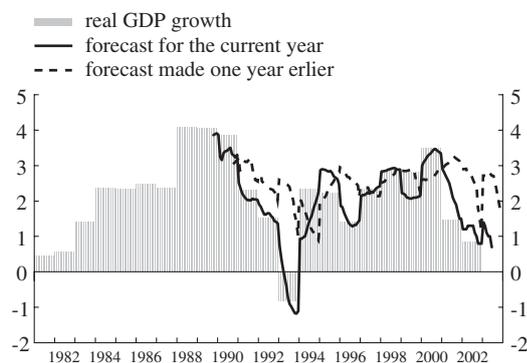
Given the time-lags in implementing investment decisions and the high cost of reversing them, expectations of future growth play an important role. Expectations can undergo considerable change, and “surprises” may have a disproportionately strong effect on investment, helping to explain the pronounced movements in the investment-to-GDP ratio observed in the last two decades. Moreover, the adjustment of investment plans to changes in expectation may not be gradual. For instance, irreversibility and lumpiness of investment projects may introduce “zones of inaction”, meaning that investment projects are not scaled down or up gradually but are potentially scrapped or launched as a whole when growth expectations exceed a particular threshold.

The expectations underlying individual investment projects cannot be directly measured. At the aggregate level, macroeconomic forecasts provide some information on the general economic outlook at individual points in time. Since the end of 1989 Consensus Economics has published, on a monthly basis, private sector forecasts for annual averages of key macroeconomic variables for the current year and the year ahead. It should be noted that investment decisions are based on expectations covering the whole period of the investment project and that the Consensus Economics forecast data can therefore only serve as an illustration.

Chart 3

Real GDP growth and Consensus Economics forecast

(annual percentage changes)



Sources: Eurostat, Consensus Economics and ECB calculations.
Note: Forecast data are based on a slightly varying coverage of euro area countries.

Real GDP as a measure of demand and income suggests that each of the two broad investment cycles was characterised by above-average growth, at the end of the 1980s and 1990s respectively (see Chart 3). Significantly, the real GDP forecasts made at the time suggest that the end of the 1990s was a period in which the positive growth expectations for the year ahead were mostly confirmed *ex post*. This was even the case when the financial crises in Russia and South-East Asia led to a temporary deterioration in current-year growth expectations. Finally, the year 2000 clearly surprised on the upside, considering that the forecasts made one year

earlier had been much lower. By contrast, with regard to growth in the last two years, and probably also this year, the earlier expectations were too positive. A similar negative surprise can be observed for the early 1990s, helping to explain why the decline in the investment-to-GDP ratio in these periods was relatively steep.

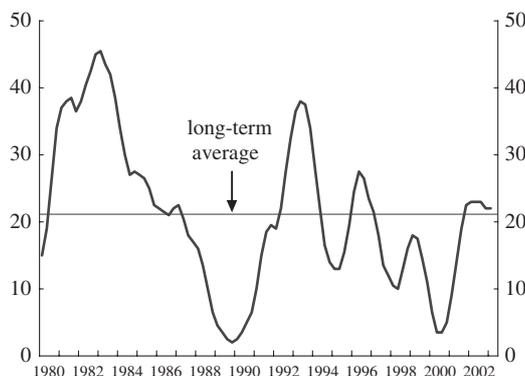
As a result of over-optimistic expectations and negative surprises, firms may find themselves with larger than warranted capacity and may subsequently invest less than would have been the case if demand expectations had been met. Survey evidence on the assessment of capacity in the manufacturing sector – which, however, only accounts for a little less than one-fifth of total investment – suggests that the number of firms that consider their production capacities more than sufficient has increased in the past two years. However, this number was, in the first quarter of 2003, close to its longer-term average and considerably lower than in the downturn of the early 1990s, suggesting that there is little evidence of an overhang from previous excessive capital accumulation that would still have to unwind (see Chart 4).

