CHAPTER 3

DETERMINANTS AND BENEFITS OF INVESTMENT IN THE EURO AREA

TABLE OF CONTENTS

1. INTRODUCTION

Investment is a crucial element of economic performance. It determines the structure and size of the capital stock and enables the penetration of new technologies in the economy, thereby affecting employment. Therefore, investment is key to the development of the economy's growth potential over the medium and longer term. Moreover, as one of the most volatile components of aggregate demand, it is an important source of short-run fluctuations in economic activity.

The lacklustre investment performance in the euro area during the 1990s is often considered a major factor behind the area's relatively poor economic growth and insufficient growth potential. This raises several related questions on the investment performance of the euro area in the 1990s, both in a historical perspective and in comparison to the USA. What accounts for the weakness of euro-area investment in the 1990s? And what type of policy measures would create a more investment-friendly environment in the euro area?

Although many empirical studies on investment are available for the individual Member States, relatively limited research has thus far been devoted to investment issues for the euro area as a whole. This chapter elaborates on euro-area investment trends, its determinants and the policy options to improve the investment performance. Thereto, Section 2 sets the stage by assessing trends in gross fixed capital formation in the euro area over the past decade. Section 3 analyses macro- and micro-economic factors that may explain these trends. Section 4 provides insights regarding the effectiveness of possible policy measures to enhance the investment environment in the euro area, focusing mainly on structural policies. Conclusions are drawn in Section 5.

2. INVESTMENT IN THE EURO AREA: SOME STYLISED FACTS

2.1 INVESTMENT TRENDS IN THE EURO AREA IN THE 1990S

A lacklustre overall investment performance

During most of the 1990s, the euro area posted a lacklustre investment performance. Gross fixed capital formation fell sharply in 1992-93 and was slow to recover after the recession. Between 1994 and 1997, real investment expanded at the same pace as GDP, with average annual growth at about 2 per cent. Capital accumulation only began to post clear signs of a recovery at the end of 1997. However, the recovery proved short-lived, reaching its peak in the third quarter of 2000 after less than three years of existence. Investment growth has been slowing sharply since the end of 2000.

Table 1: **Gross investment (GFCF) in the euro area** (annual change in %)

	1991-95	1996	1997	1998	1999	2000	2001	1997-2001
Total investment	0,1	1,4	2,4	5,3	5,4	4.4	0.4	3,2
Equipment	-0,8	4,5	5,5	9,6	7,4	7.3	1.3	6,2
Construction	0,9	-1,0	-0,4	1,5	3,8	1.7	-0.6	1,2
Housing	2.4	0.6	0.8	1.5	3.4	0.7	-2.1	0.8
Non-resid cons.	-0.6	-2.7	-1.7	1.6	4.2	2.7	1.0	1.6
Construction excl. Germany	-1.2	0.4	0.4	3.5	5.5	4.6	2.4	3.3

Source: Commission services.

Graph 1: **Trends in investment in the euro area**

Gross investment
(% of GDP)

Real investment
Nominal investment

Source: Commission services.

Equipment[1] and construction investment
% of GDP
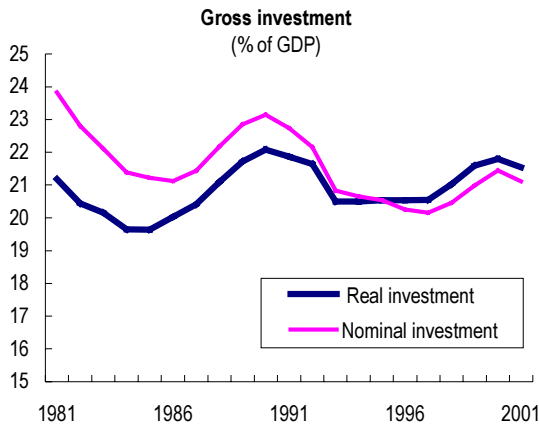
Equipment
Construction
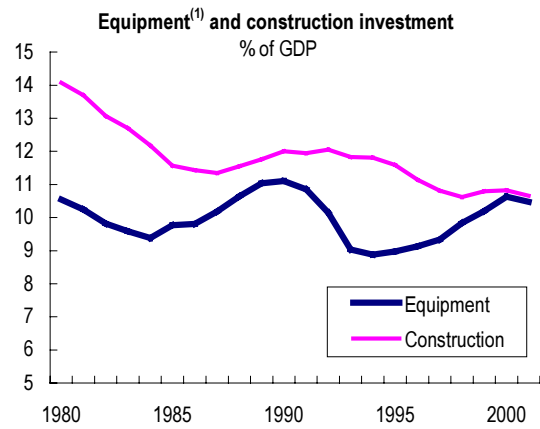
(1) Including the other category - in that case equipment and construction add up to total investment. Both construction and equipment is excluding B.
Source: Commission services.
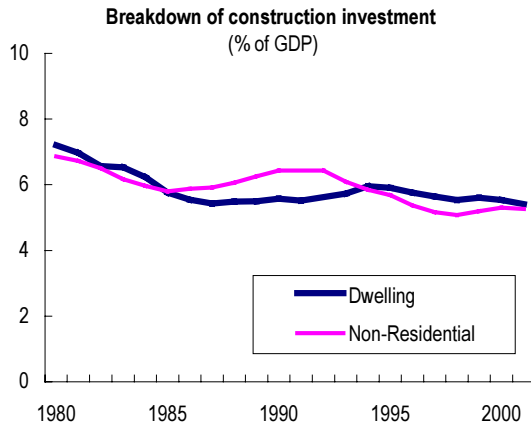
Breakdown of construction investment
(% of GDP)

Dwelling
Non-Residential

Source: Commission services.

Public investment
(% of GDP)

Source: Commission services.

Business investment
(% of GDP)

Real investment
Nominal investment

Source: OECD.

Components of total investment in 2001, %

Housing 25.6%
Non-residential 24.8%
Equipment 49.6%

Private inv. 88%
Public inv. 12%

Replacement investment 67.3%
Net fixed capital inv. 32.7%
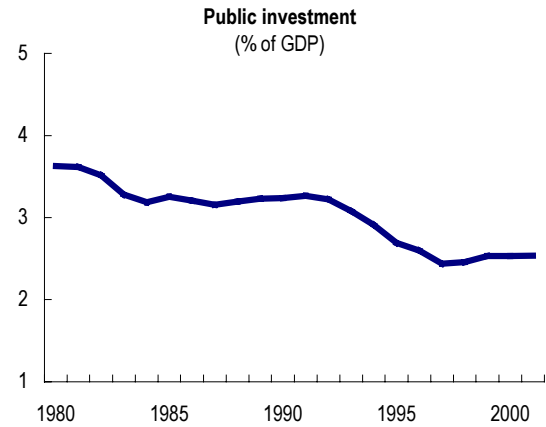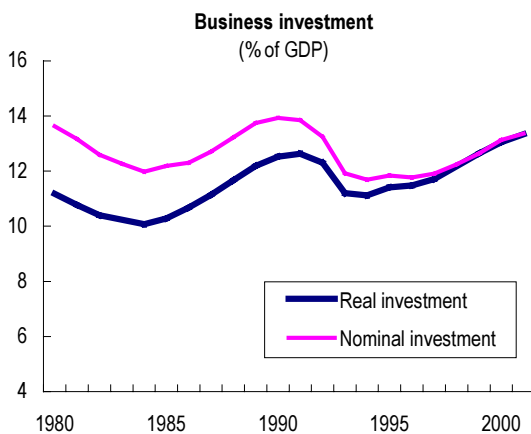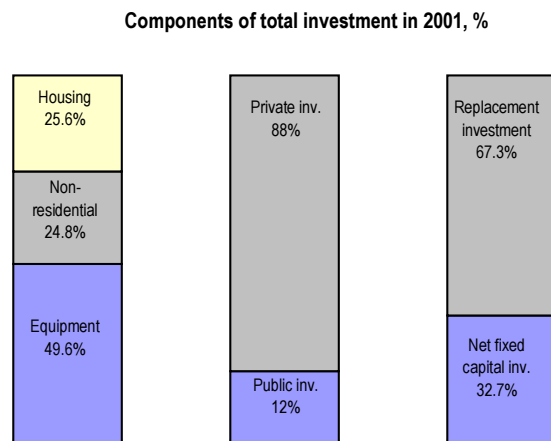
Source: Commission services.

The investment recovery of the late 1990s appears subdued compared to the previous investment cycle. The expansion phase of the previous investment cycle began in 1986 and lasted 5 years. Peak growth rates for total investment reached or exceeded 7 per cent in 1988-89. In contrast, the recovery of the late 1990s was both shorter and less pronounced, with annual growth rates not exceeding 5 per cent between 1998 and 2000. Investment shares give a similar picture of a more muted recovery in the 1990s. The share of investment in GDP progressed steadily between 1997 and 2000 but, in the latter year, the investment-to-GDP ratio was still below its peak of the late 1980s. Investment growth was unusually buoyant in the second half of the 1980s. This buoyancy reflected, at least partly, an anticipation effect of the completion of the Single Market.

Diverging underlying developments of investment components

Decomposing aggregate investment trends gives additional insights into the most important developments. The overall investment trend can be disaggregated into construction investment and equipment investment or, alternatively, into government investment and private investment (Graph 1). Decomposing these elements even further can help to understand the developments, as - for instance - ICT-equipment was a main driver behind the growth in equipment investment in the second half of the 1990s. Below, and in the following sections, the main components of investment are discussed further.

The construction sector, representing more than half of total investment, has played an important role in the lacklustre investment performance of the euro area after the 1992-93 recession. Apart from a brief rebound in 1999, the construction sector suffered from stagnating or contracting activity during most of the second half of the 1990s. Some of this weakness reflects belated adjustments to the real estate boom of the late 1980s. More importantly, the persistent weakness of the construction investment in Germany sliced off nearly 2 percentage points of annual growth in euro-area construction over the 1995-2000 period.[1] The complement of construction investment, equipment investment, collapsed in the euro area during the 1992-93 recession. It experienced, however, an earlier recovery than total investment. Capital accumulation in equipment increased by more than 6 per cent annually between 1995 and 2000.

An interesting difference between the upswings of the 1980s and the 1990s is the relative contribution of equipment and construction. In the 1980s, the investment recovery was backed both by a surge in equipment investment and by a construction boom, whereas the construction sector experienced only sluggish growth during most of the second half of the 1990s (Graph 2). In contrast, the expansion phases of the equipment investment cycles of the 1980s and 1990s appear pretty similar both in terms of duration and growth rates. Average growth rates were slightly slower during the expansion of the 1990s but, in 2000, real equipment investment was significantly higher as a share of GDP than at the peak of the previous investment cycle.

As business investment takes predominantly the form of equipment investment, its growth pattern is similar. Approximately, three quarters of total corporate investment spending is on equipment. So, business investment, which is the main component of private investment, saw a steep drop in 1992-93 followed by an early recovery in 1995 and sustained growth during most of the second half of the 1990s. Contrary to business investment, government investment did not register any rebound in the late 1990s. Its share in GDP declined continuously between 1991 and 1998 and has remained nearly stable thereafter.[2]

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[1] The lasting weakness of construction in Germany can, in part, be traced back to the reunification. Construction investment in the New Länder more than doubled between 1991 and 1994. The weakness of construction in the New Länder during the second half of the decade was the result of the progressive scaling back of public and business investment in construction. As a result, non-residential construction was more severely hit than residential construction, a development which was also visible at the euro-area level. However, in 2000, despite continuous contraction since the middle of the decade, construction investment in the region was still around 70 per cent higher than in 1991.

[2] This apparent weakness of government investment should, however, be interpreted with caution. It is, to a considerable extent, a consequence of the consolidation of public finances in the euro area but it also reflects accounting problems linked to changes in the nature of public investment. Hence the privatisation of state-owned activities and the more direct

Investment spending can also be decomposed in replacement investment and net fixed capital formation. Replacement investment is by far the largest share, representing about 2/3 of gross fixed capital formation, leaving little more than 1/3 to net fixed capital formation, limiting the effect of investment on the capital stock. The impact of fluctuations in investment on the capital stock is further limited by the relative size of investment flows relative to the capital stock, with total gross fixed capital formation representing less than 10 per cent of the capital stock during investment booms. As a result, changes in investment growth affect the capital stock only progressively.

