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*Directorate-General for Research*

WORKING PAPER

# **Public and Private Investment in the European Union**

*Economic Affairs Series*  
*ECON 113 EN*

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## EXECUTIVE SUMMARY

(1) This study evaluates the individual policy areas of public investment, private investment, product market reform, and labour market reform and also the respective roles which these policies play in promoting economic and employment growth. The main concentration of the study, however, is on the role of investment. The study also attempts to elicit the enhancing role of public investment in increasing the effectiveness of private investment in productive assets. Comparisons are made between the European Union and the US and between a number of European countries. The period over which the comparisons are made is generally the 1990s, with some reference made to earlier historical periods.

(2) The study presents a statistically-backed analysis of the sets of economic variables and policy measures described and their relative importance in relation to the promotion of economic growth and employment growth. The study does not provide an econometric analysis to support the conclusions drawn, though this does not invalidate the conclusions. However, econometric testing related to the endogenous growth models and associated factors which form the theoretical basis of this study has been evaluated. Some tentative policy recommendations are made, together with suggestions for further empirical, econometric analyses. There were the usual problems accessing satisfactory, primary data, particularly on a comparative basis, whether from Eurostat or from OECD sources. The data on public investment is not well-developed or in a form which readily lends itself to empirical analysis. For these reasons secondary data from other studies has been used.

(3) It should be noted that in conducting the study and in framing the conclusions the author has attempted to avoid a simplistic approach to the relatively contentious policy issues involved. Positions which assert that labour market reform is the *only* solution to the current unemployment problems are misleading in that they ignore the need for a substantial number of *new* jobs to be created, and tend to be insufficiently specific in indicating which reforms are required in which countries. Equally, calls for Keynesian-type demand stimulation through deficit financing as the *only* mechanism for resolving the unemployment problem give less weight than is necessary to the need for fiscal stability and tend to under-value the need, on a continuous basis, for structural reform. The general approach taken in this study, and the conclusions derived, based on the empirical analysis, is that private and public *investment* in productive assets, in supporting infrastructure, and in technical progress are an intrinsic part of a supply-side policy approach to economic reform aimed at sustainable economic and employment growth. But that such an approach will *fail* to achieve its objectives if it is not accompanied by *on-going structural reforms* of labour markets, product markets, and, lastly but importantly, capital markets. The requirement for a successful economic policy overall appears to be an appropriate *policy mix*, aimed particularly at supporting and maintaining high levels of investment.

(4) The use of the US performance and policies as a benchmark is apposite, given that, during the 1990s, the US has been seen, in relation to some key aspects of its performance, though not all, as the economy which has been the most successful in achieving sustained economic growth, high levels of employment, and flexible product, capital, and labour markets. It is also the case

that, given the US position as a large single currency area, future comparisons with the Euro-11 will be even more relevant.

(5) During the 1990s, and particularly during the past six years, the US has recorded significantly higher economic growth and lower unemployment than the European Union. There appear to be a number of factors which explain this impressive, superior performance during this period. A recent European Commission paper analysed some of the factors involved and concluded that it was possible to explain the differential performance as follows: *real wage growth* in recent years has been lower in the Eur-11 than in the US (under half on average between 1995 and 1998); that *monetary policy* during the relevant recession year and for the two years thereafter was substantially tighter in the EUR 11 than in the US, whether measured by the yield curve or by short-term real interest rates, and that, while *budget deficits* during the three years preceding the recession year were higher in the EUR 11 than in the US, it was the *timing* of the adjustment of the deficit which appears to be the explanatory factor, with the US *increasing* the deficit during the recession year and the year following, whereas the EUR11 *decreased* the deficit in the recession year and the year following. In relation to the evaluation carried out in this current study these differences seem to have led to *relatively* higher investment, public and private, in the US than in the EUR 11, over the corresponding periods during the 1990s.

(6) However, it is also relevant to observe, going beyond the factors explored in the Commission paper, that the capital stock in manufacturing and in services in the US was strongly augmented in the period 1990-1998, as was, importantly, investment in research and development. Hence, the role of *private investment* has made a major contribution to the sustained economic growth in the U.S. during the 1990s. The latest figures produced by Eurostat indicate that the contribution of investment to GDP growth between 1990 and 1997 was *37% in the U.S.*, as against 9% in the EUR-11 and 7% in the EUR-15. The role of public *investment* in the US has also been a strong element in ensuring the continued growth of the US economy and during the late 1990s is increasing and running at almost *double* the level in the EU, despite substantial reductions in US Federal defence expenditure. Moreover, the augmentation of the capital stock was accompanied by a strong growth in the labour supply, in terms of hours worked in the manufacturing sector and, importantly, also in terms of *more jobs* in the services sector. The importance of *capital-widening* investment, stimulating the growth of the labour supply in the services sector in particular, is another important element in the nature of growth-sustaining investment in the US, and more generally. It is also relevant to observe that the services sector increasingly employs new technology and may not simply be represented as creating low-skilled jobs. (NB The use of the term 'skilled' is becoming misleading, derived as it is from the manufacturing sector. It is not clear that jobs in the services sectors which deal with customers and require inter-personal skills should be regarded as low-skilled occupations.)

(7) It may be concluded from the comparison of Euroland with the US that the raising and maintaining of high-levels of capital stock (including human capital) has been an important factor in explaining the high-level of economic growth in the US during the 1980s; *together* with the increases in labour supply and, in particular, the *flexibility* of the labour force in moving from the manufacturing sector into the services sector and in applying new technologies and high-levels of interpersonal skills within the services sector. A dynamic, *fluid* labour market, as well as an

expanding capital stock, is seen as a pre-requisite for *sustained* economic and employment growth. This empirical evidence is linked in this study to a suggested variant of endogenous growth models which incorporates technical progress variables in relation to investment in physical capital, in human capital, and in relation to the labour factor. A *key issue* for policy-makers, whether in relation to fiscal policy or monetary policy, is the basis of their estimates of the output gap as it evolves through time. The OECD reliance on a strong NAIRU/NAWRU element in calculating this key policy variable produces estimates of the output gap which are *too low*. US policy-makers in the 1990s (ref. Alan Greenspan) appear willing to accept higher estimates (similar to alternative European Commission estimates, see 1999 Annual Economic Report) and, hence, to base policies on the expectation that investment will continuously alleviate capacity restraints.

**(8)** The preponderance of SME's in the services sector, combined with the existence of an extremely wide and dynamic capital market as US appears to be a further contributory factor in stimulating investment in the services sector. However, further statistical analyses would be required, comparing the economies of European Union and the US, to establish the strength of this proposition.

**(9)** Very little empirical, or theoretical, work has been done to establish the role of *public investment* in the economy, and particularly the potential *leverage* role of public investment in terms both of rendering private investment more productive and in terms of stimulating more private investment in productive assets. Such relationships are plausible to postulate and examining such statistics as are available seems to confirm that correlations exist. Again the strong argument, to be tested by econometric studies, is of a mutually re-enforcing relation between public investment and economic growth, though it should be noted that public investment (as with private investment) does not *cause* economic growth. Nonetheless, when public investment augments the capital (including human capital) stock this *permits* economic growth to be sustained, via the easing of the capacity restraint on the economy, providing also that the effective labour supply is similarly augmented. The role of public investment in removing important 'bottlenecks' - by creating and improving infrastructures; by easing qualified manpower restraints via investment in human capital, and, crucially, by stimulating technical progress via investment in research and development - is as important as private investment as a mechanism for sustaining economic and employment growth. Certainly, it is interesting to observe that during the 1990s, despite substantial reductions in Federal defence expenditure, public investment in the US actually increased and, indeed, has remained, throughout the second half of the 1990s, at approximately double the percentage of GDP as in the EU. One singular, but important, difference between public and private investment lies in the fact that public investment is *discretionary*, and is not therefore dependent on *expectations* of economic growth, as is private investment. This means that it *can* form part of a stability-oriented policy.

**(10)** Product market reform - which broadly encompasses product market competition and liberalisation and trade liberalisation; stimulating innovation and technology via tax incentives and venture capital; and improving entrepreneurship by reducing 'red-tape' for business start-ups and easing regulatory and financial constraints on SME's and removing constraints on developing the services sector - has an enhancing effect on economic and employment growth, but it is

difficult to quantify. Moreover, *providing* European economies remain 'open' - both within the European Union, via the further development of the Single Market, and externally via continued trade liberalisation - it is not clear that an inadequate pace of product market reform represents a current, major barrier either to economic growth or to employment growth. However, this is with the proviso that the present rate of progress in product market reform in the European Union is not permitted to slow down.

**(11)** Labour market reform needs clear specification as to which measures are required in which countries. Labour market reforms include reform of: tax and benefit systems; working time flexibility, active labour markets policies, skills training, and wage formation systems. In all cases the overall aim is to provide a more dynamic, *fluid* labour markets which enables rapid movement within the labour market and from unemployment into employment. Such overall fluidity has been indicated by this study to be a *necessary* accompaniment to sustained augmentation of the 'broad' capital stock, if economic and employment growth is to be achieved. Moreover, if the employment (not job) security provided by the European social model is to be retained then the concentration of European governments would appear to be on measures which increase the flexibility and dynamism of labour markets, as in the US, rather than on measures which *simply* to make it easier to fire workers. Nor should wage formation reforms impede either the need to reflect differential relative wage gains in line with differential productivity changes or neglect the essential role in sustaining economic growth which is played by private consumption, based on *moderate*, real wage development. Crucial among the reforms, again in comparison with the US in the 1990s, appears to be the work-based training and education of the workforce in new technologies, so enabling technical progress to lift the overall rate of growth rate of the economy.

**(12)** Finally, the conclusions derived from this study suggest that the Broad Economic Guidelines - taking account also of the contribution of the ESCB in developing, and the ECB, in implementing the Euro-area monetary strategy - should be concerned to establish the appropriate *macro-economic policy mix* as well as promoting the *on-going* structural reforms of product, labour, and, not least, capital markets.



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## 1. APPROACH OF STUDY

### 1.1 Objectives

1.1.1 The objectives of this study are:

- ◆ to assess, *quantitatively*, the contribution to economic and employment growth of private investment;
- ◆ to assess, *quantitatively*, the contribution to economic and employment growth of public investment;
- ◆ to assess, *qualitatively*, the contribution to economic and employment growth of product market reform;
- ◆ to assess, *qualitatively*, the contribution to economic and employment growth of labour market reform;
- ◆ to assess, *qualitatively*, the relative contribution of broad of policy measures relating to these economic variables and aimed at supporting economic and employment growth.

