

## Box 4

**ESTIMATES OF THE EURO AREA CAPITAL STOCK**

This box presents, for the first time, ECB estimates for the capital stock of the euro area. Capital stock is defined as the value of all fixed assets in use, where fixed assets are described as produced assets (i.e. excluding land) that are used in the production process for more than a year.<sup>1</sup> The box analyses trends in the euro area capital stock at constant prices for the period 1980-2005.

**Estimation method**

According to the current EU Regulation on national accounts data<sup>2</sup>, EU Member States should provide annual data on fixed assets for the total economy and a number of product types within 24 months of the reference year. However, as not all euro area countries currently provide capital stock data<sup>3</sup>, an estimate of the euro area aggregate capital stock cannot be derived as a straightforward summation of country data. The part accounted for by the countries for which no such data are available therefore needs to be approximated. The ECB estimates are based on the capital accumulation equation, which links the capital stock (K) to investment (I) and the retirement rate (r):  $K_t = (1 - r_t) * K_{t-1} + I_t$ . In other words, the gross capital stock in a given year equals that of the previous year minus that part of the stock that has reached the end of its service life plus the gross fixed capital formation in the current year (the same applies for net capital stock, with the difference that consumption of fixed capital or depreciation is also taken into account).

In the case of those countries for which capital stock and gross fixed capital formation (investment) data are available, the retirement and depreciation rates are not directly observable but can be estimated using the capital accumulation equation. In the case of those countries for which capital stock data are not available (which account for about one-fifth of euro area investment), the retirement and depreciation rates, as well as the initial level of capital stock, need to be estimated. In deriving a proxy for the capital stock of the missing countries in the starting year 1980, the 1980 GDP-to-capital stock ratio of the missing countries is assumed to be equal to the same ratio for the available countries. This ratio is in fact relatively similar and relatively stable over time across countries for which data are available. Furthermore, the retirement and depreciation rates corresponding to those countries for which data are not available are assumed to be equal to the average retirement and depreciation rates of the other countries. Combining these results yields estimates for the total euro area capital stock and four main product types.

**Evolution of the capital stock and breakdown by product type**

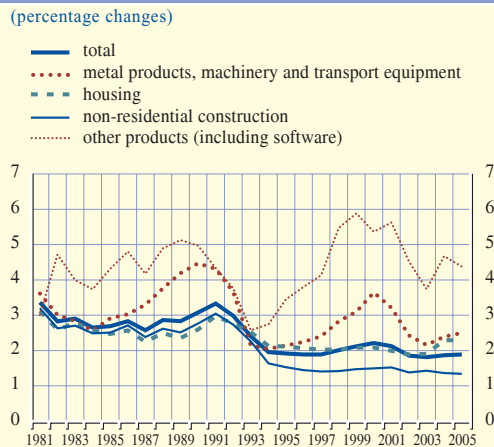
The gross capital stock reflects the physical capital available in an economy for production processes. The ECB estimates show that the volume of total euro area gross capital stock grew

1 For further information, see paragraphs 7.14-7.15 of the European System of Accounts and OECD Manual "Measuring Capital: Measurement of Capital Stocks, Consumption of Fixed Capital and Capital Services" (2001).

2 See Annex B of Council Regulation (EC) No 2223/96 on the European system of national and regional accounts in the Community.

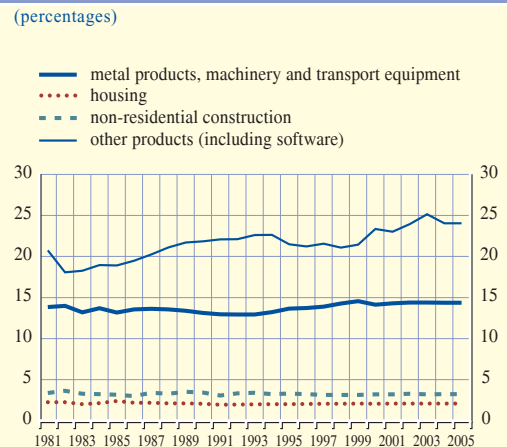
3 At present, capital stock estimates are published by seven euro area countries: Belgium, Germany, France, Italy, the Netherlands, Austria and Finland.