Graph 2: **Investment cycles, euro area**

Total investment in constant prices

Construction investment in constant prices

Equipment investment in constant prices
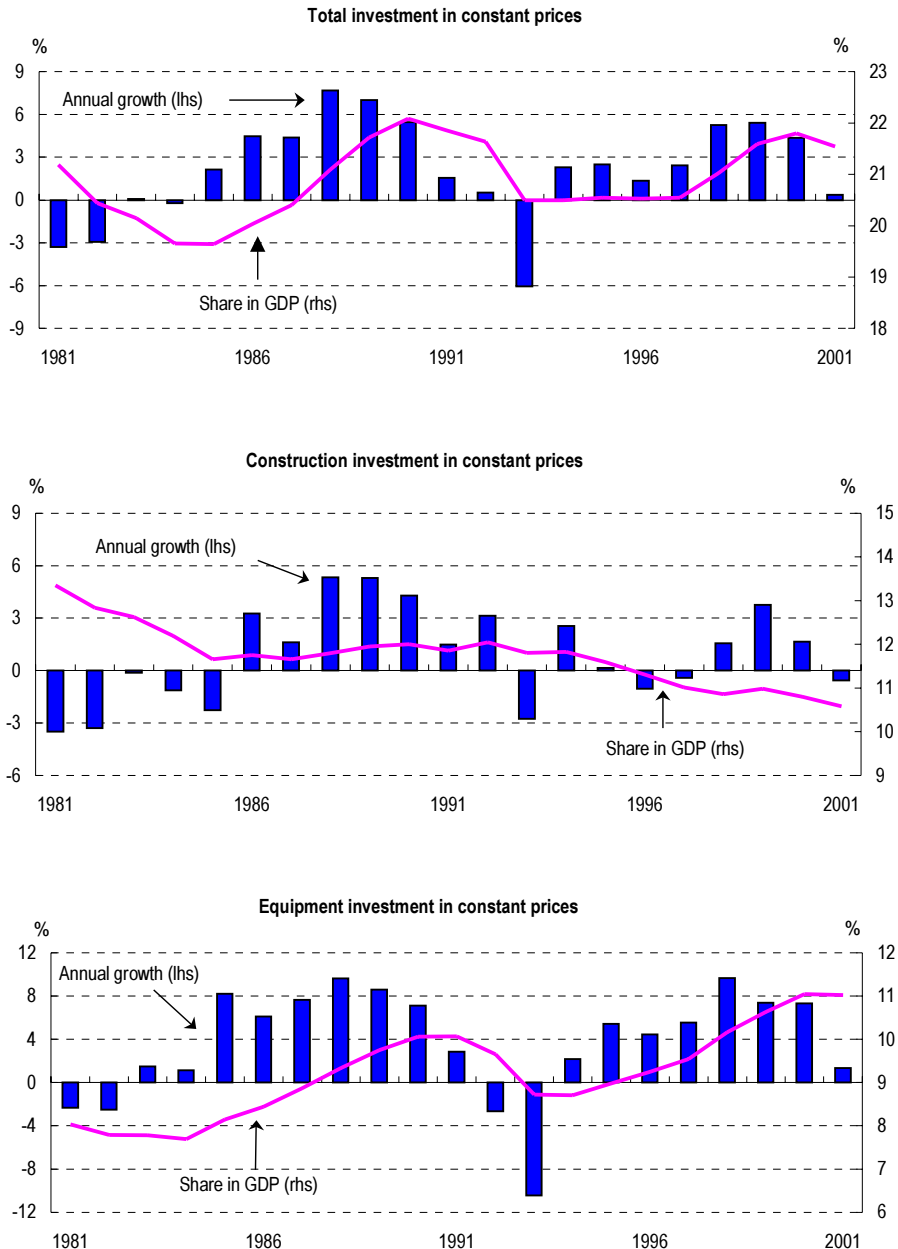
Source: Commission services. Both contruction and equipment investment are excluding B.

involvement of the private sector in the provision of public services have resulted in the transfer of some investment from the public to the private sector.

2.2 DIFFERENT INVESTMENT CYCLES IN THE EURO AREA AND THE USA IN THE 1990S

In the 1990s, the contrast in investment growth between the euro area and the USA was particularly striking (Graph 3). Whereas total fixed capital formation expanded by less than 2 per cent annually in the euro area over the decade, it rose by more than 6.5 per cent in the USA. Investment growth clearly exceeded output growth in the USA, resulting in a rapidly increasing share of investment in GDP. In the euro area, the share of investment to GDP decreased or stagnated during most of the decade, edging up again only after 1997. Due to a less capital-intensive production, the US economy has traditionally posted a lower ratio of investment to GDP than its euro-area counterpart.[3] Nevertheless, the surge in investment registered in the 1990s pulled the US ratio in real terms above the euro-area level for the first time in 1999.

Investment cycles in the 1990s were quite different in the euro area and the USA. Whereas the euro area experienced a belated and relatively moderate investment recovery, the US economy benefited from 9 consecutive years of rapid growth in fixed capital formation between 1992 and 2000, by far the longest expansion period since the early 1960s. The strong investment performance of the 1990s was not just a by-product of robust growth in aggregate demand. A comparison with the growth and investment performance in the 1960s is illustrative to this respect, as US GDP grew slightly faster than during the 1990s while investment expanded at a much slower pace.

Turning to the components of investment, some of the difference in investment growth between the USA and the euro area can be attributed to the construction sector, which was characterised by continuous slack in the euro area. Both residential and non-residential construction fared much better in the USA than in the euro area during the second half of the 1990s. Nevertheless, growth differences between the USA and the euro area are more striking for equipment investment, as it accounts for most of the difference in total investment growth rates.

Annual growth in real spending on equipment investment climbed to double-digit levels between 1993 and 2000 in the USA, a much faster pace of expansion than at anytime in the past 30 years. This surge largely reflects a boom in spending on information and communication technologies (ICT). Based on national accounts data, US ICT investment has expanded at double-digit rates since 1992, with annual growth climbing to 25 per cent during the second half of the 1990s. Double-digit growth rates were also registered in the 1970s and the 1980s but never over such a prolonged period of time. In nominal terms, ICT investment accounted for 42 per cent of private fixed investment in non-residential equipment in 2000 in the USA, a substantial increase on the 32 per cent registered at the end of the previous decade.

The euro area did not experience a boom in equipment investment of the same scale as the USA. Real spending on equipment grew at a healthy rate during the second half of the 1990s but the expansion was not more rapid than during similar upward phases of the business cycle in the past.[4] In terms of ICT investment, the euro area lags substantially behind the USA. Most European statistical institutes do not provide estimates of ICT-related fixed capital formation. However, estimates constructed by the Commission services show that ICT investment in the euro area was worth about 2 per cent of GDP in 2000, against 2.5 per cent for the USA. There were some signs of a pick-up in euro-area ICT spending at the end of the 1990s but it nevertheless has remained lower than in the USA.

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[3] Differences in the relative size of the capital stocks in the USA and the euro area are attributable to three interrelated factors: (1) differences in industrial structure, in particular, the higher weight of services in the US economy; (2) a higher capital-labour substitution in the euro area; and (3) a greater insertion of low-skilled workers in the USA.

[4] It is worth stressing that comparisons of investment performance between the USA and the euro area are fraught with statistical difficulties related to differences in the measurement of investment price deflators. Nevertheless, in-depth analysis shows that although the true difference in investment growth between the two regions is probably less wide than what is indicated by national account data, it cannot be reduced to a simple statistical artefact.

Graph 3: **Comparison of investment: the euro area versus the USA**

Real gross investment
(% of GDP)

Euro area

USA

Source: Commission services.

Real construction investment
(% of GDP)

Euro area [1]

USA
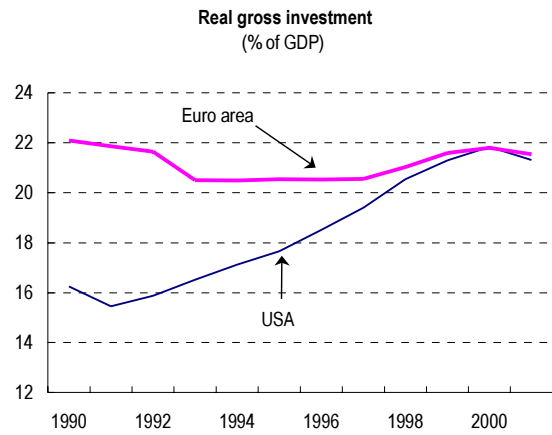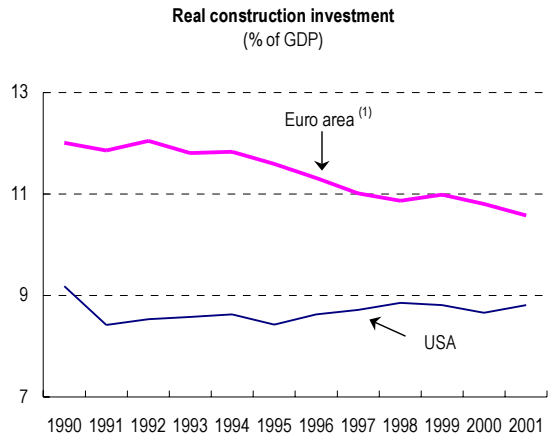
Source: Commission services. [1] Euro area is excl. B.

Real equipment investment ,
(% of GDP)

USA
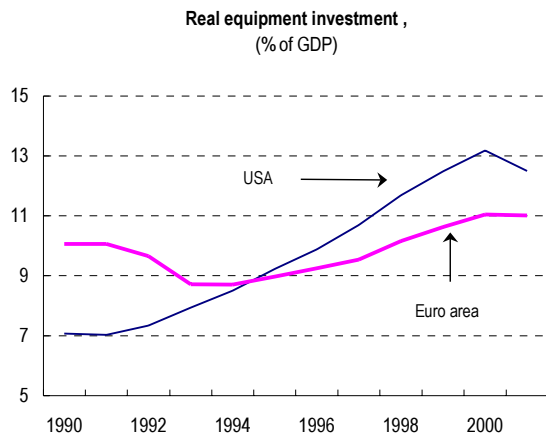
Euro area

Source: Commission services. *Euro area is excl. B.

Public investment ,
(% of GDP)

Euro area

USA

Source: Commission services.

Investment in ICT equipment
(% of GDP)

EU USA

Source: Commission services and REEDS .

Investment deflators in the USA
(1995 = 100)

Total equipment

ICT equipment
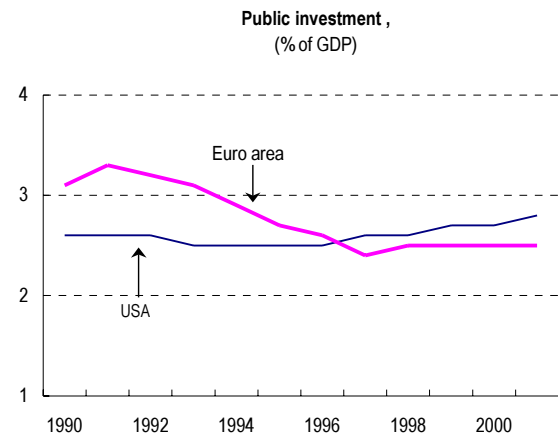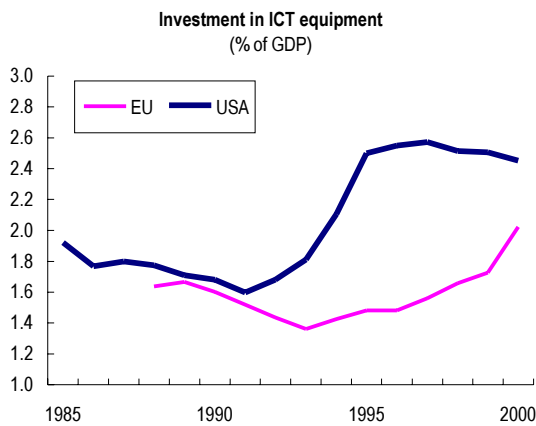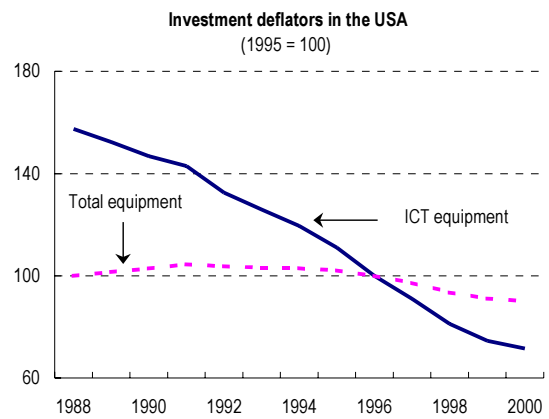
Source: Bureau of Economic Analysis.