As regards the cost of capital, the real interest rate may be a good benchmark

Chart 4

Assessment of production capacity in manufacturing

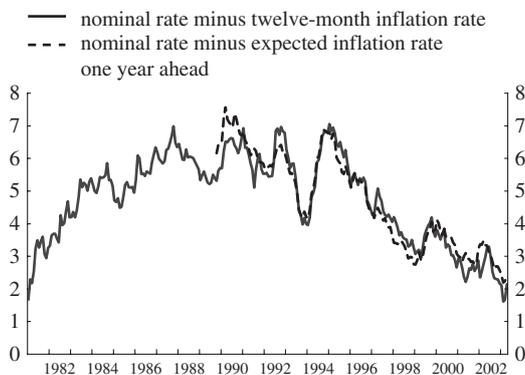
(percentage balance)



Sources: European Commission and ECB calculations.
Note: Seasonally adjusted data. A higher value indicates a larger share of firms with sufficient production capacities.

Chart 5
Measures of the real long-term interest rate in the euro area

(percentage per annum; monthly averages)



Sources: Eurostat and ECB calculations.
 Note: Expected inflation is calculated as a weighted average of the forecast for the current year and the forecast for the next year.

measure of the real opportunity cost of investing in fixed capital. Measures of the real interest rate are typically subject to a number of caveats considering that they depend, for instance, on the maturity of the interest rate chosen and on the proxy chosen for expected changes in the price level (see the article entitled “Stability-oriented policies and long-term real interest rates in the 1990s” in the November 1999 issue of the Monthly Bulletin). Chart 5 shows two measures of the euro area real interest rate, both based on the nominal ten-year government bond yield, but calculated on the basis of different proxies for inflation expectations. The first measure uses actual consumer price inflation as a proxy for inflation expectations, while the second measure uses the expectation of consumer price inflation for the 12 months ahead as implied by the Consensus Economics forecast. On the basis of these measures, developments in real interest rates were characterised by a broad upward trend during the investment cycle starting in the 1980s and by a broad downward trend during the cycle starting in the 1990s. This suggests that, taken on their own, real interest rates cannot explain the trends in fixed capital formation. This conclusion is in line with model-based evidence that aggregate demand tends to be a

more important factor in explaining developments in investment than the cost of capital.

Two caveats need, however, to be mentioned. First, risk premia are a significant part of the financing costs of enterprises and households and they can vary substantially with macroeconomic conditions and the financial position of firms and households. In this respect, the rise in the indebtedness of euro area non-financial corporations in recent years, coupled with macroeconomic uncertainty, has meant that corporate borrowers, particularly those with weak balance sheets, have had to pay a higher spread for credit vis-à-vis government borrowers.

Second, while the broad pattern of investment may be determined more strongly by demand expectations than financing conditions, the latter can have a significant impact on the timing of investment, especially when cash-flow constrained firms have to rely on external finance to implement their investment projects. For instance, in the past two years financial constraints may have added to the weakness of investment spending, partly counterbalancing the impact of generally low interest rates (see Box 2 entitled “The impact of financial factors on corporate investment in the euro area”, published in the June 2003 issue of the Monthly Bulletin). As regards the longer-term developments in internal finance, the ratio of nominal investment to gross operating surplus in the euro area appears to have been on a broad downward trend since the early 1980s, with peaks in 1990 and 2000 (See Chart 6). At the aggregate level, the gross operating surplus includes components such as rents and labour income of the self-employed that are not directly related to the funding of business investment. The developments in the gross operating surplus nevertheless suggest that, over time, the availability of cash-flow has become a less binding factor for investment.

Chart 6
Investment over gross operating surplus

(as a percentage; current prices)



Sources: Eurostat and ECB calculations.
 Note: Calculated from seasonally adjusted data.