1.1.2 The final assessment attempted is of clear relevance to the formulation of the Broad Economic Guidelines, and hence a section on the implications of the conclusions of this study for the formulation of the 1999 Guidelines is included.

### 1.2 Restrictions

1.2.1 The principal restriction on this study has been the limited time and resources available to carry out the work. This has entailed some compromises in the approach to the study. Secondary data rather than primary data sources have been used and the analysis has had to be based on a variety of other secondary sources without the opportunity to rigorously re-examine some of the propositions. Moreover, it was clearly not possible to subject the propositions advanced to a complete econometric analysis, though as indicated in 1.3.1 below, this does *not* invalidate the conclusions of the study. In any event, the results of previous, relevant econometric testing of growth models, particularly endogenous growth models, and other factors on which this study has been based, have been considered and reference made to them where appropriate. The study was further restricted by the desire of the European Parliament's Economic and Monetary Affairs Committee (EMAC) to have a strong, though not exclusive, focus on investment, particularly public investment. Hence the sections of the report on product market reforms and labour market reforms are more limited than those on investment.

1.2.2 Notwithstanding the constraints placed on the study, one advantage of the restrictions has been to enable a broader approach to be taken to the comparative analysis than would have been possible with a narrower remit. It is hoped, therefore, that some of the conclusions may be easier to translate into policy prescriptions, with further validating econometric work to be carried out by others subsequently.

### **1.3 Methodology**

1.3.1 Because of the combination of the breadth of the study - encompassing public investment, private investment, product market reform, and labour market reform - and the limited resources and time available to carry out the study, it will clearly not be possible to produce a fully quantified analysis based on an econometric approach. However, it should be noted that, for a variety of technical, statistical reasons, econometric models are less reliable than is commonly supposed. It is worth remarking that, as in all fields of empirical, scientific analysis, the conceptual framework and the testing methodology interact with the data testing itself. Hence, the need for a robust conceptual model, closely related in an intuitive manner to the real world, rather than an esoteric theoretical model subjected to over-sophisticated econometric testing.

1.3.2 The theoretical framework of the study is based on a variant of the endogenous growth models which underpin economic policy development among European Union countries and in the United States. The key element in all such models - as opposed to the neo-classical, Solow-type models which they have generally replaced - is the role of investment in enabling the long-run growth rate of the economy to be permanently raised. In the theoretical framework adapted for this study the variants proposed includes placing importance on the integration of technical progress in all three terms - physical capital, human capital, and labour of the production function. The importance also of capital-widening investment, particularly in the services sector, is stressed. Finally, it is argued that augmentation of the labour supply is a necessary accompaniment of the augmentation of the, broad, capital stock if economic growth is sustained. The theoretical bases of the analysis are derived from the substantial technical literature (see Bibliography) and from the author's own theoretical analysis.

1.3.3. The empirical methodology adopted is to select key sets of variables in the main areas of study and compare the European Union (including in some cases individual EU countries) against the US as an external comparator. The principal period over which the comparative evaluation is made is the period from 1990 to 1998. This period is selected because the US in this period has seen a strong growth and employment performance accompanied by high levels of private and public investment and flexible and dynamic product and labour markets. This combination appears to have eased expected capacity restraints on economic growth, and enabled a long period of sustained growth to occur in the US.

1.3.4. The main statistics used are at macro-economic level. Some comment is made on issues connected with the differences between economies, and particularly when comparing the EU with the US, in relation to the relative proportions of services and manufacturing. This is relevant for two reasons. First there is a considerable difference between the USA on the one hand and Germany on the other hand as far as the structure of the two economies are concerned. This is likely to be masked in any comparison between Euroland or the European Union and the USA. Secondly, the European economies are characterised by an increasing proportion of GDP being taken up by services, as is already the case in the USA. (Within the European Union, during the 1990s the UK moved substantially closer to the US in this regard and further away from the EU average). Hence, if, for instance, part of the success of the US economy during the 1990's is

because of strong investment in the services sector then this will be an important pointer for the European economies in the future.

1.3.5. The decision to examine mainly the large countries was made principally because smaller countries inevitably show greater proportionate variations in output and other statistics than larger countries and they are also far more 'open' economies in terms of their trade than large countries.

1.3.6. The issue of the 'openness' of the economies being compared is relevant to the validity or otherwise of the comparisons. For instance, the impact of any significant reduction in labour costs is likely to be amplified in a relatively open economy because of the positive effects on exports. This may be the case for the Dutch and the Irish economies during the 1990s.

1.3.7. Every attempt has been made to assess the relevance of various factors which may have an impact on the comparative analysis. Hence, though this has not been done in any formal quantitative sense the evaluation has been made as rigorous as possible.

1.3.8. Finally, in general, statistics have been taken from Eurostat, European Commission, or OECD sources to provide a common basis for the evaluation. Reference has been made to internal papers of the European Commission (with their permission) to supplement the author's own study analysis; reference has also been made to papers from the OECD, the US Federal Reserve Board, and the Bank of England. Of particular value have been the set of papers from a 1997 edition of the Oxford Economic Review. Further methodological information and an indication of other sources of data and analysis used by the author is provided in the Annex 1.

## **1.4 Presentation**

1.4.1 The presentation of the study has been, first, to explain the background to the study, in relation to the overall situation and in particular the relative weight which might be given to policies on investment and those on structural reform. The background situation in each of the four policy areas evaluated in the study are then described.

1.4.2. The next section examines the area of private investment and indeed of investment generally. The first sub-section analyses in theoretical and empirical terms the nature and role of private investment and investment generally in relation to economic and employment growth. This sub-section also indicates the theoretical underpinning of the study in terms of endogenous growth models. There then follows a sub-section which examines and compares the level and growth of private investment among the European Union countries and the US during the 1990's, with some reference to earlier periods. The final sub-section then draws some conclusions from the primary and secondary data sources and econometric studies discussed in the preceding two sub-sections.

1.4.3. A similar mode of presentation and evaluation is used when dealing, in the next three sections of the study report, with public investment, product market reform, and labour market reform.

1.4.4. The next section discusses the link between the conclusions arising out of the study and the Broad Economic Guidelines.

1.4.5. The final section of the study report discusses the overall conclusions derived from the evaluations of the data and analysis contained in the study.

1.4.6. Finally, there is a bibliography of primary and secondary data and other study, sources plus some technical notes.

## **2. BACKGROUND**

### **2.1 Overall Situation**

2.1.1. This study is relevant to the current debate in the EU concerning the appropriate macro-economic policy and structural policy actions required - in the circumstances of: a slow-down in growth; the need for a sustained period of economic and employment growth and the development of the third stage of economic and monetary union. For a start, it is common ground that what is required is a low inflation, investment-led period of growth. Hence, the need for productive investment, public as well as private, is acknowledged. Moreover, it is also common ground that structural reform, as an on-going process, needs to be intensified, in capital, product, and labour markets.

The issues appear to concern the emphasis to be placed on macro-economic policy as opposed to structural reform.

2.1.2. In evaluating the respective roles of public investment, private investment, product market reform, and labour market reform this study will take account not only of the situation in the economic policy areas compared examined, but also the policy development suggested by the results of the evaluation.

2.1.3. In terms of the establishment of the appropriate policy mix, EMAC will be concerned to ensure that this is communicated clearly in its discussions with the ECB in terms of monetary policy and the Commission, the Economic and Financial Committee, and the Council of Economic and Finance Ministers (Ecofin) in terms of macro-economic policies set in the context of the Broad Economic Guidelines. This study's conclusions will, it is hoped, be helpful in these areas of policy debate and development.

### **2.2 Position on Private Investment**

2.2.1 Private investment has been in severe decline during the whole of the 1990s, though over the last two years it has seemed to 'bottom out'. Nonetheless it will require a sustained period of substantial investment growth to recover to the rates of annual growth and levels in relation to GDP which this study suggests will be required to achieve and to sustain economic and employment growth such as that experienced in the US in the 1990s. In the Euro-11, the ratio of investment to GDP has fallen from 22% in the early 1990s to 18.5% in 1998.

2.2.2. It is also the case that investment is considerably lower than in previous periods of high economic growth accompanied by low levels of employment, eg the 1960s or more recently the second half of the 1980s. There are of course variations between member states. For instance, though the EUR-15 figure for the ratio of gross fixed capital formation to GDP was 18.9% in 1997, the range between countries varies from Sweden (14.1%) to Portugal (25.6%). NB Too much should not be read into these raw figures for individual countries whose circumstances vary considerably; for instance Portugal is in a

period of 'catch-up' growth, whereas Sweden is a mature economy. However European averages over longer periods can be more informative.

### **2.3 Position on Public Investment**

2.3.1 During the 1990`s government expenditures among European Union countries have declined as a share of GDP. However, the fall in public investment has been considerably more severe, from 3 percent in the early 1990`s to just over 2 percent on average, though this masks very considerable differences between national performances.

2.3.2 Private investment, as indicated in 2.2. above, showed similar weakness for the first half of the 1990s, but is now recovering and forecasts suggest that private investment in real terms will increase by 4 to 5 percent in both 1998 and 1999. For private investment to be fully effective in generating output growth and employment, it must be accompanied by the appropriate development of infrastructure via public investment. Increased public investment is therefore essential for the competitive performance of the European economy.

2.3.3 Obviously some part of the fall in government investment is because of the transfer of expenditure from the public to the private sector. (Around 25% of the reduction in government investment in the United Kingdom over the period 1993 to 1997 can be explained by the shift into the private sector). However, governments retain a large and crucial role in the direct provision of various kinds of infrastructure, e.g. roads, schools and also in spending on human capital, e.g. research and training programmes.

2.3.4 One key issue is how to ensure the parallel development of public investment supportive of private investment, and yet maintain the budget discipline required by the Maastricht Treaty and the Stability and Growth Pact.

### **2.4 Position on Product Market Reform**

2.4.1 Product market reform at EU level has been a matter of priority since the late 1980s. The Single Market reform programme, recently intensified, has provided a strong momentum for structural reform in this area.

World trade liberalisation and other global factors have added not only to the urgency for the reform process, but also to intensifying pressures on business and on governments to achieve ever increasing levels of competitiveness. Nonetheless, there are significant gaps in the area of reform of national and EU-level product market structures and dynamics.

2.4.2 In particular there are two areas where product market flexibility seems essential if economic performance is to be enhanced. **First**, the services sector must be allowed to develop without undue regulation or hindrance. It is clear that in some member states there are barriers to the development of certain elements of the services sector.