**Chart A Euro area capital stock volume growth**



Source: ECB calculations.

**Chart B Depreciation rates by product type**



Source: ECB calculations.

on average 2.4% per annum in the period 1981-2005. Two periods can be broadly distinguished: between 1981 and 1992, when the annual growth in the capital stock volume was about 2.8%, and from 1992 onwards, when it slowed down to about 2.1%. As far as the product types are concerned (see Chart A), growth in metal products, machinery and transport equipment was 3.0% in the period 1981-2005. Somewhat lower growth was observed for housing (2.4%) and for non-residential construction (2.1%). However, growth was strongest for “other products” (4.3% in the period 1981-2005), a category which includes, in particular, ICT products.

**Product type and depreciation rates**

For the total capital stock, the depreciation rate has been broadly constant at 4.6% per year. This corresponds to an average lifetime of the capital stock of around 20 years. Chart B shows the depreciation rates for four product types. As expected, depreciation rates are lower for construction than for non-construction assets because of the higher average lifetime of construction assets. For construction, the depreciation rates are also broadly constant throughout the period, at around 2% per year for housing and 3% for non-residential construction. These two groups account for over three-quarters of the overall capital stock. For non-construction assets, the depreciation rates are significantly higher. They are broadly constant for metal products, machinery and transport equipment at around 14%. Notwithstanding some decline at the beginning of the period, the depreciation rate for the “other products (including software)” category has increased steadily. The depreciation rate is estimated to have been 24% per year in 2005. This corresponds to an average lifetime of around four years, reflecting to a large extent the fact that ICT equipment depreciates more quickly than other assets.

**Share of replacement investment in total investment**

Changes in investment that exceed the replacement of depreciated capital stock may be seen as an indication of increasing

**Share of replacement investment in total euro area investment**

1981-1985	1986-1990	1991-1995	1996-2000	2001-2005
52.1%	50.4%	50.9%	52.2%	53.9%

Source: ECB calculations.

confidence about future sales. This information is therefore useful in assessing the robustness of investment growth. The table shows the share of replacement investment in total investment over various periods.

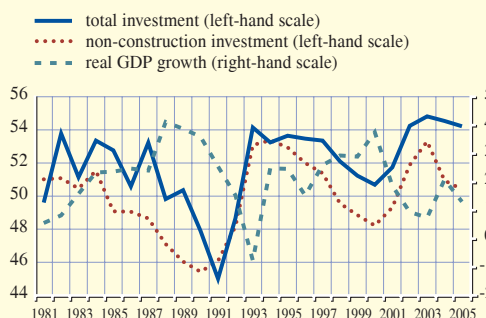
Overall, the share of replacement investment has increased since the early 1990s (see Chart C). The acceleration of the depreciation of some assets cannot alone explain this upward movement. The increase may also be related to the weakness of investment previously observed at the euro area level and/or to a lowering of the optimal ratio of capital to output. Nevertheless, a counter-cyclical pattern seems to emerge in the evolution of the share of replacement investment, in particular for non-construction assets, i.e. the two categories: “metal products, machinery and transport equipment” and “other products (including software)”.

In downturns, new investment is mainly used for the replacement of the existing capital stock, albeit likely with more modern and efficient assets. As the recovery gathers pace, companies increasingly invest to extend capacity. The share of replacement investment therefore decreases. In this respect, looking at the last few years, available estimates up to the end of 2005 suggest that the recovery in investment has so far not been strong enough to lead to a decrease in the share of replacement investment, even though some decline in the replacement share of non-construction investment has been visible since 2003.

Overall, the provision of this new source of statistics allows a better understanding of the structure of euro area productive assets and investment behaviour. In particular, the increase in non-construction investment for capacity expansion purposes since 2003 provides some support for a positive outlook for economic activity in the euro area.

Chart C Share of replacement investment and GDP growth

(percentages; annual percentage changes)



Source: ECB calculations.