A downward impact on the cost of capital is associated with the fact that in the last two decades the prices of capital goods on average increased at a slower pace than overall prices as measured by the GDP deflator (see Chart 7). Following a line of reasoning mostly put forward for the United States, it has been argued that in particular the absolute decline in the prices for information and communication technologies (ICT), which accelerated in the course of the 1990s, explains the investment cycle starting in the 1990s and possible over-investment in certain types of equipment. Moreover, estimates based on annual data for individual euro area countries (covering around three-quarters of the euro area) suggest that the share of ICT-related expenditure in total nominal investment spending increased over most of the 1990s, implying that the impact of the relative price declines on real investment grew larger.¹ However, the rising share of ICT in total investment also implies a higher average rate of depreciation, considering that the service life of ICT tends to be much shorter than that of other capital goods. This rise in the rate of depreciation should have

had a counterbalancing effect on falling capital goods prices, increasing the (user) cost of capital. Moreover, the broad downward trend in relative prices for capital goods seems to have halted during the periods when investment was strongest, suggesting that this factor taken on its own cannot explain the investment performance.

Chart 7
Deflator of investment over GDP deflator

(index: 1995 = 100)



Sources: Eurostat and ECB calculations.
 Note: Calculated from seasonally adjusted data.

Taken together, the main macroeconomic determinants of investment, in particular developments in expectations of aggregate demand and, albeit less so, in the cost of capital, can help to explain at least part of the two broad cycles in aggregate investment starting in the 1980s and 1990s respectively. Differences between the investment performance of individual sectors can be explained by a number of specific shocks, as discussed below.

¹ Continuously falling capital goods prices could also have perverse effects on investment if they induce firms to wait in order to benefit from lower prices in the future. It is difficult to gauge the extent to which such effects play a role in actual investment decisions. The gains from lower prices of capital goods need to be weighed against the possible losses from missing an investment opportunity if investment is delayed. Possible early-mover advantages of capturing additional demand may often be much more important than any short-term gains from lower capital goods prices.

4 Breakdown of investment dynamics by economic activity

This section looks at disaggregated data on investment in order to gain an insight into specific factors that may have driven the dynamics over parts of the investment cycles. In the period from the 1980s onwards, a number of specific factors and shocks may have affected overall investment dynamics. The disaggregated data below highlight the possible impact of three such factors, namely German unification, changes in government investment policy, and the information and communication technology shock of the 1990s.

The disaggregation of investment considered below is based on a sectoral breakdown by type of activity and product. Though different from a breakdown by institutional sector (i.e. private enterprises, households and governments), the breakdown of investment by type of activity and product can be broadly mapped into a breakdown by institutional sector. Moreover, it avoids some of the problems of data interpretation arising from the fact that a number of previously public enterprises (particularly in the area of network industries) were privatised in the period under consideration.²

Aggregate investment is divided in four broad categories:³

- 1) In a number of industrial and services sectors, including agriculture, mining, manufacturing, the construction industry, commerce, hotels and business services (henceforth called, for the sake of brevity, “manufacturing and market services”) investment is predominantly made by private enterprises.
- 2) Residential investment is predominantly undertaken by households.
- 3) In network industries, which include electricity and gas production and distribution, water distribution, telecommunications and transport, investment has been and continues to be

a mixture of private and public, with government intervention in most cases omnipresent.

- 4) In a number of service sectors, including public administration, education, defence and health (henceforth called “non-market services”), investment has largely been public.

The contributions of these categories to overall investment growth are shown in Chart 8. On the basis of these data, the overall investment cycle has largely been shaped by the decisions in *manufacturing and market services*. This reflects the fact that investment in this category represents more than 40% of total euro area investment and that, measured in terms of the standard deviation of annual rates of growth, it has been the most volatile component of investment in the period since the 1980s. The category’s contribution to overall investment growth at the end of the 1990s did not reach that at the end of the 1980s, suggesting that the technology shock did not have a strong impact on this type of investment.