**Second**, the information technology and communications technology sectors must also be allowed to develop freely and rapidly in the context of the global markets in which they now operate. Further liberalisation of these sectors will be required in some EU countries if this goal is to be achieved. Both of these sectors, while important in their own right, are also important in relation to the development of what is being called the 'network' economy, including electronic commerce.

## ***2.5 Position on Labour Market Reform***

2.5.1 Labour market reform has been suggested as the main plank of the structural reform programme of the EU. Whatever weighting may be appropriate to this area of structural reform it is clear that all EU governments are committed to pursuing measures to improve the flexibility and dynamism of their labour markets. This study will attempt to identify, as far as is possible given the methodology adopted and the resources available, the contribution made by labour market factors to economic performance. Some measures are directly targeted on improving economic performance, whereas others may be seen as measures aimed at alleviating social exclusion and reducing over-reliance on welfare benefits, but also having an impact on the labour market.

2.5.2 Some EU countries may lay claim to good performance in a number of areas of labour market reform. This study is not concerned to analyse in any detail specific reform measures. The aim is to examine the role which the provision of incremental growth of the quantity and quality of labour plays at macro-economic level, as a key factor in economic and employment growth. Hence, the issue of how this provision may best be achieved is a more detailed issue and no judgement is made on this aspect.

2.5.3 Notwithstanding the above points, the study will attempt to assess, qualitatively, the relevance of the outcomes of labour market reform measures in enabling the labour supply, quantitatively and qualitatively, to enhance and complement investment in physical and other capital in its role in the economic growth process.

## INVESTMENT

### 3. PRIVATE INVESTMENT

#### 3.1 *The Nature and Role of Private Investment*

3.1.1 Clearly the principal role of private investment is to augment the capital stock of productive assets held by the private sector. The two main motivations are replacement of the existing capital stock and the creation of additional capital stock embodying new technology. (It should be noted that in this context 'new' will not always mean latest, but it will be new to the firm investing).

3.1.2 Nowadays, it is common to include human capital in this definition, with not standing some problems in estimating and manipulating the notion of human capital. Human capital is, in essence, the embodiment of investments in education and training in the workforce, including managers and entrepreneurs, and in society more generally.

3.1.3 In national accounts, investment in stocks/inventories is reported and represents a strong cyclical element in the make-up of national income varying directly and inversely with the level with level and rate of change of demand. In this study this component of investment is not considered. It may be noted in passing that modern 'just in time' production techniques may be tending to reduce the amount of stocks held in the economy)

3.1.4 The physical capital stock is broadly divided into two components, i.e. the structures (buildings, sites, etc) and equipment (machinery, transport, etc). Some studies on investment have attempted to isolate investment in equipment, with this being regarded as the key element in influencing short-run (or in some endogenous growth models long-run ) economic growth.

3.1.5 Essentially, current economic models relating to investment may be classified into two categories<sup>1</sup>. Neo-classical models, which regard technology as given (i.e. exogenous to the model, and therefore, determined *outside* the model) and where investment *does not* increase the rate of long-run growth. The production function of the conventional neo-classical model may be represented as:

$$Y = TK^a L^b \quad (a+b=1; 0 < a < 1)$$

where Y is output, K is physical capital, L is labour, and T is a 'scaling' factor representing the level of technology or total factor productivity<sup>2</sup> T is determined *outside* the model and long-run growth is independent of investment which is subject to diminishing returns, i.e. a is less than 1.

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1 There are also neo-Keynesian models, but these generally are neo-classical in relation to long-term growth with short-term price and wage 'stickiness' grafted on to the underlying model.

2 Total factor productivity is that part of value-added in output which is not specifically attributable to the capital and labour factors themselves, i.e., is either not captured when determining the contributions of these factors and/or is attributable to technical progress.

3.1. Endogenous growth models which regard technology as influenceable (i.e. endogenous to the model and, therefore, determined *inside* the model) and where investment either in research and development and training, or in some variants 'broad capital' (including human capital), *does* increase the rate of long-term growth. The production function of an 'endogenous innovation' model may be represented as:

$$Y=CK^a L^b D^c (a+b+d=1)$$

Where C is a constant and D represents innovation, embodied in intermediate goods. Labour can be used in research to generate constant returns; by virtue of spillover effects. It thus can enhance D where growth represents growth in total factor productivity, but in this case from *inside* the model.

3.1.7 It is not the purpose of this study to examine the various models and the contentions surrounding them. Econometric studies provide ambiguous support to a variety of positions. Nonetheless, there are some conclusions which may be drawn from the current state of the theoretical and empirical debate and can inform policy-making. One of the key considerations is the role played by technical progress in growth and, if endogenised, how should it be treated.

3.1.8. It is clear, for instance, that there is a *correlation* between economic growth and investment or, more strictly, between the capital stock and its augmentation. However, this does not necessarily mean that if investment in productive assets is increased that economic growth will increase. Indeed, the direction of causality (for instance, when subjected to Granger-Causality tests which take into account leads and lags) appears to be in the *opposite* direction, i.e. economic growth leads to higher investment.

3.1.9 The most plausible explanation of the relationship would appear to be that economic growth will lead to increased investment and a larger capital stock (including human capital) - because clearly entrepreneurs are more likely to invest if they expect demand for their products to increase - and that a larger capital stock *will permit economic growth to continue* as the capacity restraint on the economy will be relaxed. However, it will be necessary that the augmentation of the capital stock is accompanied by an increase in labour supply. An increase in capital stock alone will not be sufficient condition to alleviate the capacity restraint on the economy. Indeed, in the short-term the capacity restraint may be released simply by an increase in the labour force participation rates, whether workers are taken from the unemployed or by increasing the size of the available working population. The reason is that more intensive and better use (by improved working methods) of the existing capital equipment will secure increased capacity and, hence, increased short-run growth rates.

3.1.10 The position taken in this study is that not only does technical progress need to be endogenised into the model, but that to explain its impact it needs to enter into the three separate factors in the model, i.e physical capital, human capital, and labour.

3.1.11 There is also a separate issue relating to investment in physical capital. The augmentation of the physical capital stock should be regarded as having two components: capital-deepening

(where capital replaces labour), and *capital-widening* (where both capital and labour increase). In empirical terms the distinction may be broadly reflected in investment in equipment, on the one hand, and on investment in non-residential construction on the other. However, more broadly, it may be reflected in investment in manufacturing (capital-deepening) and investment in services (capital-widening). Capital-widening will not, in general, increase the capital/output ratio of the economy.

3.1.12 Technical progress should, it is suggested, enter into the production function of the economy as a component of physical capital (i.e. embodied technical progress); human capital (i.e. education, research and development, and entrepreneurship), and labour (new technology skills). In this way technical progress may be fully (or almost fully) endogenised. In empirical terms the three areas should be identifiable in statistics, though not without some difficulty.

3.1.13 The production function appropriate to the above suggested model will be of the form

$$Y = EK(a + x + d)H(b + q)Lc$$

$$(a + x + d) + (b + q) = 1$$

Though here technical progress is not represented, as in traditional Solow-type neo-classical growth models, as a separate factor, its impact is indicated in the exponent of each factor, though, in the case of the labour factor, technology skills are not held to have externalities. Note also that capital-widening, represented by  $x$ , is also held to offset, to an extent, diminishing returns. Overall, therefore, the capital term exhibits constant, not diminishing returns to scale. Total factor productivity, the, theoretically, measurable aspect of technical progress, is (as in the well-known Rebelo model) subsumed in the model.

3.1.14 In the next sections of this study the empirical evidence for such correlations will be examined. For the time being it is worth observing that is counter-intuitive (though not necessarily wrong) to suggest that augmentation of the capital stock has no effect on the *long-run* growth rate, particularly if accompanied by increases in labour supply. The suggestion in 3.1.9 tends to be supported by the theoretical and empirical observation that an increase in *the productive capacity of the economy and augmentation of technical progress/total factor productivity* are the keys to raising short-run *and* long-run growth. If, therefore, it can be shown in comparisons between the US and the European Union in the 1990s and/or historically within the EU - that the productive capacity of the economy increases as both capital and labour are augmented, via associated investment in technical progress and in human capital, then there will be demonstrated, at least a prima facie case, for the type of policy mix followed in the US during the 1990's to be adopted within the European Union.

3.1.15 There are some other relevant observations to be made if inter-country comparisons are to be used. First, strictly, one should adjust for the differing structures of the economies, and in particular for the proportion of the economy taken up by the services sector. This is relevant when comparing the US economy with the Euroland economy. Three issues arise. First, measurements, both of the productivity in the service sector and of the augmentation of the capital stock in the

service sector will be less well-defined and more difficult to measure at the level of national accounts. Second, the impact of investment and of capital utilisation will be less in the services sector than in the manufacturing sector, and equally, the importance of the augmentation of the labour supply into the services sector will be greater than in the case of manufacturing, particularly in terms of new jobs. Third, and more generally, the economic and monetary dynamics of different economies may themselves differ, at least in respect of reactions to policy measures. This problem may be partially obviated by making longer term comparisons, as is done in this study, but this procedure may not completely eliminate the impact of the differences.

3.1.16 Second, though it may be thought that the amount of capital equipment per worker will be a key factor in stimulating economic growth, this may not, of itself, be a sufficient explanation. For instance, the UK economy tends to have a relatively comparable equipment per worker levels with other countries, but low amounts of buildings per worker. This may relate to a lack of *capital-widening* investment, particularly in the services sector. One explanation may be that an unwillingness to invest in extra buildings will constrain the capacity of sectors and so limit any growth even when the utilization of existing or new equipment has increased via an increase in hours worked. Further expansion would require the creation of extra *jobs*.

### **3.2 Comparisons - European Union Countries and United States, 1991 - 1998**

3.2.1 The levels and growth of private investment, and other macro-economic variables, in the European Union and the US are set out on the various tables below, and in the statistical annex.

3.2.2 It should be observed that the structure of the US economy is dominated by the services sector. The EU economy, and particularly, the German economy within it, has a larger manufacturing sector. As the value of physical capital in manufacturing is, overall, higher than that in services than one would expect the size of the capital stock and the rate of its augmentation to be less for the US than for the EU. As the rate of investment is linked - though by no means proportionally - to the size of the physical capital stock.

3.2.3 Similar observations may be made in relation to individual EU countries, where, of course, size variations are considerable.