With regard to the US business cycle in the 1990s, capital formation played a central role. On the demand side, investment accounted for a much larger share of growth in domestic demand than in the previous cycles. On the supply side, strong investment growth accounted for a substantial share of the acceleration of gains in labour productivity observed during the second half of the 1990s. Overall, the business cycle was largely investment and technology-driven in the USA in the 1990s, with massive spending in ICT accounting for much of the surge in capital formation. However important, ICT investment was not the only determinant of the US investment boom of the 1990s. ICT investment did not expand particularly rapidly, at least by historical standards, during the first half of the decade, a period which nevertheless registered faster growth in overall equipment spending than during comparable periods in the 1970s and the 1980s. Although ICT investment also contributed to growth in the euro area, the impact of technology on the business cycle was much more modest. National accounts data on ICT remain scarce in the euro area but slower growth in equipment investment indicates a more moderate path of development of ICT capital than in the USA.

A direct consequence of the surge in equipment investment in the USA in the 1990s was an acceleration of the pace of depreciation reflecting the fact that equipment capital has a much shorter average lifetime than construction capital. This effect is very strong for ICT equipment. Given that the average lifetime of equipment is much shorter for ICT (around 5-6 years) than non-ICT equipment products (about 20 years), the rising penetration of ICT is lifting the depreciation rate of equipment capital. Such a trend has been particularly clear in the USA in the 1990s (Graph 4). Hence, back-of-the-envelope calculations suggest that the progressive rise of the depreciation rate due to ICT in the 1990s may have accounted for an increase in the ratio of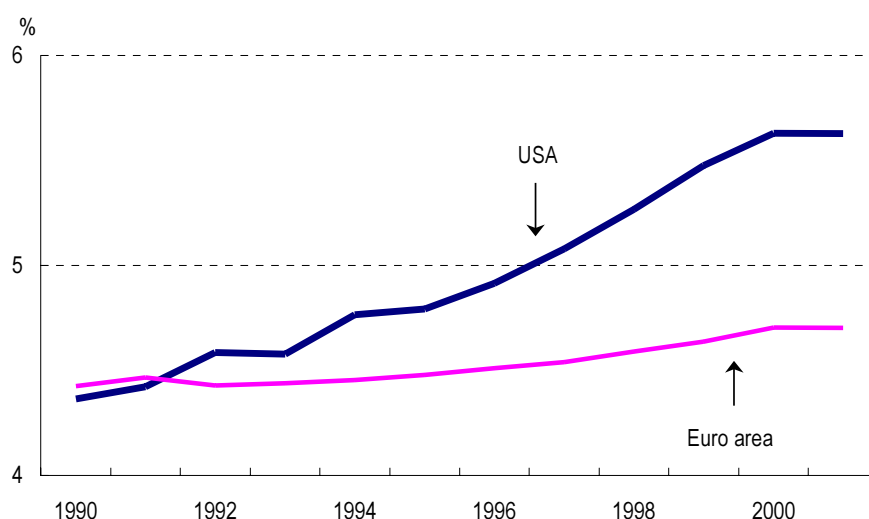 investment to GDP of 3 percentage points in real terms in the USA.[5] The depreciation rate increased only slowly in the euro area. Given the share of replacement investment in total investment, changes in the depreciation rate may have a significant bearing on investment growth.

Graph 4: **Annual depreciation rate of total capital stock, euro area and USA**

The impressive investment growth in the USA in the 1990s was not without its pitfalls. Part of this investment boom probably reflected the usual overestimation of the expected profitability of a new generation of capital, i.e. in this case ICT technology capital stock, in a sustained expansion and therefore the US economy is now suffering from severe excess capacity. A sharp drop in investment is currently the

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[5]   The depreciation data presented here are based on national accounts sources. National statistical institutes may use different depreciation rules and differences between the euro area and the USA should therefore be interpreted with prudence.

main driver of the US downturn. Capacity utilisation in the manufacturing has been at or below historical average since the second half of 1998. There has also been a remarkable divergence between the developments in corporate profits and investment in the late 1990s. The economy of the euro area is not plagued by such structural over-capacity problems. Despite slowing GDP growth, capacity utilisation remains close to its long-term average. Contrary to the USA, gross fixed capital formation has not spearheaded the current downturn but has reacted with a lag to the weakening of activity.

Box 1: **The measurement of investment in national accounts**

Investment as analysed in this chapter corresponds to the national accounts' concept of gross fixed capital formation. According to European System of Accounts (ESA) definition, gross fixed capital formation consists essentially of resident producers' acquisitions less disposals of fixed assets. It also includes certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units (e.g. natural assets, patents, purchased goodwill).

Until ESA 95, the concept of investment had traditionally been restricted to physical or tangible assets in national accounts. A major improvement brought by the ESA 95 standard introduced in the 1990s is the broadening of the coverage of fixed capital formation to encompass the acquisition of some forms of intangible assets. The main categories of fixed assets covered in ESA 95's definition of gross fixed capital formation are listed in the table below.

Despite some improvement, the treatment of intangible assets remains a major weakness of the measurement of investment in national accounts. Software accounts for much of the spending on intangible assets currently considered as investment while other critical assets, such as research and development, education and training, market research, advertising continue to be counted, at best, as intermediate consumption. As a result, the share of intangible investment in fixed capital formation remains low, at about 10 per cent in the euro area. Nevertheless, other statistical sources suggest that spending on R&D or education and training is nowadays much larger than spending on software. On some measures, the stock of intangible capital might even be larger than the stock of tangible capital in the USA (Mortensen 2000).

Another problem akin to the measurement of fixed capital formation is that international comparisons are sometimes difficult. In particular, there are significant differences between accounting practices in Europe and in the USA, both for the allocation of software spending between intermediate consumption and investment and for the measurement of investment deflators in the area of information technologies

Types of fixed assets covered in gross fixed capital formation (ESA 95)	
Tangible assets	Intangible assets
Dwellings	Mineral exploration
Other buildings and structures	Computer software and large databases
Machinery and equipment	Entertainment, literary or artistic originals
Cultivated assets (such as trees and livestock)	Other intangible fixed assets

Graph 5: **Foreign direct investment (FDI)**

FDI outflows by destination, euro area
(average 1996-99)

Other 28%

United Kingdom 27%

Latin America 13%

USA 32%

Net FDI outflows by destination, euro area
(average 1996-99)

Other 27%

United Kingdom 10%

Latin America 27%

USA 36%

Foreign direct investment, euro area
(in billion euro)

| | 1997 | 1998 | 1999 | 2000 |

■ Outwards ■ Inwards □ net
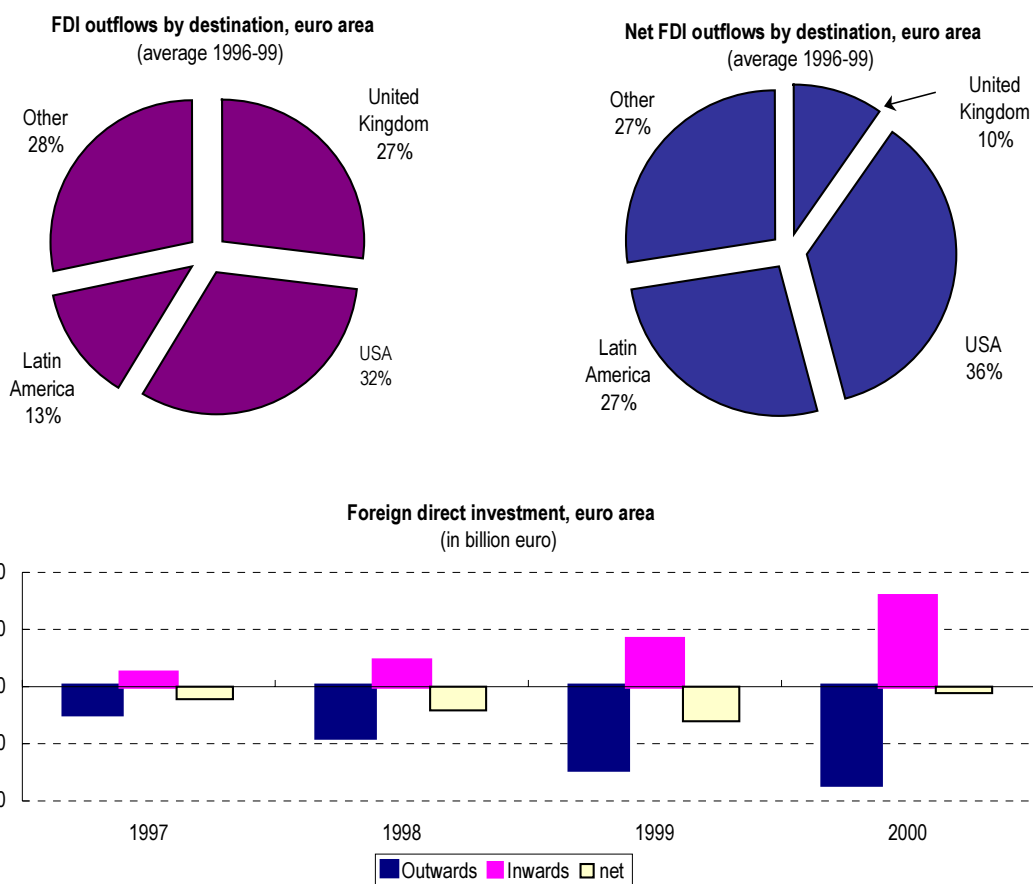
Source: Commission services and ECB .

Table 2: **Euro-area FDI outflows to the USA by industrial sector - in billion euro**

	1996	1997	1998	1999
Total	22.7	22.5	60.0	70.4
Manufacturing	8.9	3.9	37.1	18.5
Of which transport and equipment	0.7	0.1	28.8	2.6
Electricity, gas and water	0.0	0.0	0.1	14.9
Financial intermediation	6.9	11.4	12.1	19.7
Real estate and business activities	2.9	6.3	6.2	8.0

Source: Commission services.

2.3 LARGE OUTFLOWS OF FOREIGN DIRECT INVESTMENT

A remarkable feature of the euro-area economy in the past few years has been a high level of net outflows of foreign direct investment (Graph 5). Both outflows of FDI from the euro area and inflows into the region increased significantly during the second half of the 1990s, but the former substantially outstripped the latter. As a result, net FDI outflows from the euro area surged during the second half of the 1990s, averaging more than 1 per cent of GDP between 1996 and 1999. These FDI data indicate that investment by companies based in the euro area actually recovered much more strongly during the second half of the 1990s than what is suggested by national accounts data on business investment.