The breakdown also suggests that all investment activities followed a broadly similar cyclical pattern, with, in particular, the retrenchment in 2001 having been widespread. One notable exception is the pattern of *residential investment* in the mid-1990s. Unlike other major investment

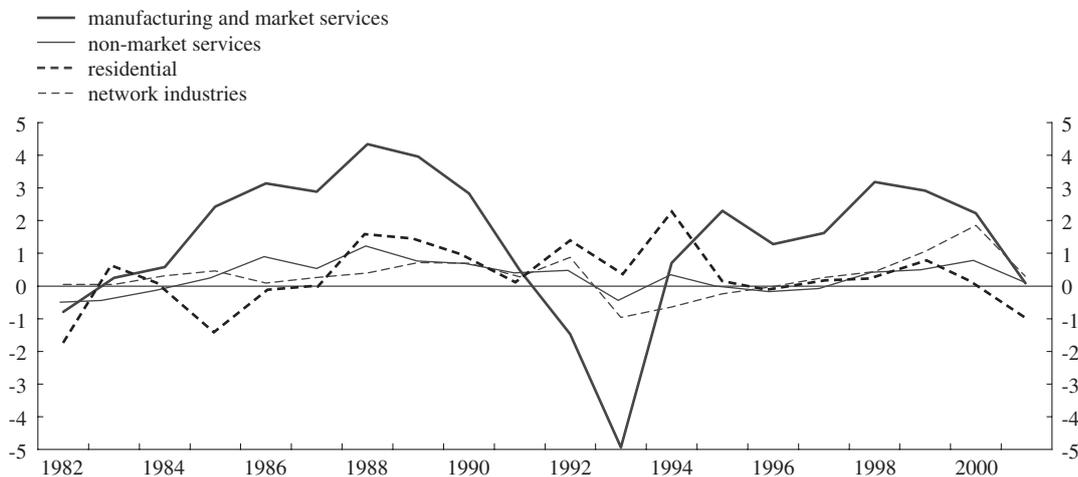
² The available institutional sector accounts provide nominal, but not real, investment series separately for households, financial and non-financial corporations and the public sector for the majority of euro area countries.

³ The four categories are based on the statistical classification of economic activities in the European Community (NACE Rev. I) as follows: 1) residential investment: as defined in the national accounts (gross fixed capital formation in housing); 2) “manufacturing and market services”: NACE sectors 01-37, 45-55 and 65-74 minus residential investment; 3) “network industries”: NACE sectors 40-41 and 60-64; 4) “non-market services”: NACE sectors 75-93. The euro aggregate series are based on data and ECB estimates for Belgium, Germany, France, Italy, the Netherlands, Austria and Finland, for which longer time series exist. These seven countries account for approximately 83% of total fixed capital investment in the euro area.

Chart 8

Contributions to real investment growth

(annual percentage points)



Sources: Eurostat, OECD, national sources and ECB estimates.

components, the contribution from residential investment, which accounts for around 30% of total euro area investment, remained positive and increased to a historical high in the early 1990s. Thereafter, during the upturn in the investment cycle that started in the mid-1990s, the contribution from residential investment was relatively weak, and in the downturn of 2001 and 2002 this category contributed about 1 percentage point to the fall in overall investment.

The distinct dynamics of residential investment to a large extent reflect the special

developments in Germany. In the wake of German unification, residential investment was boosted by government intervention. The resulting relatively abundant supply of housing as well as a number of changes in housing policy in the second half of the 1990s have contributed to the weakness of residential investment in Germany since then. In the rest of the euro area, residential investment followed the overall investment cycle more closely (Chart 9). While it decelerated sharply, residential investment in the rest of the euro area did not contract in 2001 and 2002, in part reflecting the fact that the household sector benefited from favourable financial conditions.⁴

Chart 9

Real residential investment in the euro area

(annual percentage changes)



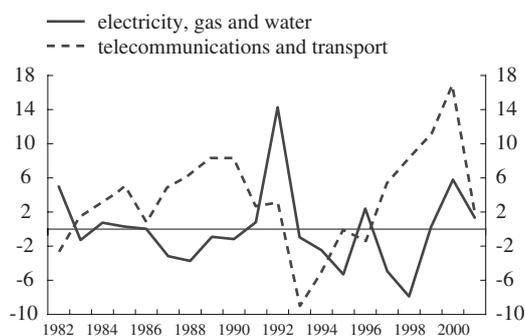
Sources: Eurostat, OECD and ECB estimates.