3.2.4 Most of the figures are taken from OECD sources in order to achieve comparable results. However, internal EU figures from Eurostat and from the European Commission have been used for some of the internal EU tables. The main information provided relates to the 1990's, but some tables refer to longer periods or at least to benchmark years from earlier periods.

3.2.5 Investment in human capital and particularly in research and development is not easy to quantify, but the tables provided give some idea of the level and growth rate such investment.

3.2.6 In relation to investment the statistical examination provides some evidence of *correlation* between investment, sizes of capital stock, and growth and employment, and the monetary policy stance.

3.2.7 The augmentation of the total physical capital stock in the US over the period 1991 to 1998 was at an annual average of 5.6%. The corresponding figure for the same period for the augmentation of the stock of machinery and equipment was an average annual increase of 7.8%. The comparable figures for the Euro area were 0.8% and 1.4% respectively.

3.2.8 However, a more instructive comparison may be made by splitting 1990s into two periods: 1991 to 1994 and 1995 to 1998. Table 3.1 indicates the comparisons between to US and the EU 11 over the two 4-year periods during the 1990s, and for comparison during the 1980s. There has been a welcome recovery of investment in the EU during the second half of the decade. However, the overall level of investment compares unfavourably with that of the US during the 1990s. The comparative figure for private consumption has also been included. Further evidence of the relative roles of investment and consumption in economic growth in the US and in the EU during the 1990s is provided by the latest Eurostat figures.(Table 3.2). The contributions to GDP growth from 1990 to 1997 were 65% in both the EUR-11 and EUR-15 and 71% for the U.S. However, the comparative figures for investment are substantially different, with the EUR-11 figure at 9%; the EUR-15 figure at 7%, and the U.S. figures *at* 37%.

3.2.9 The evolution of the monetary policy stances in the U.S. and in the EUR-11 are interesting to note from Table 3.1. Both in relation to timing, linked to the recession years, and in relation to both the average levels of real short-term interest rates and yield gaps and the minima and maxima for these two indicators of the restrictiveness or otherwise of the monetary policy stance. Table 3.1 indicates that the minimum real short-term interest rate in the US was 0.4% in 1993, following a 0.8% rate in 1992, the year following the US recession year. The minimum rate in the EUR-11 was 2.2%, some *five* years after the EUR-11 recession year. The average rate in the US for the four years following the recession year (1991) was 1.9%, despite a rate 'hike' to 3.9% in the fourth year, 1995. The average rate for the EUR-11 was 3.2%, some 68% higher.

3.2.10 The ECB, in its March Bulletin, also analyses real short-term rates, historically and as between Germany and the US, using Germany, essentially, as a surrogate for the EUR-11. Its conclusion draws attention to the fact that the current EUR-11 rate (2.2%) is lower than the German rate for the 1990s (3.2%); lower than the German rate for the entire period 1960 - 1998 (2.8%), and lower than the current US rate (3.2%). However, these comparisons - meant, presumably, to take away pressure for further rate cuts - *entirely ignore the key comparison*, i.e. that during the 1990 - 1998 period the German rate was 3.2% compared with the *lower* US rate of 2.3%. The ECB also ignores the significant point that, during the entire period 1960 - 1998, the *only* period when the yield curve (i.e. the long-term rate minus the short-term rate) was *lower* in the US (+0.9%) than the German yield curve (+1.3) was also from 1990 - 1998. As has been indicated, it was during *this* period when investment levels and economic and employment growth in the US substantially exceeded that of the EUR-11, including Germany.

**Table 3.1 Macroeconomic Developments: US and EUR-11 (1990 - 1998)***(in percentages)*

	1990	1991	1992	1993	1994	1995	1996	1997	1998
<b>UNITED STATES</b>									
<i>Real GDP Growth</i>	1.2	-1	2.8	2.4	3.7	2.6	3.6	3.8	2.5
<i>GDP Deflator</i>	4.3	3.9	2.7	2.7	2.2	2	1.5	2	2
<i>Short-term interest rates</i>	7.8	5.5	3.5	3.1	4.7	6	5.5	5.7	5.6
<i>Yield curve</i>	0.8	2.6	4.2	2.7	2.4	0.6	0.9	0.6	-0.1
<i>Real short-term int. rate</i>	3.3	1.6	0.8	0.4	2.4	3.9	3.9	3.6	3.6
<i>Net returns on net capital</i>	7.9	7.7	8	8.3	8.7	8.9	9.4	9.7	9.6
<i>Real long-term int. rate</i>	4.1	4.1	4.9	3	4.8	4.5	4.9	4.3	3.5
<i>Return on capital minus real long-term int. rate</i>	3.8	3.6	3.1	5.3	3.9	4.4	4.5	5.4	6.1
<i>Years after recession</i>	-	0	1	2	3	4	5	6	7
<b>EUR-11</b>									
<i>Real GDP Growth</i>	3.6	2.3	1.3	-1	2.6	2.4	1.6	2.5	3
<i>GDP Deflator</i>	4.7	4.9	4.5	3.7	2.7	2.9	2.2	1.5	1.7
<i>Short-term interest rate</i>	10.7	10.5	11.1	8.6	6.3	6.4	4.8	4.2	4
<i>Yield curve</i>	0.2	-0.3	-1.2	-0.9	2.6	1.8	2.2	1.7	1.4
<i>Real short-term int. rate</i>	5.8	5.5	6.4	4.8	3.6	3.6	2.8	2.8	2.2
<i>Net returns on net capital</i>	7.7	7.6	7.4	7.1	7.6	7.9	8.1	8.5	8.9
<i>Real long-term int. rate</i>	6	5.2	5.2	3.9	5.2	5.5	5	4.4	3.1
<i>Return on capital minus long-term int. rate</i>	1.7	2.4	2.2	3.2	2.4	2.4	3.1	4.1	5.8
<i>Years after recession</i>	---	---	---	0	1	2	3	4	5

*The grey areas represent recession years for the U.S. and the EU*

Source: European Commission



	<b>EUR-11</b>	<b>EU-15</b>	<b>U.S.</b>
<b>Investment</b>	9%	7%	37%
<b>Private Consumption</b>	65%	65%	71%
<b>Government Consumption</b>	13%	13%	0
<b>Net Exports</b>	13%	15%	-8%

Source: Eurostat, IMF *World Economic Outlook* May 1998.

3.2.11 It appears - on the basis of economic performance during the 1990's - that the European Union's higher average and minimum real short-term interest rates, and corresponding yield curve, than the US, produced a situation in which the augmentation of the industrial physical capital stock in the EU was drastically reduced during periods of tight monetary policy. A similar scenario did not occur in the US. Moreover, even when a relatively more relaxed monetary policy prevailed in the EU the recovery in investment tended to be restorative rather than enabling a substantial net augmentation of the capital stock to take place. The impact on economic growth and employment growth was similarly constrained. The corresponding figures for economic growth are also set out in Table 3.1.

3.2.12 On the other hand, the US, with a generally less restrictive monetary policy, measured by real interest rates and the yield curve, appears to be able to sustain increasing investment and economic and employment growth, even when monetary policy was tightened. This was the case despite the fact that the *change* in monetary stance was greater in the US than the EU. *The implication is that entrepreneurial expectations are formulated and changed cumulatively over the medium to long-term rather than in the short-term. Indeed it may be hypothesised that the process is one of cumulatively adjusted short-term expectational horizons, which are also adjusted by reference to other economic agents, e.g. central banks.*

3.2.13 As the anticipated net real return on capital is an important determinant of the rate of investment it is also interesting to note from Table 3.1., that the net real return on capital actually *increased* in the US, from an average of 4.0% during the period of relaxed monetary policy (1991 to 1994) to an average of 5.1% during the more restrictive 1995 to 1998 period. By contrast the same statistic for the EU showed an (expected) reduction from an average 3.9% to 2.6%, as between the relaxed and restrictive monetary policy periods.

3.2.14 The other main determinant of aggregate investment is the expected rate of growth of private consumption. Table 3.3. shows that the growth of private real consumption in the US

during the relaxed period of monetary policy was 2.2% and actually increased to 3.0% during the restrictive monetary policy period. In the case of the EU, during the tight monetary policy period, private real consumption grew at the rate of 1.5% (i.e. half the US rate of growth) and during the period of relaxed monetary policy grew by 2.0%, just below that of the US growth rate during the corresponding period.

3.2.15 The perverse behaviour of the US economy during the period of tight monetary policy when one might expect consumption to moderate, or at least not to grow, is partly explained by the part played in the U.S. in the 1990s by asset price inflation in creating a consumption-stimulating wealth effect, with a corresponding reduction in the personal savings ratio. However, it may also partly be explained by the role played by *persistent low average* rates of short-term real interest rates in stimulating and *maintaining* consumption over a longer period via buoyant, cumulative expectations, despite relatively higher interest rates.

**Table 3.3 Investment, Consumption, and Interest Rate Comparisons**

**U.S. and EU 1985-1998**

	<b>Real short term interest rate</b>	<b>Real private consumption</b>	<b>Real gross fixed capital formation</b>	<b>Real equipment investment</b>
<b>U.S. 1985-90</b>	2.7%	2.9%	0.5%	2.8%
<b>1991-94</b>	1.3%	2.2%	4.5%	5.4%
<b>1995-98</b>	3.8%	3.0%	6.7%	10.2%
<b>EU11 1985-90</b>	4.2%	3.6%	5.9%	7.4%
<b>1991-94</b>	5.1%	1.5%	-1.0%	-2.9%
<b>1995-98</b>	2.9%	2.0%	2.5%	5.6%

Source: OECD Historical Statistics

3.2.16 In the case of the EU, the average tightness of monetary policy and the lack of reliance on asset price inflation (except for housing boom conditions in the UK) to support private consumption has, during the 1990s (unlike the second half of the 1980s), severely dampened the growth of private real consumption. Unfortunately, this sensitivity of consumption to restrictive monetary policies is matched by a similar sensitivity of investment, producing severe disinvestment during periods of tight monetary policy, which seem not to be compensated for sufficiently when monetary policy has been (relatively) relaxed.

3.2.17 The 'cumulative expectations' hypothesis advanced above to explain, partly, consumption growth in the US, seems - as suggested in para 3.11 - to fit the pattern of investment during the 1990s, the second half of which has seen a substantial increase in investment in the US, notwithstanding the tighter monetary policy.