Large net FDI outflows may indicate that foreign investors perceive the long-run profitability of investment to be relatively low in the euro area compared to other regions. In this context, the c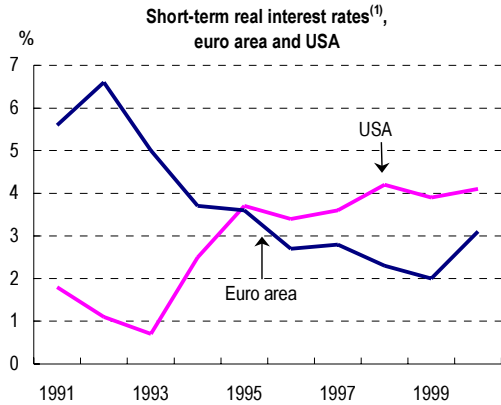ontrast with the USA is particularly sharp. Net FDI inflows financed 30 per cent of the US current account deficit in 2000, pointing *a priori* to large differences in expected returns on real long-terms investments in the USA and the euro area. Still, some prudence is required on the interpretation of the FDI developments. First, the euro area also benefited from a significant increase in FDI inflows during the second half of the 1990s, a fact which does not tally with a decline of the region's attractiveness to foreign capital. Second, in the late 1990s, FDI between industrialised countries took predominantly the form of mergers and acquisitions rather than green-field investment. As a result, FDI flows were strongly affected by a small number of large M&A operations, themselves reflecting global strategies of multinational corporations in a limited number of industrial sectors as much as regional differences in expected profitability. Furthermore, countries with comparatively large equity markets benefited from a strong advantage in attracting M&A and therefore FDI. In this context, the USA was much better positioned than the euro area.

The analysis of geographical and sectoral data confirms that the surge in net FDI flows in recent years was largely driven by specific strategies of multinational corporations in a limited number of sectors and geographical areas. These strategies had probably more to do with the need to acquire assets and to expand globally than with differences in expected profitability. The US economy was an important beneficiary of euro-area foreign investment during the second half of the 1990s but only in a small number of sectors. The increase in euro-area FDI outflows to the USA essentially reflected large M&A operations in the automotive equipment and utility sectors, combined with a steady increase of investment in financial and business services. In addition to the USA, Latin America and the UK also accounted for substantial shares of the rise in net FDI outflows from the euro area during the second half of the 1990s. Privatisation and the relaxation of regulations on foreign ownership boosted inward investment into Latin America. Large M&A operations in the telecom sector explain the sharp fluctuations in euro-area FDI with the UK in 1999 and 2000.

3. DETERMINANTS OF INVESTMENT IN THE EURO AREA

The overview of investment trends has illustrated the relatively poor performance of the euro area over most of the past decade, especially in comparison to the USA. The relatively slow pace of additional capital formation influences potential economic growth rates, in particular through future productivity growth. In this context the development of equipment investment is most important. Before assessing policy options to enhance the economic environment for investment, an analysis of the determinants of investment is required.

Graph 6: **Cost of capital in the euro area and the USA**

Short-term real interest rates[1],
euro area and USA

USA

Euro area

(1) Inflation based on GDP deflator.
Source: Commisson services.

Long-term real interest rates[1],
euro area and USA

USA

Euro area

(1) Inflation based on GDP deflator.
Source: Commission services.

Relative prices of equipment investment[1],
euro area and USA

Euro area

USA
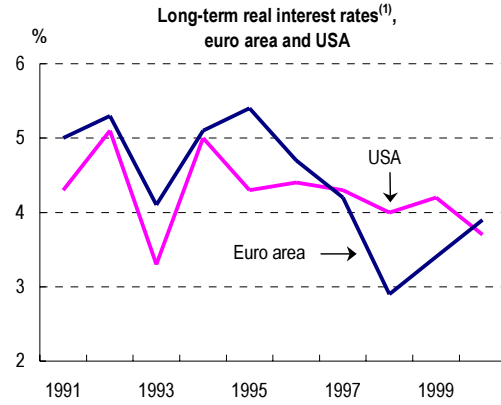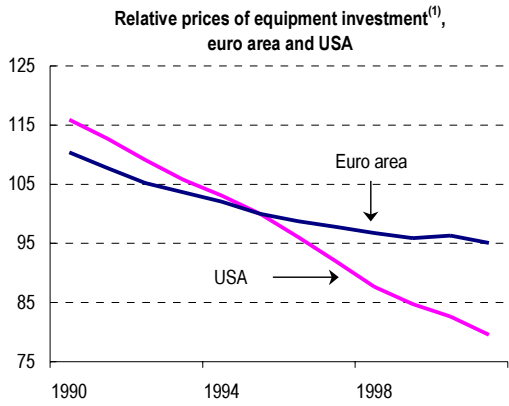
(1) Deflator of equipment investment divided by GDP deflator - base 100 in 1995
Source: Commission services.

Equity prices, euro area and USA[1]
(Base 100 in 1994)

USA
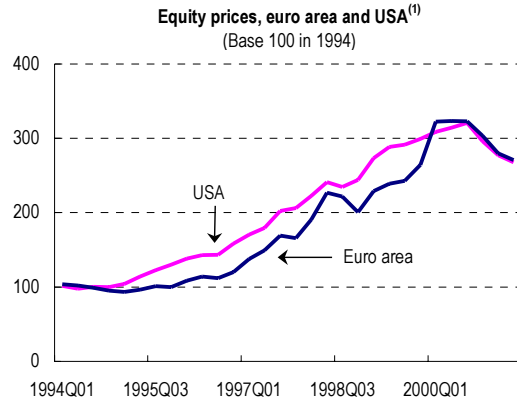
Euro area

(1) Dow Jones broad EURO STOXX index for the euro area and S&P 500 for the USA.
Source: ECB.

Bank lending rates to the corporate sector,
euro area and USA

USA

Euro area
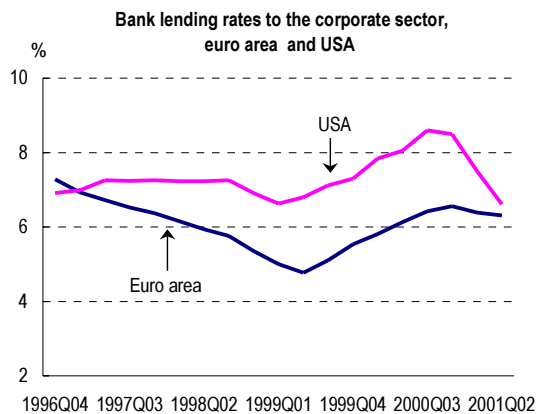
Note: Loans over 1 year.
Source: ECB and Federal Reserve Board.

Yields on AAA corporate bonds,
euro area and USA

USA

Euro area
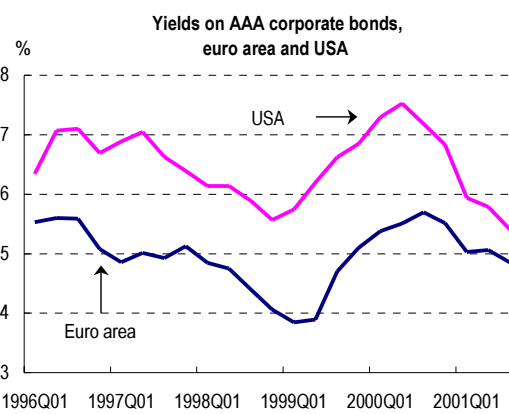
Source: Meril Lynch, Lehman Brothers.

Theoretical models generally point to aggregate demand, capital costs and profitability as main determinants of investment. However, the empirical literature reveals that underpinning the theoretical models with empirical support frequently encounters difficulties. Moreover, these traditional macroeconomic variables seem to have little explanatory power for the different investment performance in the euro area and the USA in the 1990s. Other factors seem to have played a role in these diverging developments. In order to shed some light on the driving forces behind investment expenditure, this section not only investigates the conventional macroeconomic determinants, but also reviews and assesses the underlying structural or microeconomic variables.

3.1 MACROECONOMIC DETERMINANTS

Theoretical models

The most straightforward macroeconomic model of investment is known as 'the accelerator model'. It simply postulates a relationship between investment and changes in output. As its theoretical foundation is rather poor, other models have been developed since the 1960s with a more solid microeconomic basis. The conventional assumption of the microeconomic foundation is that firms only invest if the expected *net present value* of an investment project is positive. Thus, before an investment project is undertaken, an assessment is made of the expected future revenues that this project would generate and this is compared to its costs. This indicates that factors that influence the expected costs and profitability of investment are crucial determinants.

The *neo-classical investment models* start from this basic assumption, translating the firm-level microeconomic elements to macroeconomic proxies. Economic theory points to three main macroeconomic factors for investment: aggregate demand, cost of capital and profitability. To incorporate the forward-looking nature of investment decisions, expectations are introduced, thereby creating dynamics in the models.[6] Tobin's Q models, using stock market valuations as a proxy for profitability expectations are most commonly used to this extent.

To model market imperfections, such as taxation and imperfect capital markets, extensions have been added to the basic neo-classical model. In practice, not all firms may have access to external finance. This liquidity constraint means that new investment expenditure may have to be financed out of current profits. Therefore, the role of current after tax profits as a determinant of investment can be much more important as it is a source of internal finance and not only an indicator of expected future profits. Other extensions have been added to take account of adjustment costs, planning and time-to-build lags, irreversibility and uncertainty. These imply lumpiness of investment, leading to thresholds and non-linearities in the relationship between investment and Q, affecting overall investment developments.

A glance at the main macroeconomic determinants

Consecutively, the three main macroeconomic determinants, aggregate demand, cost of capital and profitability will be assessed separately (Graphs 6-7). Thereafter, the explanatory power of the variables will be assessed more formally on the basis of regressions using panel data.

Firstly, concerning aggregate demand, the USA fared much better than the euro area in 1991-2000 with an average real growth of 3.3 per cent against 2.0 for the euro area. However, although the development of demand growth does explain part of the difference in investment growth rates, it does not provide an explanation for the diverging trends in the share of investment to GDP.

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[6] The basic *neo-classical model of investment* was introduced by Jorgensen (1963, 1971). For a Tobin's Q-model, see Hayashi (1982). For other extensions of the basic model, see for example Bertola and Caballero (1990), Abel and Eberly (1994), Dixit and Pindyick (1994).

Graph 7: **Trends in profitability in the euro area and the USA**
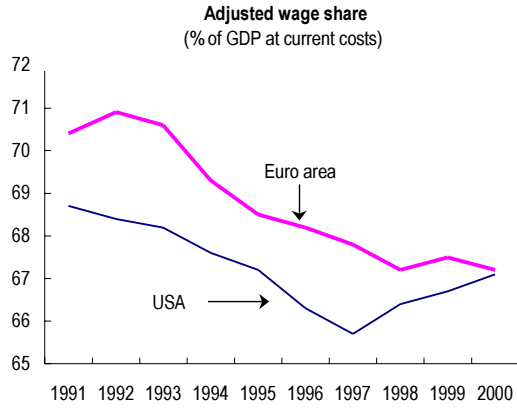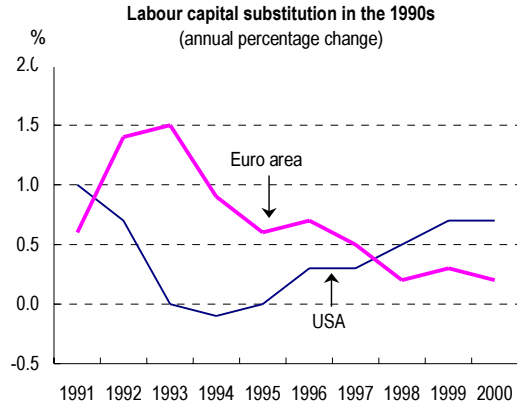
Adjusted wage share
(% of GDP at current costs)

Source: Commission services.

Labour capital substitution in the 1990s
(annual percentage change)

Source: Commission services.

Net return on net capital

Source: Commission services.