Investment by *network industries*, which were among the sectors most strongly affected by the information and communication technology shock, contributed substantially to the upswing in the investment cycle in the 1990s. In 2000 this type of investment activity contributed around 40% to total investment growth, although the share of network industries in total investment is relatively small, at less than 15%.

⁴ For a more detailed analysis of the determinants of demand for housing services, see the article entitled "Recent trends in residential property prices" in the May 2003 issue of the ECB's Monthly Bulletin, pp. 49-59.

Much of the growth in investment in this category is attributable to the telecommunications sector and was concentrated in 1999 and 2000 (see Chart 10). In this period telecommunications enterprises undertook large investment projects in new technologies, both in mobile telecommunications infrastructure and in fixed network infrastructure (particularly fibre-optic cable installation). The strong dynamics that unfolded in these industries over a relatively short period may have also reflected important structural reforms that had been introduced or were in the process of being introduced in this market in a number of euro area countries. These reforms related to liberalising entry barriers and privatising government-owned enterprises. A downward revision of expectations with regard to future returns in the sector, together with financial difficulties on the part of some of the main players, contributed to a large-scale investment

Chart 10
Real investment in network industries
(annual percentage changes)

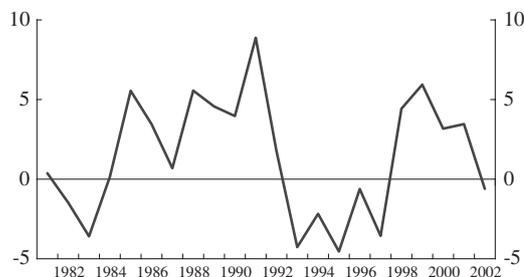


Sources: Eurostat, OECD, national sources and ECB estimates.

5 Conclusions

This article reviewed the broad trends in fixed capital formation since the 1980s, focusing on two long-term cycles starting in the mid-1980s and mid-1990s. The fact that the real investment-to-GDP ratio in 2000 almost reached the peak level of 1990 reflected the improved growth expectations at the time and a strong decline in the relative price of

Chart 11
Real government investment
(annual percentage changes)



Sources: OECD estimates and ECB calculations.

retrenchment starting in 2001. The retrenchment also had a significant impact on up-stream manufacturers of telecommunications equipment.

Finally, investment activities in *non-market services* contributed to the pick-up in the overall investment cycle in the 1990s, but the dynamics remained relatively subdued compared with those of the investment cycle starting in the 1980s. Non-market services account for around 14% of total investment, but this share has been gradually declining since the 1980s.

Estimates of real government investment confirm that this only started to rise towards the end of the investment cycle of the 1990s (see Chart 11). The relatively subdued investment activity in previous years reflected partly the privatisation of some activities and partly governments' decisions to cut back investment when confronted with fiscal consolidation requirements. As a result, public investment has been pro-cyclical.

capital goods against the background of favourable financial conditions.

As regards an explanation of the somewhat divergent developments in the individual components of investment, shocks such as those associated with German unification and the advances in information technology are

likely to have been of importance. While the impact of German unification was most evident in the growth of construction investment, the impact of advances in technology showed largely in the investment by network industries. These investment categories were also characterised by a stronger downward adjustment in the last two years, as the positive impulses from special factors ceased and reversed. Government investment, which was also mainly in construction, also contributed to the shape of the euro area capital accumulation cycles.

In light of these findings, developments in investment in the last two years appear to largely reflect adjustments to the deterioration in the outlook for growth and a revision of expectations with regard to returns, in particular in network industries. In this respect, a recovery in investment requires an improvement in expectations and confidence, which can be fostered by a stable macroeconomic environment and renewed momentum in the process of structural reform.