3.2.18 It is possible to speculate at this point that the main hypothesis offered by theoretical framework of this study seems to fit the behaviour of the US economy in the 1990s. The phenomenal growth of investment overall - discussed further in paragraphs 3.2.21 and 3.2.22 below - lend credence to the argument that the augmentation of the (broad) capital stock, and of R and D, has enabled the capacity restraints on the US economy to be continuously relaxed. Hence, the growth of the US economy, stimulated by private consumption (some 50% higher on average during the 1990s than the EU average), has been able to be *sustained* by virtue of the even higher rates of capital, including human capital, growth, augmented also by growth of the labour supply (see paragraphs 3.2.19 and 3.2.20).

3.2.19 Table 3.4 indicates the role of the labour supply as another important feature of the comparison between the US economy and the European Union economy, supported also by other comparisons within the EU. The growth of the labour supply and the corresponding growth of employment is shown in Table 3.4. Employment growth is part of the essential development of private consumption. Aggregate real wage growth; the augmentation of the capital stock, and employment growth are major elements in the growth of GDP. This study is examining what *combination* of these factors will secure *sustained* economic and employment growth.

	<b>Labour Force</b>	<b>Employment</b>
<b>US 1991-98</b>	<b>1.1%</b>	<b>1.3%</b>
<b>EU-11 1991-98</b>	<b>0.6%</b>	<b>-0.2%</b>
<b>US 1991-94</b>	<b>1.0%</b>	<b>0.9%</b>
<b>1995-98</b>	<b>1.2%</b>	<b>1.6%</b>
<b>EU-11 1991-94</b>	<b>0.8%</b>	<b>-1.6%</b>
<b>1995-98</b>	<b>0.4%</b>	<b>0.5%</b>

Source: OECD Historical Statistics

3.2.20 The table (OECD) indicates that over the period 1991 to 1998 the labour force in the US grew at an average rate of 1.1% and employment at the faster rate of 1.3%. By contrast the corresponding Euro-area figures over the same period were 0.6% and -0.2%. Splitting between the two four-year periods 1991 to 1994 and 1995 to 1998 periods an even more stark contrast. In the US over the first period, including the US recession year of 1991, the labour force grew by 1.0% and employment by slightly less at 0.9%. However, during the second period, even though monetary policy (and fiscal policy) were relatively much tighter in the US, the growth of the economy was accompanied by the an increase in the labour force of 1.2%, but a 33% *higher* growth in employment of 1.6%. By contrast the Euro-area figures show that during the first period the labour force grew by 0.8%, but employment *declined by -1.6%*. During the second period the EUR-11 labour force growth itself declined to 0.4%, but employment growth was still modest at only 0.5%, despite some (though clearly not enough) easing of monetary policy.

3.2.21. Although much of the employment growth in the US has been in the *services* sector this growth is not primarily due to the continuing shift from manufacturing into services in comparison with the EU. Though, between 1986 and 1996, the total percentage of employment lost in manufacturing (-3.9%) was matched by the percentage gained in the services sector (+4.0%), this structural shift was out-performed by the EUR-15, with the reduction in manufacturing of 3.6% being outweighed by the increase of 6.4% in the services sector. The main contributory factor in the US employment performance appears to have been the considerably higher (than the EU on average) economic growth rate and employment rate during the 1990s.

3.2.22 It may be argued that all these figures reflect is the slower growth of the Euro-area economy compared to the growth of the US economy over the periods considered. However - aside from the fact that it is this difference in economic growth which this study is exploring, in connection with the role of investment and other factors - if one examines the development of private consumption per se than the differences are less severe than those reflecting differences in investment and labour supply. The growth of private consumption in the US over the 1991 to 1998 period was, on average, 44% greater than the Euro-area. However, the corresponding figures (see Table 3.3) for total fixed capital and for machinery and equipment investment are, respectively, some 700% and some 560% greater. Even if one takes a longer period, which includes a more favourable period for the Euro-area when investment in the Euro-area was substantially *higher* in the Euro-area than in the US, i.e. from 1985 to 1990, the corresponding figures still indicate a disproportionate level of investment in the US. Over this longer period US private consumption was, on average, only 12.5% greater than the EU whereas total fixed capital formation was some 56% higher and investment in machine and equipment some 80% higher.

3.2.23 Another way of measuring the relevance of investment to the economy is to examine the evolution of the share of investment as a proportion of GDP. Using the ratio of gross fixed capital formation to GDP to measure this statistic, the following results emerge (see Table 3.5). Clearly, the ratio involved will vary between countries. The ratio is likely to reflect the proportions of manufacturing and of services in the total economy. Countries are likely to have a higher proportion of GDP devoted to investment, other things being equal. However, the *trends* in the ratio can provide evidence of rates of capital augmentation. Hence, the table indicates that, as between the two periods 1991 to 1994 and 1995 to 1998, the average investment rate fell in

Germany and the EU, from 22.6% to 21.3% and from 20.6% to 19.6% respectively. In the UK and especially in the US the corresponding ratio changes were upwards, from 16.4% to 17.2% (UK) and from 16.1% to 18.7% (US). Even more impressive was the 26% overall increase over the 1991 to 1998 period (with year on year increases) in the US. By contrast the UK, the best performer in the EU over the same period, managed only a 3.5% increase and that only in the final year (1998).

3.2.24 A further statistic, which indicates the willingness of the US policy during the 1990s to continue to stimulate growth on the basis that investment will relax the capacity restraints on the economy, is provided by a comparison of the evolution of the OECD estimated potential output gaps of the US and the EU since their respective recession years (see Table 3.6). In 1991, the recession year for the US, the output gap, i.e. the deviation from actual GDP from potential GDP, was estimated to be -2.0%. The average output gap over the next four years was -0.7%, and fell to -0.6% in 1995. By contrast the corresponding figures for the Euro-area were -1.9% in 1993, with an average over the next four years of -1.6%, falling to only -1.7% in 1997.

	<b>1991-1994</b>	<b>1995-1998</b>
<b>US</b>	<b>16.1</b>	<b>18.4</b>
<b>EUR-15</b>	<b>20.6</b>	<b>19.6</b>
<b>UK</b>	<b>16.4</b>	<b>17.2</b>
<b>Germany</b>	<b>22.6</b>	<b>21.3</b>
<b>France</b>	<b>19.6</b>	<b>17.4</b>
<b>Ireland</b>	<b>16.5</b>	<b>19.2</b>
<b>Finland</b>	<b>16.9</b>	<b>16.9</b>

*Source: OECD Historical Statistics*

	<b>US</b>	<b>EUR-11</b>
<b>1991</b>	<b>-2.0%</b>	----
<b>1991-1995</b>	<b>-0.7</b>	----
<b>1995</b>	<b>-0.6</b>	----
<b>1993</b>	----	<b>-1.9</b>
<b>1993-1997</b>	----	<b>-1.6</b>
<b>1997</b>	----	<b>-1.7</b>

Source: OECD Statistics

3.2.25 Of course it may be argued that these statistics casts doubt on the study hypothesis of the role of investment in the economy. However, it should be pointed out that the OECD figures rely, partly, on the somewhat tautological NAIRU/NAWRU hypothesis for the estimation of output gaps. In both the US and the EU the predicted (under NAIRU/NAWRU hypothesis) acceleration of inflation, either economy-wide or within the respective labour markets, does not seem to have occurred. Hence, the output gaps may well be larger, particularly in the US, than those estimated by the OECD. Indeed, alternative, medium-term, estimates of the potential output gap by the European Commission, based on capital stock figures adjusted for changes in the capital/output ratio, gives a figure for the *Euro-area* of - 4.0% in 1993, declining to - 2.1% in 1997, with an average gap of -3.4%. This medium-term estimation, related to capital stock movements, seems more likely to reflect the actual output gap than short-term measures which ignore the *medium-term, cumulative nature* of private investment behaviour and the increasing importance, in a developing services economy of *capital-widening* investment. Using a (crude) multiplicative factor, a re-calculation of the corresponding US figures would raise this estimate to -3.8% in 1991, declining to - 1.3% in 1995, with an average gap of -1.5%. These figures are more supportive of the main hypothesis of this study, i.e. the growth-sustaining role of investment, *and* of the conviction and behaviour of the authorities in the US ( e.g. the Federal Reserve Board) that this is the case. *Indeed, it could be argued that EU government policies have been less expansive than they might have been, because of being hampered by policy restraints based on NAIRU/NAWRU-influenced estimates of output gaps which may seriously under-estimate those gaps and the effectiveness of investment in alleviating capacity restraints on growth.*

3.2.26. A further key area of investment is that of knowledge/technology capital. As has been indicated earlier it has been suggested that R and D investment in the US is perhaps only 25% of its optimal level. Let us first examine the actual performance of the US during the 1990s (see Table 3.7). Investment in R&D in the US has recovered from a three-year decline dating from the recession in 1991 and continuing until 1994. From 1994 investment in R&D - two-thirds of which is provided by industry - has increased in real terms by almost 10% from the 1994 figure,

reaching 2.61% of GDP in 1998. However, Federal funding has halved over the decade from 1987. International comparative figures are only available for 1996. The US total of R&D as a proportion of GDP at 2.57% was higher than France at 2.32%, Germany at 2.28%, The UK 1.94% and Italy at 1.03%. Industrial R&D at 2.11% was lower in the US than in Germany at 2.20%, but still higher than France at 2.04% (1995); the UK at 1.71%, and Italy at 0.98% (1995). Between 1990 and 1995/96 all countries save the US and France reduced than non-defence R&D expenditure.

<b>US</b>	<b>1994</b>	<b>2.36</b>
<b>US</b>	<b>1998</b>	<b>2.51</b>
<b>US</b>	<b>1996</b>	<b>2.57</b>
<b>France</b>	<b>1996</b>	<b>2.32</b>
<b>Germany</b>	<b>1996</b>	<b>2.28</b>
<b>Italy</b>	<b>1996</b>	<b>1.03</b>
<b>UK</b>	<b>1996</b>	<b>1.94</b>

*Source: US National Science Foundation*

3.2.27 Analysis of the EU research and development statistics (Source: Eurostat) provides some interesting 'stylised facts' in the light of the increase in industry-based/linked R&D in the US during the 1990s. (NB This study does not set out to conduct a detailed comparative analysis of research and development activity in the EU or between the EU and the US. Hence the points now made, though based on firm statistics and supportive of the more general hypothesis of this study, require further analysis). EUR-15 investment in R&D, taking 1990 as 100 actually fell (in line with investment generally) to 96 by 1995; the main fall occurring between 1992 and 1993, accompanying the EUR-11 recession. Nonetheless, it is instructive to note that *five EU* countries managed increases above 19% during this period. These were: Austria (35%); Finland (19%); Greece (42%); Ireland (66%), and Portugal (61%).