Difference between net return on net capital and real long-term interest rate

Source: Commission services.
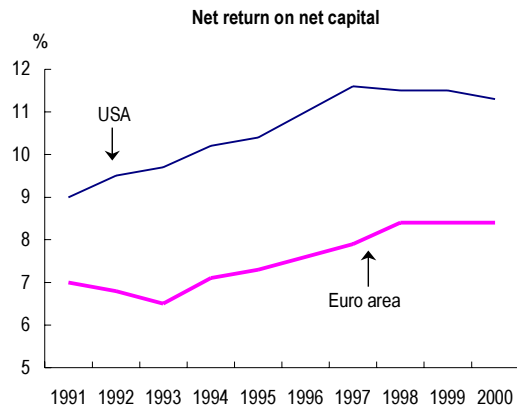
Earning growth embedded in stock prices [1]**, euro area and USA** (Index 100=1990)
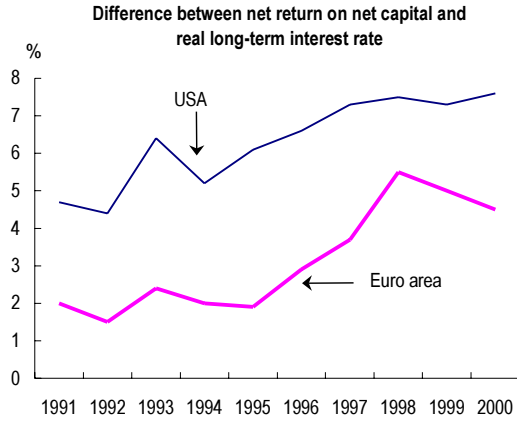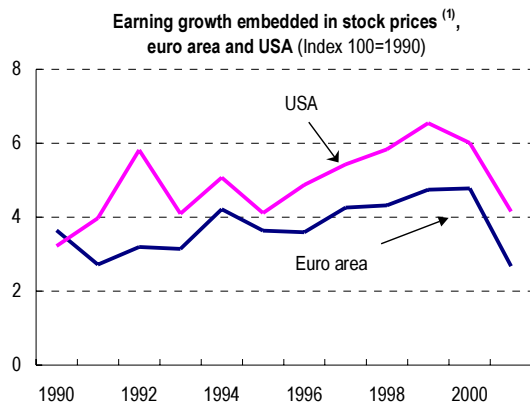
(1) Expected constant earning growth on the basis of existing price earning ratios and interest rates .
Source: Commission services.

Profit expectations embedded in stock prices

	Technology sector		Non-technology sector	
	Price-earning ratio	Implied real earning growh	Price earning ratio	Implied real earning growth
United States				
March 2000	51.3	7.7	21.0	4.9
April 2001	25.4	4.4	21.8	3.7
Europe				
March 2000	74.2	7.9	19.3	4.0
April 2001	29.5	4.4	16.5	1.8

Source: IMF (2001).

Secondly, the cost of capital decreased significantly both in the USA and the euro area during the second half of the 1990s. As explained in Box 2, the cost of capital can be decomposed in to different constituents, of which borrowing costs, the relative price deflator of investment and share prices are the most important. Yields on long- and short-term bonds are indicators of the borrowing costs. On average over the 1990s, yields on long-term government bonds were comparable in the euro area and the USA. Real short-term rates were much higher in the euro area during the first half of the 1990s but lower during the second half of the decade. More adequate indicators of true borrowing costs for the corporate sector are bank lending conditions and corporate bond interest rates. Data on corporate bonds and bank lending rates in the euro area unfortunately limited. However, information available since 1999 does not point to conspicuous differences between the euro area and the USA in terms of yields on corporate bonds. In addition, differences in terms of bank lending rates between the two regions have not been extremely large in the past few years.[7] Given the data limitations mentioned above, any comparison between the euro area and the USA over a longer period of time can only be made via the above mentioned standard macroeconomic interest rates such as money market and government bond rates.[8]

The second component of the cost of capital, the price deflator of investment, shows distinctly more favourable developments in the USA in the 1990s, as the downward trend was significantly more pronounced than in the euro area, especially for equipment goods and in particular ICT investment goods.[9] This is a crucial development insofar as the increasing penetration of ICT seems to have reinforced the link between investment spending and the capital cost (Box 3). Finally, equity prices, the third component of the cost of capital, have evolved in a fairly comparable way in the euro area and the USA over the past decade.

The third main macroeconomic determinant, profitability, provides only limited additional explanation for the US/euro-area divergences (Graph 7). The US economy has traditionally enjoyed a higher rate of return on capital than the euro area. The gap widened somewhat during the first half of the 1990s but has been narrowing since 1998. It is therefore difficult to attribute the superior investment performance in the USA during the 1990s to observed profitability developments. However, expected profitability may have been different from observed profitability. Differences in FDI flows between the USA and the euro area may, to some extent, reflect differences in long-term profit expectations in the two regions. This difference in expected profitability is backed by recent calculations made by the IMF.[10] On the basis of existing price-earning ratios, the IMF has evaluated the profit forecasts embedded in equity prices in Europe and in the USA. The calculations point to more optimistic profit expectations in the USA than in Europe for the non-technology sector in March 2000. The fall in stock prices which took place after March 2000 seems only to have widened the difference. In contrast, profit expectations in the technology sector were similar in the two regions both at the stock market's peak and in 2001. Similar calculations also show a widening gap in terms of profit expectations for all sectors (technology and non-technology) between the USA and the euro area over the 1995-2000 period.

Overall, a first assessment of traditional macroeconomic variables gives little insights that can explain the different developments in euro area and the USA in the 1990s. The relative price of investment goods is the main exception. Moreover, expectations might have played a role.

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[7]   Note, however, that bank lending rates in the euro area and the USA are not fully comparable.

[8]   In this context, note that, in the euro area, bank lending rates to entreprises for over 1 year are closely linked to a combination of money market interest rates and yields on long terms government bonds.

[9]   Some of this price gap may be attributed to different accounting practices in the USA and the Euro area with a more systematic use of hedonic pricing in the former country. Nevertheless, the gap cannot be reduced to accounting problems.

[10] See IMF (2001).

Box 2 : **The cost of capital**

The cost of capital constitutes one of the building blocks of the neo-classical theory of investment pioneered by Jorgenson (1963) and Hall and Jorgenson (1967). In the standard cost minimising model, the firm determines the optimal level of capital and labour necessary to achieve a given amount of output for a given set of factor prices. In this setting, the cost of capital, also sometimes referred to as the user cost of capital, is the total cost associated with the ownership and usage of one unit of capital. In it simplest form, the cost of capital covers three types of elements:

- the financial costs associated with the ownership of the capital stock;

- the losses due to the physical depreciation of the capital stock; and

- the changes in the price of the capital (a drop of the price is an additional cost to the owner insofar as it lowers the revenues from the sale of the capital stock).

Assuming that financial costs can be proxied by long-term interest rates, the cost of capital may be expressed as:

$$C_K = P_I \; \times \; (R - dlog(P_I^e) + \delta) \; / \; PGDP$$

C_K : real cost of capital
R: nominal long term interest rate
P_I : investment price deflator
$dlog(P_I^e)$: expected changes in the investment price deflator
δ : depreciation rate of capital
PGDP : GDP deflator

The graph below illustrates the development in the real cost of capital in the euro area and the USA with the further simplification that expected and actual changes in the investment price deflator are identical. In both the euro area and the USA, the cost of capital decreased sharply during the second half of the 1990s. Looking at the contribution of the various components, the decline was essentially driven by falling interest rates in the euro area. In the USA, it was more or less equally attributable to declining relative investment prices and real interest rates.

The real cost of capital, euro area and USA
(index 100 = 1990)
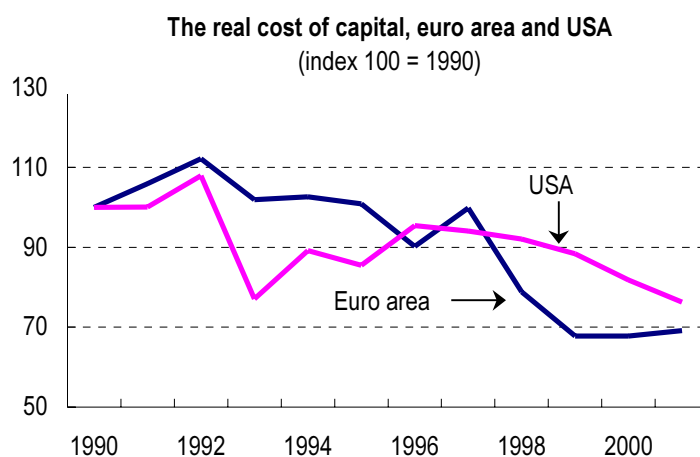
Source: Commissions services.

The above formula for the cost of capital is designed to be applicable to standard macroeconomic data. Nonetheless, it suffers from two major limitations. Firstly, it ignores that financial costs should reflect the cost of equity capital as well as borrowing costs. In this context, higher equity prices have a positive impact on the cost of capital. Secondly, it does not take taxation into account. In general, a decrease in taxes reduces the cost of capital.

Box 3: **Increasing ICT investment and the capital cost**

The increasing importance of ICT investment has a number of implications for total private investment demand, including a potentially higher sensitivity to capital cost or stock market fluctuations.

There is now a broad consensus that rapidly decreasing prices in the USA have been a key driver of demand for ICT equipment in the USA. ICT equipment prices declined by close to 9 per cent annually between 1995 and 1999 compared with 2.5 per cent for the deflator of equipment investment. Investment prices as measured by the deflator of equipment have decreased much less in the euro area than in the USA. This seems partly attributable to the use of different statistical methodologies. Nevertheless, the observed difference between euro-area and US prices cannot entirely be explained by accounting practices and probably also reflects a less steep decline of ICT prices in the euro area.

Although the impact of capital cost on investment is notoriously difficult to identify empirically, the importance of prices in the determination of ICT investment in the USA is backed by a study by Terlin and Whelan (2000). It suggests that ICT investment is more sensitive to price changes than non-ICT equipment investment. Real demand for equipment investment is modelled by breaking it down into two sub-components, computing and non-computing equipment. Each component is estimated separately. While spending in non-computing equipment is found to be mainly explained by fluctuations in GDP (the standard accelerator model), spending in computing equipment is found to be quite sensitive to the capital cost. The overall surge in spending in equipment in the 1990s therefore owes much to the rapid decline of computer prices.

Terlin and Whelan also offer a possible theoretical explanation for these observed differences in the responsiveness to prices. If the investment process is characterised by adjustment costs and uncertainty, the effect of changes in capital cost will depend on their perceived persistence. A decrease in capital cost will affect investment more substantially if it is perceived to be persistent rather than transitory. Given that technological change is driving the decline in ICT prices and ICT capital costs and given that technological change is generally unlikely to be reversed, drops in ICT capital costs may be considered as permanent. In contrast, changes in non-ICT equipment costs are largely determined by changes in interest rates which can be considered as more transitory. Moreover, the increasing importance of ICT is making the capital stock less subject to adjustment costs and delivery lags, thereby allowing it to respond more rapidly to changes in capital costs or other determinants. Such a trend may have important consequences for business cycle fluctuations.

On top of a higher sensitivity to capital cost, increasing penetration of ICT may also have modified the transmission mechanism between stock markets and investment. Using a VAR approach, Edison and Sløk (2001) conclude that private investment is more sensitive to changes in 'new-economy' than 'old-economy' stock market capitalisation. This differences is particularly large in countries such as Germany and France where old-economy stock market capitalisation has virtually no effect on private investment according to this specific model. It can be explained by differences in investment financing, with a more significance reliance on the stock market in the new-economy sector. Given the comparatively smaller size of the new economy as a producing sector, the impact of 'new-economy' stock market wealth remains smaller in the euro area than in the USA. Nevertheless, a rising share of the new economy in euro-area's output should enhance the sensitivity of private investment to stock market fluctuations even in the euro area.