3.2.28 However, what is more interesting to note is that when the allocation of R&D expenditure of these five countries is examined the following facts emerge. The two countries, Finland and Ireland, which spent over 30% of their R&D on *industrial production/technology* also saw a substantial (ie more than a doubling) increase in the number of patent applications made. Weighted by population, Finland increased from 79 applications per million inhabitants in 1989 to 166 in 1995. Ireland increased, on the same basis, from 14.3 in 1989 to 35.3 in 1995. By contrast, the three countries which, though increasing their total R&D expenditure *spent less* than 12% on industrial production/technology, ie Austria (7.7%), Greece (10.8%), and Portugal (8.5%), saw patent applications either fall (Austria-93.5 in 1989 to 88.2 in 1995), or experience

smaller rises from existing low levels (Portugal -1.0 in 1989 to 1.4 in 1995; and Greece-2.2 in 1989 to 3.8 in 1995). Moreover, Spain - which though it saw a fall in total R&D spending of around 10% from 1990 to 1995, nonetheless was the only country other than Finland and Ireland to spend more than 20% of its R%D on industrial production/technology (20.2%) - was also the only other country to achieve a doubling of its patent applications (from 5.8 in 1989 to 11.4 in 1995).

3.2.29 It may not be without significance that the two countries in the EU - albeit two of the smallest - which have had the highest economic growth rates since 1994 are also the two which have invested most heavily, and apparently successfully, in industrial R&D during the 1990s, as has the US.

3.2.30 Finally, it is worth noting that investment in work-related skills training in the US has also seen growth during the 1990s. Table 3.8 provides some evidence of the level and nature of such investment. Between 1991 and 1995 there was a 7% overall increase in the number of employed workers participating in skill improvement training for their current job. The increase was much greater for female workers (19%) than for male workers (6%), and for part-time workers the increase was 23%. Interestingly the increase for male, part-time workers was higher at 40% than for females at only 19%. Moreover, the greatest overall increase occurred in the age range 45 - 54 where the increase for all workers was 27%, with 17% for full-time workers and 57% for part-time workers.

3.2.31 In terms of occupations there was a contrast between the percentage *decrease* for workers in precision production, craft, and repair, 9% down to 2.5%, and the *increases* for workers in service employment, 12% up to 16.7%, and in sales and administration support, 11.2% up to 15.5%. There is also supporting evidence that the highest increases occurred in the group with the lowest educational attainment, ie those with only high school qualification or less (16.6% to 20.4%). Comparisons with EU countries are problematic at this relatively detailed level of training. However it is interesting to note that, according to OECD figures, Finland demonstrated a higher proportion of the employed population in job-related education and training than even the US 1997 figure of 38%.

3.2.32 Indeed the OECD figures show that of EU countries Finland has the highest proportion in this category. Almost 50% of Finnish employees fell into this category compared to 2% in Spain, 5% in Ireland, 10% in the UK, 27% in France and Germany, and 37% in Sweden. In the age range 25 - 34, the Finland figure rises to over 50%, with France increasing to 42%, higher than the corresponding US figure of 42%. However in the age range 45 - 64, the Finland figure is 40%, the US figure 33%, but the figure for France falls to 12%. If we take account of the fact that some EU countries, eg Ireland do have high rates of young people in *tertiary* education then the issue for the EU seems to be inadequate provision of education and training for older workers.



	<b>1991</b>	<b>1995</b>	<b>Increase 95/91 (%)</b>
<b>Male</b>	----	---	<b>6</b>
<b>Female</b>	----	----	<b>19</b>
<b>Part-time</b>	----	----	<b>23</b>
<b>Prodn/Craft</b>	<b>9%</b>	<b>2.5%</b>	----
<b>Services</b>	<b>12%</b>	<b>16.7%</b>	----
<b>Age Range</b>	----	----	<b>F/T 17</b>
<b>45-54</b>			<b>P/T 27</b>
<b>Low Education</b>	<b>16.6%</b>	<b>20.4%</b>	----

Source: US National Centre for Education Statistics

### **3.3 Some Conclusions**

3.3.1 The correlations observed in the above sub-sections, together with empirical and theoretical observations from other studies, and particularly those examining endogenous growth models, seem to suggest the following propositions in relation to the role which private investment (and also public investment covered in the next section of this study report) plays in the economy. The evaluation of the role of private investment, set out in the propositions listed below, may also permit conclusions to be drawn as the preferred macro-economic and structural policies to be followed, particularly, when combined with the conclusions of the next three sections of this study report.

3.3.2. The key propositions are as follows:

(1) There is a clear *correlation* to be observed between economic growth and employment growth and the level and augmentation of the capital stock via investment. (NB Capital here is to be interpreted as including human capital and technology/knowledge capital).

(2) The direction of causality appears to be from economic growth to investment rather than the reverse (see paragraphs 3.1.8.). Notwithstanding this apparent direction of causality, in so far as investment augments the capital stock then this permits economic growth to be *sustained*. In *theory*, providing demand proceeds at a stable rate and investment also, accompanied by a pari

passu augmentation of the labour supply, it should be possible to sustain growth indefinitely. However, the potential for exogenous economic shocks, and the inherent difficulty of controlling key economic variables, both those in the hands of government and other policy-makers and those in the hands of other economic agents, eg the social partners, make it unlikely that indefinite economic growth can be achieved. Nonetheless, as the US economy in the 1990's has demonstrated (and to a lesser extent the UK and the Dutch economies) far longer periods of sustained growth are possible in mature economies than has been believed possible.

(3) One necessary condition for the 'golden scenario' to be achieved - via growth supported by the development of private consumption and of investment to sustain that growth - appears to be the accompanying augmentation of labour supply and its flexible employment. In mature economies, moving jobs from the manufacturing sector to the services sector, and within the services sector, is of particular importance. This movement has its parallel in the requirement in under-developed economies for movement of workers out of agriculture and into manufacturing. Moreover, the evidence from the US suggests, and as the European Commission has urged on a number of occasions, there is a need to raise the *employment rate* in the EU.

(4) The substantial increase in US spending on industry-based or industry-linked research and development during the second half of the 1990s has clearly assisted the development of, and investment in, new technologies, and appears to have *supported the economic growth process*, in line with the hypothesis of this study. However, even this increase *may be substantially less than optimal* in relation to the societal benefits of such investment. Evidence from an econometric study from the US Federal Reserve Board suggests that earlier empirical studies of the rate of return to society of R&D expenditures are supported by appropriate new endogenous growth model estimates. The authors of that study claim that a *conservative* estimate of the rate of return would suggest that optimal R&D investment is about four times larger than actual investment in the US. This estimate would seem certain to carry over to other mature economies, including the European. Hence, while this analysis related to applied research and development in industry, it would imply substantial benefits from the public funding of similar R&D and, probably, similar benefits from basic science research done with academic institutions and other non-industry based research. It would also apply to EU level R&D programmes, both direct (EU Research Centres) or indirect (Framework R&D programmes). Union. There seems indicative evidence from examination of cross-country comparisons in the EU that spending on industrial production/technology, as in the US, is related to successful economic growth patterns. There is a case to be made, therefore, for *increasing R&D investment* at both national and EU level, particularly that which is industry-based or industry-linked.

(5) The existence of a deep, dynamic capital market, particularly one which provides risk capital to SMEs, appears also to be a pre-requisite for the successful augmentation of the capital stock in the services sector, particularly for capital-widening investment. (NB This point has not been explicitly considered in this study, but ample evidence exists from other studies, Commission communications, and EMAC papers, to support the view that the EU needs at least partly, to emulate the US capital market).

(6) Investment in work-based training has been increasing in the US during the 1990s. Though a number of European countries do have similar levels of such training as the US, notably Finland, the performance of others, notably Spain and the UK, needs to improve. The need for education and training to be targeted on older groups of workers seems to be confirmed by the statistical analysis. The evidence suggests that this type of training can assist in relaxing labour market constraints on growth.

(7) The achievement of a higher level of capital investment - though not necessarily as high a proportion of GDP as historically was the case in the European Union during the 1960's (26%), or subsequently in the Asian economies - is required. The optimum level of investment appears to be reached when a substantial increase in total factor productivity is achieved by a combination of appropriate macro-economic, investment-promoting policies; adequate real wage growth, and a sufficiently dynamic labour market. As the US economy appears to demonstrate, the actual proportion of GDP represented by investment is less important than increasing the present level and quality of investment to an optimum level. In an economy with a high proportion of services it appears likely that the amount of investment required will be less than for economies with relatively high manufacturing sectors. Comparisons between the German and the US and UK economies seem to confirm this view. However, it should be noted that the overall increase in the US investment ratio has been substantial during the 1990s. The same increase in the EU, using the recession year as the base year, would lift the EU ratio to 24%. Nonetheless, the comparative evidence suggests that because of the higher proportion of services in the EU now than in the 1960s, a target figure of 22% would be more reasonable. (This is the 1986 figure for the EU and in line with the European Commission forecast for 2000). *What matters though, more than the investment/GDP ratio itself, is to achieve in the EU a substantial increase in the quantity and quality of investment over the next decade.*

(8) Overall, the conclusions on private investment are that the evidence from comparisons with the US suggests strongly that priority needs to be given to increasing and *sustaining* the rate of augmentation of capital (of all types and, in relation to physical capital, to capital-widening investment) in the EU. The role of monetary policy in stimulating investment appears to be stronger than some commentators seem willing to countenance; nonetheless the evidence from the US does suggest that, given the way expectations would appear to be formulated and adjusted, the long-run impact of a well-timed and relatively relaxed monetary policy can be substantial in terms of the *sustaining* role of investment in all types of capital.

NB. Indeed, the relevance of monetary policy in this scenario may be challenged by those who argue - sometimes from very different theoretical and policy perspectives - that monetary policy has no impact on either economic growth or investment, *beyond* achieving a permissive level of price stability. It is difficult to understand how this view is derived, unless it is a, misleading, way of stating the (correct) proposition that *in long-run equilibrium* money is neutral. Economic activity *is* influenced by monetary policy, via its effect on aggregate demand and does influence investment decisions; the modus operandi being the impact of a central bank's operations and decisions on overall liquidity in the economy and, importantly in modern financial markets, on expectations. (*Precisely how* investment is influenced by monetary policy is difficult to assess via econometric studies for three reasons: *expectations* are as important a mechanism as liquidity, but

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are far less easy to handle; *variable time-lags* make estimation of impacts inherently difficult to handle; and it is the level of interest rates *relative to the returns achievable on alternative ways of spending and investing money* which must be captured in the specification of the relationships). The short-run action of monetary policy, targeted on bringing the *nominal* economic variables back into line with trend *real* economic variables, *can* achieve, via its impact on investment and on aggregate demand, an increase the *real long-run* growth rate of the economy.