A country panel approach to macroeconomic determinants

As a simple and direct test of the relative importance of macroeconomic variables explaining equipment investment expenditure, an investment equation with as explanatory variables profitability, relative investment prices and real interest rates, was estimated. Empirical analyses based on a sound theoretical footing, such as the (extended) neo-classical models, have long been largely unsuccessful at finding significant estimates for the responsiveness of investment to the cost of capital (here proxied by relative investment prices and real interest rates). Pitfalls, such as among others, simultaneity, capital market frictions and firm heterogeneity, seriously biased estimates based on traditional macroeconomic data. Since the 1990s, a number of new approaches have been proved more successful. The first change in approach that enabled finding a significant role for the cost of capital and overcome the econometric measurement problems, shifted the emphasis from aggregate to microeconomic data or focused on "natural experiments", such as tax reforms.[11] A second option to overcome the pitfalls is the use of country panel data.

This latter approach has been applied here. The focus is on equipment investment. A panel of data is formed consisting of annual data for 16 countries[12] for the period 1970 to 2000. To allow for country differences in the investment levels, fixed effects estimator are used. The dependent variable is the equipment investment to output ratio, while profitability, relative prices and real interest rates are included in the explanatory variables. This type of specification follows from the firm's investment rule in the q model of investment. In theory, the current and expected value of profitability, real interest rates and relative prices determine current investment. Assuming that expectations can be modelled as univariate autoregressive processes, then expectations, conditional on a current information set which includes current and lagged realisations of these variables, can be written as functions of current and lagged variables.

$$\frac{I_t}{Y_t} = a_1 PR_t + a_2 r_t + a_3 PIP_t$$

The investment to output ratio is a function of profits, the real interest rate and the relative price of investment goods.[13] The profit rate PR is defined as the ratio between the gross operating surplus adjusted for taxes and the total capital stock.[14] The relative price of investment goods PIP is the ratio of the deflator in investment in equipment relative to the GDP deflator and the real interest rate equals the nominal rate minus inflation as measured by the GDP deflator.

The sign of the coefficients a_i is straightforward. An increase in profitability induces firms to increase capital accumulation thus a_1 is positive. Since an increase in the real interest rate r increases capital costs a_2 will be negative. The sign of the relative price of investment goods a_3 is also negative in this model, as in conventional neo-classical investment equations.

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[11] See e.g. Caballero (1994) for the microeconomic data approach and Cummins, Hassett and Hubbard (1996) for a focus on "natural experiments", such as tax reforms.

[12] The panel consists of each of the EU Member States (except Luxembourg), Japan and the USA.

[13] Theoretically, the correct specification would have the investment to capital ratio as dependent variable. However, at the time of writing we have not been able to obtain a reliable series for the capital stock of equipment investment, and we therefore used the ratio of equipment investment to GDP here. We do not think our conclusions will be altered when capital is used as a scaling variable, as panel regressions using total investment as the ratio of the total capital stock gave very similar results.

[14] Note that, the major explanatory variable in the model is expected *future* profitability, while these regressions use current profitability under the assumption that expectations can be modelled as autoregressive processes.

Table 4 gives the estimation results for this panel estimation with fixed effects. As expected, the results indicate that investment is positively affected by higher profits and a fall in relative investment prices and negatively by higher real interest rates and higher taxes (column 1). A sustained increase in profitability rates by 1 percentage point would increase the investment in equipment share in GDP by 0.10 to 0.15 percentage point. Conversely, a similar change in relative investment prices or real interest rates would decrease the equipment share by about 0.05 percentage points. A correction for inflation in investment goods was added to the real interest rate variable, but this term proved insignificant. When instead of short rates, long-term interest rates were used, the coefficient became larger with a similar significance level, while the effect of profitability became smaller (column 2).

These traditional explanatory variables included in the regression appear to explain investment behaviour relatively well. Profitability, as measured by the operating surplus corrected for taxes, relative investment prices and the real interest rate seem to be the most important determinants of investment.

Table 4: **Estimation results of investment equation**

Dependent variable: ratio of equipment investment to GDP (I/Y)

Variable	(1) with short-term interest	(2) with long-term interest
Pr: Profits	0.140**	0.116**
	(0.059)	(0.056)
PIP: Relative price of investment goods	-0.048**	-0.051**
	(0.005)	(0.005)
R: Short-term real interest rates	-0.043**	-
	(0.015)	
RL: Long-term real interest rates	-	-0.084**
		(0.018)
R-squared	*0.34*	*0.35*
Sample size	*403*	*403*

Notes: Panel estimation with fixed country effects, period 1970-99. Panels (1) and (2): EU-15, Japan and USA.
* and ** indicate significance at the 10 per cent and 5 per cent level respectively. Newey-West corrected standard errors in brackets.
Source Commission services.

However, an analysis of the residuals shows that the panel regression underestimates USA investment in the second half of the 1990s. This indicates that other unexplained factors may have played a role in the USA. It confirms the evidence of the partial analysis in the previous section. The behaviour of the main macroeconomic variables does not explain the different developments in euro area and the USA in the past decade.

Whereas differences in macroeconomic developments cannot explain the different investment behaviour in the USA and the euro area, structural differences in sensitivity of investment to similar macroeconomic developments can still be at the origin of the divergence. The panel estimation described above can be extended to test whether there exists differences in the elasticities and sensitivity of investment in the USA relative to elsewhere. Extending the above analysis, by adding additional dummies to see whether the coefficients in the investment equation are different for the USA, can test this hypothesis.

If the response of investment to, say, profitability was stronger in the USA than in other countries, one would expect a US dummy-coefficient to be positive and significant. However, when this panel approach is applied, the results are inconclusive, not only because no variable is significant, but also because the coefficient for certain variables, such as profitability, appears to have the wrong sign. A smaller panel, consisting of only the euro area and the USA, does not improve the results.

It is worth stressing the limitations of the used approach. Regressions of this type ignore the role of expectations in the determination of investment, by focusing on current profitability, rather than expected future profitability. This assumption of adaptive expectations is most likely to be the source of the underestimation of US investment in these regressions.

3.2 MICROECONOMIC AND STRUCTURAL DETERMINANTS

The role of financial, labour and product markets

Structural rigidities seem to be at the origin of the rather poor performance of investment growth in the euro area in the wake of the rapid developments in the ICT-sector in the 1990s. Among those structural differences that can potentially explain the discrepancy in the investment performance between the euro area and the USA, financial development assumes a key role. In particular, stock market variables feature a positive relationship with investment growth in cross-country comparisons (Graph 8). Similar linkages exist for indicators of stock market size, liquidity and prices. Evidence in favour of the latter is not surprising as firms invest to increase profits and shareholders re-assess the value of firms according to changes in expected future profits. However, the USA did not outperform the euro area in terms of stock price increases in the 1990s, whereas it is endowed with the most liquid stock market. The available evidence so far suggests that stock markets as a source of financing are particularly important for enterprises in the ICT sector, which have been a main driver of investment growth in the USA.

Product market regulation seems to be another structural determinant that has an imperative effect on investment behaviour.[15] Indicators, constructed by the OECD to gauge differences in regulatory patterns across countries, consistently show that more restrictive regulation goes hand in hand with lower rates of investment growth. In particular, indicators linked to the extent of public ownership (size, scope of public enterprises and their corporate control), the state's involvement in business operation (price control, use of command and control regulation) and barriers to enterpreneurship (regulatory and administrative opacity, administrative burden on start ups and barriers to competition) are negatively linked with investment activity.

Finally, labour market rigidities may have held back investment in the euro area.[16] Indeed, the OECD Employment Protection Legislation indicator is negatively related to real investment growth. Other quantitative structural labour market variables point to the same direction, for instance the "tax rate on low wage earners" and the "duration of unemployment benefits".

Thus, there is some partial evidence that the incentive to invest has been weighed down by the more rigid product and labour markets in the euro area relative to those in the USA.

Econometric analysis of structural determinants

To determine whether other than the traditional macroeconomic factors play a significant role in the determination of investment, some additional variables were tested (Table 5). First, capacity utilisation was added to the regressions and found to be significant. However, when it is included, the profitability term becomes insignificant and wrongly signed. Profitability and capacity utilisation are strongly correlated. Therefore, adding capacity utilisation to the regression does not improve the overall fit of the equation. Variables that could capture *uncertainty* were tested as well by adding variability of the real effective exchange rates as an additional term in the regressions. Exchange rate volatility is measured as the quarterly variation in the real effective exchange rate (vis-à-vis 24 industrialised economies, using GDP deflators, and corrected for relative openness) within a year. This term is only weakly significant in the regressions.

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[15] Product market regulation affects economic activity mainly through its impact on transaction costs and on the appropriation of profits. Both transmission chains affect the costs of capital. Administrative opacity, for example, directly increases the costs of investment whereas regulations that reduce profit margins weigh on the entrepreneur's incentive to assume risks.

[16] Strict employment protection legislation makes it burdensome for entrepreneurs to lay off workers when investment decisions need to be reverted. Labour supply side factors have an effect on the incentive to take up jobs and the efficiency of job search. In consequence, a high reservation wage and a long duration of benefits may inhibit those forms of investment that require the hiring of low-skilled or specialised skilled labour.

Graph 8: **Structural determinants of investment**

Investment and financing through stock markets

Business investment, average real growth 1991-2000

New capital raised on stock markets, in per cent of GDP average 1991-2000

Source: Commission services.

Investment and product market regulation

Business investment, average real growth 1991-2000

Summary index of product market regulation

Source: OECD.

Investment and employment protection legislation

Business investment, average real growth 1991-2000

Employment protection legislation index

Source: OECD.

Table 5: **Estimation results of investment equation.**
Testing for additional determinants
Dependent variable: ratio of equipment investment to GDP (I/Y)

Variable	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Pr : profits	0.120* (0.073)	0.139** (0.068)	0.156** (0.056)	0.008 (0.092)	0.006 (0.094)	-0.005 (0.083)	0.121* (0.063)	0.086 (0.059)	0.063 (0.071)	0.126** (0.062)	-0.031 (0.073)	0.119** (0.061)
PIP : relative price of investment goods	-0.044** (0.005)	-0.044** (0.005)	-0.038** (0.005)	-0.050** (0.006)	-0.046** (0.005)	-0.041** (0.005)	-0.051** (0.006)	-0.046** (0.005)	-0.051** (0.006)	-0.048** (0.005)	-0.038** (0.005)	-0.053** (0.006)
R: short-term real interest rates	-0.039** (0.015)	-0.037** (0.015)	-0.040** (0.016)	-0.026 (0.057)	-0.054 (0.039)	-0.015 (0.047)	-0.041** (0.017)	-0.034** (0.017)	-0.027 (0.018)	-0.044** (0.016)	-0.037 (0.025)	-0.026 (0.017)
Capacity utilisation	0.020 (0.032)	-	-	-	-	-	-	-	-	-	-	-
Exch. Rate volatility	-	-0.279* (0.174)	-	-	-	-	-	-	-	-	-	-
Credit/GDP	-	-	0.577* (0.344)	-	-	-	-	-	-	-	-	-
Capital raised (stock markets)	-	-	-	0.095* (0.057)	-	-	-	-	-	-	-	-
Stock market capitalisation	-	-	-	-	0.019** (0.006)	-	-	-	-	-	-	-
Share price index / P	-	-	-	-	-	0.007** (0.003)	-	-	-	-	-	-
Debt / GDP	-	-	-	-	-	-	-0.004 (0.006)	-	-	-	-	-
Surplus / GDP	-	-	-	-	-	-	-	0.062* (0.034)	-	-	-	-
Tax burden / GDP	-	-	-	-	-	-	-	-	-0.049* (0.029)	-	-	-
Inflation volatility	-	-	-	-	-	-	-	-	-	-0.012 (0.030)	-	-
Econ. Senti-ment Indic.	-	-	-	-	-	-	-	-	-	-	0.178** (0.025)	-
NAIRU	-	-	-	-	-	-	-	-	-	-	-	-0.123** (0.012)
R-squared	0.34	0.35	0.31	0.43	0.45	0.43	0.40	0.42	0.37	0.40	0.45	0.43
Sample size	403	403	399	124	137	177	403	432	380	420	222	429

Notes: Panel estimation with fixed country effects, period 1970-99. Estimation of the covariance matrix robust to serial correlation. Panel : EU15, Japan and US ; except for (3) : EU15 and US. Due to data availability ,the estimation sample is much shorter for columns 6, 7, 8 and 13.
* and ** indicates significance at the 10% and 5% level respectively. Newey -West corrected standard deviation in brackets.
Source: Commission services.

Experiments with other microeconomic variables proved to be more significant. Credit to the private sector has the expected positive sign and is significant at the 10 per cent level. Coefficients on other financial variables appear also significant but at the expense of the profitability term and the real interest rate. Economic sentiment indicators which may reflect "animal spirits" of entrepreneurs are also found significant at the 10 per cent level. Fiscal variables such as budget surplus and overall tax burden, which may be proxies for the crowding out impact of fiscal policy on private investment behaviour, are significant as well. NAIRU is also found significant at the 10 per cent level, indicating the role of labour market flexibility in investment decisions. All in all, some of these microeconomic or structural variables seem to have an impact on investment behaviour via their effect on the "catch-all" profitability variable.

4. ENHANCING THE INVESTMENT ENVIRONMENT IN THE EURO AREA

4.1 THE BENEFITS OF INVESTMENT

Investment plays a crucial role both on the demand and the supply side of the economy. Gross fixed capital formation only accounts for about 20 per cent of GDP. It is, however, together with inventories, the most volatile component of domestic demand and therefore a key element of business cycle fluctuations. In a more medium to long-term perspective, gross fixed capital formation is a main determinant of the economy's supply potential. There are basically three channels through which investment affects the economy's supply side: firstly, it determines the size and the composition of the capital stock; secondly, it improves the diffusion of technological progress; and thirdly, it facilitates employment growth. Below, these supply side benefits of investment are discussed. Given that public investment is sometimes considered to play a special role in the capital accumulation process, the contribution of public investment to growth is also examined.

Graph 9: **Trends in capital stock**

Growth in capital stock, euro area and USA
(Annual percentage change)
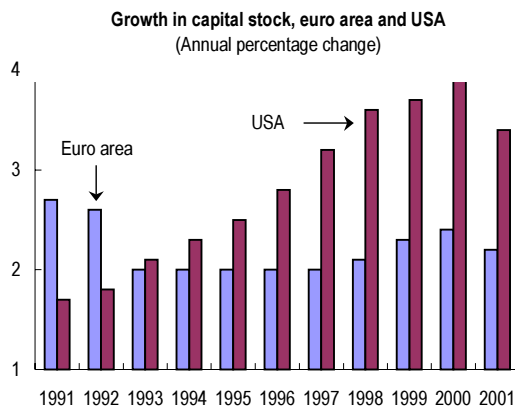
Source: Commission services.

Contribution of capital and labour to growth in the euro area
(annual average change in per cent)

	1986-90	1991-95	1996-00
GDP growth	3.3	1.5	2.5
Capital	0.9	0.8	0.8
Labour	0.9	-0.2	0.7
Total factor productivity	1.5	0.9	1.0
Growth in capital stock	2.5	2.3	2.2

Source: Commission services.

Capital stock per worker, euro area and USA
(Index 100=1995)

Source: Commission services.

Investment to capital ratio and unemployment rate
(Average change 1996-00 vs 1991-95)

$y = -3.2299x + 3.5396$
$R^2 = 0.5999$
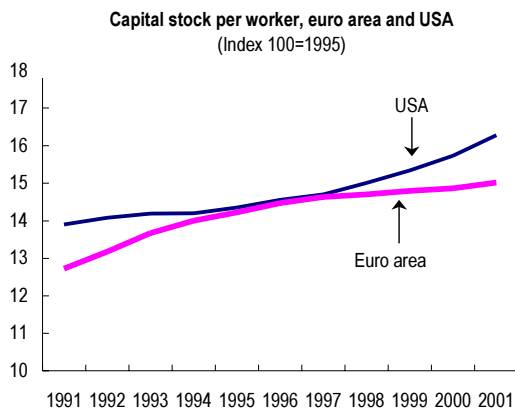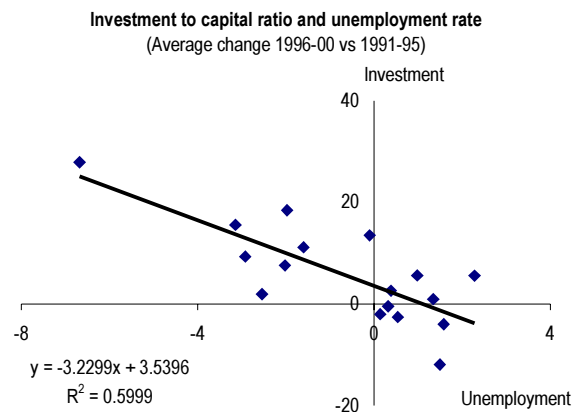
Source: Commission services.

Investment and the capital stock

There is no undisputed theoretical view of the contribution of capital to the supply potential. The role of capital formation in the growth process depends closely on the type of growth theory considered. In the standard neo-classical growth model, the main driver of growth is technical progress, which is considered to be fully exogenous. In this context, investment affects GDP only trough the direct impact of changes in the capital stock. As a result, the impact of an increase of the investment rate on potential growth remains relatively limited.

In the framework of the standard neo-classical growth model, the so-called growth accounting framework is a useful empirical tool to quantify the sources of growth. It relates changes in GDP to changes in labour, the capital stock and a residual, called total factor productivity (TFP), measuring technological progress. Such a growth accounting exercise for the euro area is presented in Graph 9. The direct contribution of capital to growth has remained broadly stable in the past 15 years, at slightly below 1 per cent.[17] This relative stability may seem surprising given the wide fluctuations of investment spending across the business cycle. It reflects, however, the fact that investment represents only a small part of the capital stock, more so if replacement investment is deducted.[18]

Investment and technical progress

Despite a deceleration in the 1990s, TFP remains the single largest contributor to GDP growth in the euro area. A strong contribution of TFP relative to capital and labour is a common feature of Western economies since World War II. From a conceptual point of view, the exogenous nature of the main source of growth may be considered as highly unsatisfying. Hence, many different types of models have been proposed to provide explanation, thereby reducing the size or even eliminating the TFP residual. Among these models, several tend to attribute a more prominent role to capital accumulation in the growth process, either for physical capital or for broader definitions of capital (i.e. including human capital).

The so-called vintage models constitute a particular class of these models. Vintage models rest on the assumption that technical progress is partly embodied in physical capital. In this context, investment affects GDP not only through its direct impact on capital stock, but also through the indirect impact of the capital stock on TFP. A younger (older) capital stock is associated with faster (slower) TFP growth. Hence, investment makes a more substantial contribution to the growth process in these vintage models than in the neo-classical model. Given the weight generally attached to the capital stock in production functions, the elasticity of GDP relative to the capital stock is relatively low in the standard neo-classical model, at about 0.35 in the euro area. It is much higher in the case of vintage models where the additional impact of investment on TFP may lift it to about 0.8-0.9.

To illustrate the respective contribution of investment to growth in the standard neo-classical and the vintage models, several scenarios of potential growth for the next years have been constructed for the euro area. Table 6 provides an assessment of the investment growth necessary to achieve an annual growth of potential GDP of respectively 2.5 per cent (moderate growth scenario) and 3 per cent (optimistic growth scenario) over the period 2000-10. Columns 1 and 2 of Table 6 are based on the assumption that the capital stock does not affect TFP (no vintage effect). In columns 3 and 4, capital affects TFP through a vintage model estimated at the European Commission.[19] All scenarios are based on the same projections in terms of labour supply. All in all, although there is clearly a lot of uncertainty associated with these calculations, this analysis suggests that to achieve sustained growth in the euro area, investment growth of 4-6 per cent per cent is necessary, according to the size of the link between capital and TFP.

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[17] However, in the 1960s and 1970s, this contribution was much higher.

[18] In 2000, total fixed capital formation represented less than 7 per cent of the capital stock in the euro area and net fixed capital formation less than 2.5 per cent.

[19] See Mc Morrow and Roeger (2001) for a discussion of the vintage model.

Table 6: **Investment required for sustained long-term growth in euro area**
(Annual growth in %)

	Without vintage effect		With vintage effect	
	Moderate growth (1)	Optimistic growth (2)	Moderate growth (3)	Optimistic growth (4)
Capital accumulation				
Investment	1.7	5.9	1.6	3.5
Capital stock	2.2	3.6	2.2	2.8
Investment/GDP[1)]	20.6	25.3	20.5	22.0
Contributions to growth				
Labour	0.3	0.3	0.3	0.3
Capital	0.8	1.3	0.8	1.0
TFP	1.4	1.4	1.4	1.7
Potential growth	2.5	3.0	2.5	3.0

[1)] The scenarios are based on the cautious assumption of employment growth of 0.5 % per annum. If employment growth were higher, thanks to accelerated labour market reforms, the contribution of investment to growth required to accomplish potential output growth of 3 % would be lower.

Investment and employment

The link between capital and employment is another important channel through which investment affects the supply potential. The concepts of equilibrium unemployment or NAIRU are frequently discussed without taking into account capital formation. Given that adjustments to the capital stock are slow, such an approach is valid in the short run. However, in a medium- to long-run perspective, the capital stock cannot be considered as fixed anymore. In this context, under rather general conditions, an increase of the capital stock increases the demand for labour, allowing for higher wages and a higher employment level.

In the euro area there was a relatively strong negative correlation between investment rates and unemployment in the 1990s. Correlation does however not imply a causal link. On the contrary, there is now a significant amount of empirical evidence backing the investment-employment channel described above. This channel explains the persistence of high unemployment in the euro area rather well, at least in the 1970s and the 1980s.[20] It is probably also one of the key mechanisms explaining the persistence of a low unemployment rate in the USA during the second half of the 1990s. As a result of fast growth in the capital stock, the second half of the 1990s was characterised by a substantial amount of capital deepening in the USA, with a rapid increase of the capital stock available per worker. This capital deepening was one of the causes of a substantial acceleration of gains in labour productivity and in real wages during that period. The channel is also backed by a recent empirical study carried out for the European Commission. That study identifies a causal link from investment to employment and concludes that 'a policy that encourages investment is good for both wages and employment'.[21]

The role of public investment

Factor accumulation can be directly enhanced by public investment in physical (infrastructure, human (education and training) and knowledge (R&D and innovation) capital. However, the growth-enhancing effects of public investment can be offset by the reactions of private agents. Empirically, there is no clear pattern associating the time evolution of the public investment ratio and growth, either in the long run or

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[20] See Blanchard (1998).

[21] See Pissarides (2001).

in shorter periods. Although preliminary analyses revealed a positive correlation between public investment and growth, more detailed studies suggest that the relationship between both variables is somewhat ambiguous. The positive insight is that there is also no clear evidence of long-run crowding-out effects between public and private investment. The correlation between both categories of investment, albeit very low, is not negative.

However, empirical evidence also suggests that public investment is subject to diminishing returns, so that as the stock of infrastructure capital increases, the effect of public investment on growth falls. It therefore turns out that a fall in public investment in countries with large stocks of infrastructure, as is the case of most EU Member States, may not have a pervasive effect on growth in the long run. Moreover, an increase in public investment may lower growth in the long run if it is financed through distortionary taxes and/or through deficit spending. This link has been confirmed by econometric analyses, showing for instance that the negative response of growth to distortionary taxation and to deficit spending is three times larger than the positive response of growth to public investment spending.

4.2 POLICY SCENARIOS TO ENHANCE THE INVESTMENT ENVIRONMENT IN THE EURO AREA

Focusing on structural policies

Based on the analyses in the previous sections, there seems to be both a need and a scope to improve the investment environment in the euro area. For a sustainable increase in economic growth, a significant increase in the rate of fixed capital formation is indispensable. To attain, for example, a sustained growth rate of 3 per cent in the euro area, a rate of investment growth of about 4 to 6 per cent per cent seems necessary, representing a significant acceleration from the average over the 1990s of about 2 per cent. Regarding the scope for enhancing the investment climate, evidence on the determinants of investment presented in Section 3, point to structural rigidities and structural differences with the US that could be tackled on a micro-level to increase profitability and reduce the cost of capital on the macro-level. The focus in this section will thus be on micro-oriented and structural policies, providing some insights on options for structural reforms that could be implemented in the coming years in order to further enhance the investment environment.