## 4. PUBLIC INVESTMENT

### 4.1 *The Nature of Public Investment*

4.1.1 Public investment is of four broad types:

- ◆ investment in infrastructure, including transport and telecommunications networks;
- ◆ investment in human capital, ie education and training ;
- ◆ investment in technical progress, ie and research and development;
- ◆ investment in plant and equipment

4.1.2 In fact, the last of the four categories, related to investment in public enterprises, is difficult, and in some cases not possible, to identify from national accounts data. However, as privatization has become common this category of investment, not large, is declining further. Hence, in this study we will be concerned only with public investment of the first three categories.

4.1.3 By its nature public investment is long-lived and its returns are usually only identifiable, in broad terms, via socio-economic cost-benefit studies. This identification is even more difficult in the case of investment in human capital. However, this does not mean that human capital investment less important. In global economies, increasingly dominated by knowledge-based activities, the skills imparted by the processes of education and training - and the potential for industrial and commercial innovation provided by investment in research and development - indicate high returns from such investment. Such returns are likely be diffused across a wide range of economic activities and to be apparent, in some cases, only over a long period.

4.1.4 These observations on the nature of investment, particularly in human capital, indicate the need to pursue appropriate public policies related to the time-frames of the likely investment returns. Policies may include public/private partnerships, where appropriate.

4.1.5 There is little doubt that some public investment is closely linked to the enhancement of the productive capacity of the economy. Without road, rail, air, and waterway transport, and telecommunications networks - production and trade would be impossible. Investment in these areas, whether or not involving public/private partnerships, should be regarded in the same way as private investment in productive assets. This point has implications for the financing of such projects including their impact on government budgets.

4.1.6 This type of public investment is clearly *not* competitive with private investment as far as development of the physical capital base of the economy is concerned. Moreover, in so far as such investment can only be provided with either public funding, or a mixture of public and private funding, it should be protected.

4.1.7 It is also the case that the state provides investment in human capital. Though the private sector has a role to play in providing education and training, public investment plays a major role,

particularly in education. The same is true of investment in research and technology. Here the private sector and the public sector collaborate closely, with public investment being biased towards longer-term, 'blue skies', research and private investment being closer to market exploitation. Indeed it can be seen in both these cases, as with elements of a physical capital infrastructure, that the longer the investment period and the larger the scale of the investment the more likely is the state to be the provider of the investment funds.

4.1.8 There is also an important distinction to be made in respect of public investment, by contrast with private investment. Public investment is *discretionary*. It is not influenced by *expectations* of anticipated returns as is private investment. It can, therefore - and this point is important in assessing the relevance of the so-called 'golden rule' - be provided on a *stable* basis, without regard to any cyclical economic variations (more correctly designated as uneven economic growth patterns).

4.1.9 The above comments mean that an uncritical application of the 'crowding out' hypothesis - whereby government expenditure at the margin is seen at 'crowding out' private investment expenditures - should be avoided. In particular, this partly valid argument should not be confused with the other proposition made in relation to public expenditure, ie that individuals should, in general, be allowed to determine their own expenditure decisions by minimising the tax burden on them, and thus minimising public expenditure. This proposition is perfectly tenable, but it should not obscure the essential and immensely important role of public investment expenditure in the overall economy.

4.1.10 The 'crowding out' hypothesis does raise an important issue in relation to the financing of public investment versus private investment. The essence of the 'crowding out' argument is that the need for government borrowing pushes up interest rates, which then results in lower than otherwise private investment. However, if the investment in question is important infrastructure investment or investment in education or research and development rather than public consumption then the case for crowding out cannot be unequivocally made. Moreover the danger is that when budget-cutting takes place the easiest area of expenditure to cut is public investment.

4.1.11 As well as national public investment there is also the role played by public investment at European level. In fact, there is a dual role by virtue of the indirect support provided to national public investment by subventions from the ERDF; the EIB; the Framework Research and Development Programmes; ESF Training and Employment Subsidy Programmes. More directly, there is the investment in Trans-European Networks, funded via the European Investment Fund. This study is not designed to evaluate the effectiveness of these various programmes and funding per se, but clearly the contribution to the public investment expenditure represented by them, though marginal in terms of total EU public investment expenditures, should not be neglected.

## **4.2 Comparisons - European Union Countries and the USA**

4.2.1 There is little doubt that public investment expenditure has reduced substantially throughout the EU during the 1990s. Table 4.1 below indicates the level of reductions in government

investment expenditures during the 1990`s. Using the same two periods as in relation to private investment, i.e. 1991 to 1994 and 1995 to 1998, the *average* fall in EU 15 government investment expenditure (as gross fixed capital formation) over the first period was -0.6% and over the second period was -4.3%. Comparisons with the US are instructive. The corresponding two period figures saw a fall of only 0.1% and over the first period and a *rise* of 2.0% over the second period. Moreover, perhaps less expectedly, the average ratio of government investment expenditure to GDP was 4.7% during 1991 to 1994 and 4.3% during the period 1995 to 1998. This was despite, it should be noted, a more rapidly growing US total economy than was the case for the EU. The comparable ratio figures for the EU 15 and for the EU 11 are 2.9% for the first period, and 2.3% for the EU 15 and 2.5% for the EU 11 during the second period. This means that public investment, as a share of GDP, in the U.S. is now *almost double* that of the EU 11

	Change (+/-)	Ratio
<b>US 1991-94</b>	<b>-0.1%</b>	<b>4.7%</b>
<b>1995-98</b>	<b>+2.0%</b>	<b>4.3%</b>
<b>EUR-15 1991-94</b>	<b>-0.6%</b>	<b>2.9%</b>
<b>1995-98</b>	<b>-4.3%</b>	<b>2.3%</b>
<b>EUR-11 1991-94</b>	<b>----</b>	<b>2.9%</b>
<b>1995-98</b>	<b>----</b>	<b>2.5%</b>

Source: European Commission and OECD

4.2.2 Table 4.2 indicates the share in *government* outlays of final consumption and of investment. It is interesting to note - affording confirmation of the above figures in paragraph 4.2.1 - that the US between 1990 and 1996, maintained the share of investment in government outlays. Most EU countries saw a fall in the share of investment in government expenditure over that period. The two exceptions were Ireland (not unexpectedly given its substantial 'catch-up' growth) and the Netherlands. In both these countries government investment expenditure from 1996 was *greater than or equal to the government deficit*.

4.2.3 What Table 4.2 also shows is that, in the US, final consumption expenditure as a proportion of government outlays has fallen; from 48% in 1990 to 44% in 1996. Only in Italy and, substantially, in Finland does this appear to have occurred in the EU countries listed in the table. Care has to be taken in interpreting these figures because, the proportion required for social

security payments has a considerable impact on the overall balance. However, because of the small relative size of investment as a proportion of government outlays, the statistics relating to investment are robust for comparative purposes. (NB It is also interesting to observe - not shown - the comparatively low figure of Italy in respect of the category 'Other Transfers and Subsidies')

<b>Countries</b>	<b>1990</b>	<b>1996</b>	<b>1990</b>	<b>1996</b>
	<b>Final Consumption</b>		<b>Investment</b>	
<b>United States</b>	<b>48%</b>	<b>44%</b>	<b>4.9%</b>	<b>4.9%</b>
<b>Finland</b>	<b>45%</b>	<b>37%</b>	<b>7.8%</b>	<b>4.6%</b>
<b>France</b>	<b>35%</b>	<b>35%</b>	<b>6.9%</b>	<b>5.2%</b>
<b>Germany</b>	<b>40%</b>	<b>40%</b>	<b>4.6%</b>	<b>4.4%</b>
<b>Italy</b>	<b>32%</b>	<b>30%</b>	<b>5.9%</b>	<b>4.1%</b>
<b>Ireland</b>	<b>36%</b>	<b>38%</b>	<b>5.0%</b>	<b>5.6%</b>
<b>Netherlands</b>	<b>25%</b>	<b>27%</b>	<b>4.6%</b>	<b>5.1%</b>
<b>United Kingdom</b>	<b>48%</b>	<b>48%</b>	<b>5.5%</b>	<b>3.2%</b>

*Source: OECD Statistics*

4.2.4 Given the proven higher relative level and growth rate of US government investment than in the EU, it will now be useful to examine more closely the make-up of public investment in the US

4.2.5 Table 4.3 indicates the broad categories of investment and their evolution over the 4-year period 1994-1997 in the US. The first important point to note is the decline in the US Federal defence expenditure, from \$63.8 billion in 1994 to \$56.1 billion in 1997, and though Federal non-defence expenditure increased slightly, from \$19 billion in 1994 to \$19.8 billion in 1997, it is clearly no longer correct to imply that the US Federal budget, and particularly its defence expenditures, is the main driving force in the economy. Nonetheless, US Federal defence expenditures as a proportion of total government expenditure remains relatively high at 17% in 1997, though reduced from the 23% figure in as recent a year as 1994.

4.2.6 State and local expenditures at \$154.8 billion now (1997) represent some 73% of total US public investment expenditure. Some \$134 billion, or 63% of the total, is spent on 'structures', *i.e. buildings of all kinds and utilities including transport links*. The total spent on non-residential



construction i.e. offices, schools, hospitals, etc., by state and local authorities represented in 1997 some \$50.2 billion or 23.8% of total expenditures, increasing from \$42.1 billion in 1994 (21.5% of total).

<b>Types</b>	<b>Amount 1994 (%)</b>		<b>Amount 1997 (%)</b>	
<b>Fed. Def. Expd</b>	<b>63.8bn</b>	<b>23%</b>	<b>56.1bn</b>	<b>17%</b>
<b>State &amp; Local</b>	<b>132.2bn</b>	<b>67.4%</b>	<b>154.8bn</b>	<b>73%</b>
<b>Structures</b>	<b>122bn</b>	<b>62.2%</b>	<b>134bn</b>	<b>63.4%</b>
<b>State &amp; Local Non- Res. Cons</b>	<b>42.1bn</b>	<b>21.5%</b>	<b>50.2bn</b>	<b>23.8%</b>
<b>Equip. (Fed)</b>	<b>48.8bn</b>	<b>24.8%</b>	<b>43bn</b>	<b>20.3%</b>
<b>Equip (State)</b>	<b>25.2bn</b>	<b>12.9%</b>	<b>34bn</b>	<b>16.1%</b>

Source: Survey of Current Business: August 1998

4.2.7 A majority of Federal defence expenditures - \$43 billion in 1997 (77%) - is obviously spent on military hardware. Nonetheless, substantial expenditure on *equipment* is represented by state and local expenditures, i.e. some \$34 billion in 1997, or 16% of the overall total of real government investment.