A number of illustrative scenarios are discussed in which different types of structural reforms that would boost investment in the euro-area economy are presented. Using the Commission's macroeconomic model QUEST, the impact of several possible structural reform measures is analysed, such as a reduction in corporate taxes, a product and/or financial market reform that increases competition, reduces monopoly rents and the cost of capital and finally a labour market reform scenario that lowers real wages.

All these measures could help directly or indirectly to enhance after-tax expected profitability of new investment or reduce the cost of capital, thereby raising fixed capital formation in the euro area. No scenario refers separately to more competitive and efficient financial markets, as the QUEST model does not incorporate a separate financial sector. However the impact on investment and growth prospects linked with more efficient capital markets are of the same order of magnitude as product market reforms.

The scenarios presented here are of a purely illustrative nature, describing the macroeconomic effects of such changes on the euro-area economy in general terms. A more rigorous quantitative assessment of the macroeconomic impact of specific reform measures would have to deal with precise assumptions on fiscal and monetary policy responses and falls beyond the scope of this section. The simulations described here merely serve to illustrate the effects of these types of measures on the euro area economy and in particular in boosting the investment to GDP ratio. As regards monetary policy, an inflation targeting regime is assumed. This is less restrictive than a fixed money supply rule when potential output expands as a result of these reforms. The long-run effects of inflation targeting and money targeting regimes are very similar though.

Table 7: **Policy scenarios 2010**

	Tax reduction with stable public deficit	Tax reduction with increased public deficit	Product market reform	Wage moderation
Total GDP	1.74	1.47	1.06	0.64
Capital stock	7.69	5.50	1.39	0.50
Private investment	16.70	11.15	2.97	1.12
Employment	0.39	-0.34	0.94	0.75
Real wages*	2.14	1.87	1.74	-0.08
Consumer price level	0.71	2.08	-0.17	-0.00

* Deflated by private consumption deflator.
Source: Commission services.

A corporate tax reduction accompanied by a government expenditure cut

The first scenario considered is a reduction of the average effective corporate tax rate by half. The tax reduction is accompanied by an equally large reduction in government expenditure, such that the deficit and the debt to GDP ratio remain roughly constant. The results of this simulation are presented in the first column of Table 7, as percentage deviations from the baseline scenario. The simulated corporate tax reduction increases the level of output, compared to the baseline scenario, by 1.74 per cent of GDP in 2010. Average annual growth is thus increased by almost 0.2 per cent.

This budgetary neutral tax cut lowers the overall tax burden, thereby raising profitability and positively affecting growth and investment. It thus has an impact on investment expenditure and consumption. The increase in expected after-tax-profitability increases investment spending directly. Through its effect on the value of equity wealth in total financial wealth held by households, it also stimulates consumption and further enhances investment via a surge in expected demand.

A corporate tax reduction with increasing public debt

To illustrate the effect of the fiscal policy assumption, the second variant shows the same reduction in corporate taxes without an accompanying reduction in expenditure (column 2 of Table 7). For a ten-year period, the debt to GDP ratio rises in this simulation. This rise in debt leads to an increase in the real interest rate and therefore reduces the size of the positive effects from this reform. Hence this simulation shows that, by comparison to the scenario above, the effect of a rise in government debt of this scale can be quiet substantial, which is in line with the positive impact of fiscal variables found in the previous section on determinants of investment.

Competition effects from product market and financial markets

The third simulation shows the effects of possible structural reforms enhancing product and financial markets functioning in order to increase competition and reduce barriers to entry. Examples of this are deregulation, liberalisation and the removal of entry barriers into sheltered sectors. These greater competitive pressures in product markets, while enhancing household demand via lower prices and higher quality, raise also the expected profitability of investment by forcing firms to restructure, so as to lower production costs. This simulation can also illustrate the potential benefits of more competitive and efficient financial markets which will diminish the cost of capital, while deeper markets facilitate access to capital for a larger number of firms, reinforcing investment potential.

The estimated increase in GDP (column 3 of Table 7) comes about by a reduction in the price cost mark-ups of 1 percentage point. As regards monetary policy, an inflation targeting regime is again assumed. Fiscal policy variables are kept exogenous in this scenario and the output expansion is thus accompanied by a reduction in deficits and debt ratios, reinforcing to some extent the positive effects from this product and financial market reform.

This type of competition-promoting reforms boosts not only investment but also labour demand. Both the capital stock and employment are higher than on the baseline. However, the implied reduction in mark-ups is relatively large, of an extent which has not been experienced by EU countries over the last decade. For instance, the estimated impact of the single market was a reduction in the mark-ups of only 0.5 percentage points, which would raise the investment-output ratio in the long run by 0.2 percentage points.

Wage moderation

The results of a labour market reform shock (column 4 of Table 7) on investment are also briefly discussed here. A fourth scenario simulates a labour market reform shock. A 1 per cent shock is given to the wage-setting rule. This ex-ante shock to real wages leads to a smaller fall in effective real wages in the medium-term, of around 0.5 per cent, as wages and prices adjust. In the long run, real wages return to their baseline level as unemployment falls. This wage moderation stimulates employment by increasing employment content of growth and boosts also output via the reduction in production costs, but has only an impact on investment via a higher profitability.

5. CONCLUSION

The investment recovery of the 1990s in the euro area appears somewhat subdued compared to the previous one in the 1980s. The relative brevity and a slower rate of expansion of capital formation is largely attributable to the mediocre performance of the construction sector and lower government investment. There is no clear evidence of a change in the equipment investment behaviour in the euro area after the 1993 recession. Nevertheless, equipment investment in the euro area has been rather lacklustre compared to the steady and marked recovery of equipment investment in the USA.

Traditional macroeconomic variables cannot explain these diverging developments of investment growth in the euro area and the USA in the 1990s. The results of a country panel approach that explains investment behaviour in general relatively well, confirm that unexplained factors have played a considerable role in the USA in the second half of the 1990s. Diverging expectations about future profitability, related to structural differences between the two areas, have probably played a role. Thus, structural rigidities seem to be at the origin of the lacklustre performance of investment growth in the euro area.

There is both a need and a scope to improve the investment environment in the euro area. Hence, structural reforms such as a reduction in corporate tax, increased competition in product market and more efficient financial market should be actively pursued. A corporate tax reduction accompanied by a government expenditure cut seems the best possible fiscal policy to create a more investment-friendly environment. When the tax reduction is not accompanied by expenditure cuts, adverse effects through the real interest rate limit the effectiveness, resulting also in a negative employment effect. Competition effects of product market and financial market reform can also boost investment. Labour market reforms leading to wage moderation stimulate more the employment content of growth than directly investment.

All in all, the implementation of these reforms can help to reach a sustainable increase in euro-area medium-term growth prospects. For instance, to attain a growth rate of 3 per cent in the euro area, a rate of investment growth of about 4 to 6 per cent per year seems necessary, which represents a significant acceleration from the 2 per cent average over the 1990s.

6. REFERENCES

BLANCHARD, O. (1998), "Revisiting European unemployment: unemployment, capital accumulation and factor prices" *NBER Working Paper* No 6566, May 1998.

CABALLERO, J. (1999), "Aggregate investment", in *Handbook of macroeconomics*, Vol. 1B 1999, pp 813-862.

CASELLI, P., PAGANO, P. AND F. SCHIVARDI (2000), "Investment and growth in Europe in the United States in the nineties", *Termi di dicussione* No 372, Banca d'Italia, March.

CHIRINKO, R.S., FAZZARI, S.M. AND A.P. MEYER (1999), "How responsive is business capital formation to its user cost? An exploration with micro data", *Journal of Public Economics* No 74, pp 53-80.

CREPON, B. AND F. ROSENWALD (2000), "Investissement et contraintes de financement : le poids du cycle', *Document de travail INSEE*, G 00/5, June.

CREPON, B. AND C. GIANELLA (2001), "Fiscalité, coût d'usage du capital et demande des facteurs : une analyse sur données individuelles", *Document de Travail INSEE*, G 01/9, June.

CUMMINS, J.G., HASSET, K.A. AND R.G. HUBBARD (1994), "A reconsideration of investment behaviour using tax reforms as natural experiments", *Brooking Papers on Economic Activity* No 2, pp 1-74.

CUMMINS, J.G., HASSET, K.A. AND R.G. HUBBARD (1996), "Tax reforms and investment: a cross-country comparison", *Journal of Public Economics* No 62, pp 237-273.

DE LONG, J.B. AND L.H. SUMMERS (1991), "Equipment investment and economic growth", *Quarterly Journal of Economics*, pp 445-502.

EDISON, H. AND T. SLØK (2001), "New economy stock valuations and investment in the 1990s", *IMF Working Paper* No 78.

EUROSTAT (1996), *European system of accounts – ESA 95*.

HARHOFF, D. AND F. RAMB (2001), "Investment and taxation in Germany – Evidence from firm level panel data", in Deutsche Bundesbank ed., *Investing today for the world of tomorrow – Studies on the investment process in Europe*, Springer-Verlag, Berlin.

HASSETT, K.A. AND R.G. HUBBARD (2001), "Tax policy and investment", in A.J. Auerbach ed., *Fiscal policy: lessons from economic research*, Cambridge MIT Press, pp 339-385.

HUBBARD, R.G. (1998), "Capital-market imperfections and investment", *Journal of Economic Literature*, No 36, pp 193-225.

IMF (2001), "International capital markets- developments, prospects and key policy issues" Washington D.C.

JORGENSON, D.W. (1967), "The theory of investment behaviour", in *Determinants of investment behaviour*, Universities-National Bureau Conference Series No 18, Robert Ferrer ed., NY Columbia University Press, pp 129-55.

JORGENSON, D.W. (1963), "Capital theory and investment behaviour", *American Economic Review*, May, 53(2), pp. 247-59.

LANDEFELD, J.S. AND B.T. GRIMM (2000), "A note on the impact of hedonics and computers on real GDP", *Survey of current business*, Bureau of Economic Analysis, December.

MC MORROW, K. AND W. ROEGER (2001), "Potential output: measurement methods, 'new' economy influences and scenarios for 2001-2010 – a comparison of the EU and the US", *EC DG ECFIN Economic Papers* No 150.

MORTENSEN, J. (2000), "Intellectual capital: economic theory and analysis" in P. BUIGUES, A. JACQUEMIN and J.F. MARCHIPONT (eds.), *Competitiveness and the value of intangible assets*, Edward Elgar Publishing.

PISSARIDES, A.P. (2001), *Patterns of employment-enhancing economic growth, optimal sectoral structure of labour productivity, capital-labour substitution and employment growth*, Report for the European Commission.

ROWTHORN, R. (1999), "Unemployment, capital-labour substitution, and economic growth" *IMF Working Paper* No 43.

SCHREYER, P. (2000), "Information and communication technology and the measurement of volume output and final demand – A five country study*", Economics of innovation and new technology*.

RONDI, L., SACK, B., SCHIANTARELLI, F. AND A. SEMBENELLI (1998) "Firms financial and real responses to monetary tightening: Evidence from large and small Italian companies", *Giornale degli Economisti e Annali di Economicia* No 57 (April), pp 35-64.

STEIN, J.C. (2001) "Agency, information and corporate investment", *NBER Working Paper* No 8342, June.

TERLIN, S. AND K. WHELAN (2000), "Explaining the investment boom of the 1990s", *FED Working Paper* No 11, Federal Reserve Board, Washington.

VERMEULEN, P. (2000) "Business fixed investment: evidence of a financial accelerator in Europe", *ECB Working Paper* No 37, November.

WOLFF, E.N. (1996), "The productivity slowdown: the culprit at last? Follow-up on Hulten and Wolff" *American Economic Review*, (86) 5, pp 1239-1251, December.