4.2.8 Although causal links cannot be proven without further analysis and econometric testing, there is a clear *correlation* between the growth and level of public investment and that of private investment in the US during the 1990s. Expenditure on utilities, transport links, offices, schools, etc clearly represents enhancing, and possibly stimulating, factors linked to private investment in productive assets; as well as their intrinsic value and role in terms of relaxing physical and, via education and research and development, human capacity restraints on economic growth.

4.2.9 Government spending on education has already been covered in Section 3. Government expenditure in this area is clearly the preponderant element, even in the US where there is a substantial private sector input. As indicated earlier, this area of spending should be (and in most EU countries is) a priority area for public investment.

### 4.3 Some Conclusions

4.3.1 Public investment is not well documented or consistently defined. Well-defined series are difficult to establish. However, three types of public investment are likely to have an impact on economic growth and employment growth. They are:

- ◆ investment in infrastructure, including networks of all kinds
- ◆ investment in human capital, ie education and training
- ◆ investment in technical progress, ie research and development

4.3.2 These three areas represent the three different types of investment discussed previously in this section and in Section 3 and which are highly relevant to the prescriptions of the endogenous growth models now favoured by governments. It should be recalled that these models encourage the view, and interventionist policies associated with the view, that the short and long-run growth rate of an economy be determined by factors which can be brought 'inside' the model and can thus be influenced by public policy. These factors include the three areas of public investment mentioned above, i.e. investment in physical capital, in human capital, and in technical progress.

4.3.3 The evaluation of public investment in this study has indicated, both from time series and from cross-sectional evidence, that the role of public investment is similar to that of private investment. This means that is likely to be stimulated by economic growth and then reinforces that growth by permitting the relaxation of the capacity restraint and the enhancement of total factor productivity. The comparisons between the EU and the US re-inforce this view in respect of government investment expenditure.

4.3.4 However, as indicated in para 4.1.8., there is also one important difference between public and private investment. The former, whether in partnership with private investment or independently, is *discretionary*. It is not, therefore, dependent on the 'animal spirits' of entrepreneurs on their expectations of the future. Government can and should pre-determine investment plans and expenditures. It will be impossible, therefore, to distinguish whether or not public investment comes before a period of economic growth; accompanies that period of growth, or follows that period of growth. *Public investment, is therefore, capable - in the context of endogenous model activity - of stimulating growth on a secular basis.* It is not the timing of the public investment which is material to its impact, but the fact that it is an intrinsic part of the growth process, mutually reinforcing that process.

4.3.5 The specific conclusions on public investment arising from the comparative evaluation are as follows:

(1) In terms of volume changes, government public investment in the euro-area fell in each year from the first post-recession year of 1994, recovering only in 1998. The cumulative fall during these years was some 12%. The falls in were greater in some European Union countries than in others, particularly in the larger countries. Of these countries only Italy maintained the share of general government gross fixed capital formation as a percentage of GDP. The most severe reductions occurred in the UK, Spain, and Germany who all suffered falls of 25% or more.

(2) The general decline in public investment expenditure within the EU during the 1990s - the only exceptions being Ireland because of its catch-up growth and the Netherlands - *contrasts* with the situation in the U.S. In the U.S., government investment expenditure has not only been maintained as a proportion of government outlays, but has also increased in absolute terms, rising by some 2% per year on average during the second half of the 1990s. This has been against a background of a fall in Federal government defence investment expenditure of around *one-fifth*, and Federal government expenditures overall of 12%. Both reductions occurring over the period 1994 to 1997, against a background of increasing overall public fixed investment expenditures and overall GDP growth. The proportion of public investment in relation to GDP in the U.S. is almost double the proportion of the EU.

(3) The correlation observed between the augmentation of the private capital stock via investment is paralleled by a similar correlation between public investment in infrastructure and in research and development. A correlation between investment in education in training and economic growth is more problematic, with timescales for education and the appropriate quantification of testable variables providing difficulties. The econometric and other evidence in this area is thus much weaker; though there is a clear *prima facie* plausibility about the hypothesis.

(4) Evidence from state and local level infrastructure spending in the US, and from EU countries which have achieved high growth rates in the 1990`s, especially Ireland, suggest a correlation between spending on non-residential construction; spending on private investment in productive assets, and economic and employment growth. Hence, public investment expenditure in these areas seems to provide a further element *sustaining* economic growth once commenced.

(5) In so far as some part of previous public expenditure on infrastructure networks - such as telecommunications and utilities - is now carried out by private sector organisations then this may, in part, mean that a reduction in public investment expenditure as such will not damage growth prospects. Nonetheless this transfer of provision should be monitored to ensure that, both in terms of overall provision and especially in relation to the timing of major infrastructure provision, gaps and delays do not occur.

(6) Given the evidence from this study, including evidence from other studies relating public and private investment provision to economic growth, of correlations between key elements of public expenditure and economic and employment growth the economic benefits for the European Union as a whole from Trans-European Networks would appear to be substantial. It would seem prudent, therefore, that in any overall consideration of European Union budgeting, e.g. Agenda 2000, that appropriate weight should be given to the need to provide and expand public infrastructure investment. This should be the case whether the investment is supported directly from public funds or, via risk-sharing arrangements, by a mixture of public and private funding.

(7) Overall, the conclusions on public investment would seem to indicate that the review of the substantial expansion of non-defence related, public investment in the US should prompt a substantial increase in such investment at EU, and at EU national government, levels. *It would seem prudent to consider policy measures to increase the level of public investment, irrespective of any suggested breach, at this time, of the 3% Stability and Growth Pact budget deficit ceiling.*

## INVESTMENT

## 5. PRODUCT MARKET REFORM

### 5.1 General

5.1.1 The term product market reform covers a wide range of issues not all of which are readily quantifiable. Essentially they are concerned with the enhancement of competitiveness. In this study the approach of the OECD Job Strategy has been used to define the areas of product market reform. In fact there tends to be an overlap between product, labour, and capital market reforms. Reference has also been made to the Broad Economic Guidelines and the Commission's Annual Economic Report, though in fact, the areas covered are close to the OECD classification. The latter, of course, covers the USA as well, which is used in this study as a comparator. One area which the OECD includes as product market reform is that of support for innovation and technology. Though clearly this is an important activity, it would seem to fall more properly under the heading of investment in technical progress. Hence in this study the issue is covered in Section 4 and is referred to in Section 4.

5.1.2 Quantification of much of product market reform is not possible in the same manner as for the impact of investment on the economy. Indeed much of the comment on the need for product market reform tends to be rhetorical rather than 'scientific', though this is not to deny its importance, but merely to indicate the difficulty in providing quantitative evaluation. Hence, the comments in this section on product market reform are qualitative. Nonetheless it is clear, even in qualitative terms, that if an economy is to be capable of continuous expansion, and if labour markets are themselves to operate flexibly, it is essential that there is flexibility, with adequate market-clearing, in all product markets.

### 5.2 Comparative Product Market Reform - EU Countries and the USA

5.2.1 It should be noted that most product markets, and clearly all intermediate product markets, which form 80% of total production, are determined by technological factors. In considering product market structures and dynamics it is therefore crucial that regulatory barriers should not impede those industries which are technological in nature, eg the newer industries of information technology and communications technology. However it is also increasingly the case that technology and its exploitation is relevant to the expansion and development of existing and new industries.

5.2.2 This aspect of product markets has, at least indirectly been recognised in most EU countries and at EU level. Liberalisation is taking place in telecommunications, in air transport and in the electricity and gas sectors. Interestingly. In the US, despite some deregulation in the power supply sectors, regulation still plays a role in the utilities sectors in the US. Moreover, the still tough US anti-trust legislation is an inhibiting factor in inhibiting some mega-mergers and certain practices relating to the licencing of technology products. The current Microsoft and Intel cases are examples. Any differences in performance between the US and the EU in technology-based industries seem more likely to be due to cultural factors than to regulatory aspects. There is some

evidence of a more rapid take-up of technological innovation within sectors in the US than in the EU.

5.2.3 Aside from the UK, EU countries appear to have a long way to go to catch up with the US in relation to the retail services sector. However there has been some easing in recent years of the restrictive shop-opening hours in Germany, Italy, Austria, Denmark, Greece, and The Netherlands.

5.2.4 Entrepreneurship, particularly that located in SMEs, is a strong aspect of US business and economic performance. Risk-taking in the US is fostered by cultural attitudes which do not morally penalise business failure. This is not the case in the EU as recent proposals by the European Commission to reform bankruptcy laws in the EU indicate. It is also the case in the US that business start-ups in the US are not hampered by legal and financial restrictions and 'red-tape' as they are in many EU countries (the UK is an exception to this latter charge, but not the former)

5.2.5 The combination of a cultural climate conducive to risk-taking; a lack of barriers to engaging in business, and a general lending structure strongly biased towards equity capital provision, in both formal market and non-market forms is unlikely to be replicated in the EU for some time to come. However, this study has suggested that the successful business and economic outcomes seen in the US during the 1990s are closely linked to a pro-investment, macro-economic policy climate. It appears to be the *combination* of micro-economic market phenomena, many of which are linked to cultural factors, together *with a strongly supportive macro-economic policy* which is the key to success in terms of economic growth and employment growth.

### **5.3 Some Conclusions**

5.3.1 Product market reform, as defined in this Section, appears to have explanatory value as far as economic growth and employment growth are concerned, in the context of ensuring that restraints on the expansion of the EU economies are not imposed by inflexible product markets. The role of product market reform is thus *permissive* rather than stimulative. However, this does not mean that it is unimportant. For instance, the problem of quantifying product market reforms in a satisfactory manner is evident; they may represent more important constraints in some circumstances than might at first appear, eg services regulation in Germany. Moreover, in so far as product market reform is being 'forced' on countries by global factors, differences between countries may not be significant, providing they remain open economies in trading terms.

5.3.2 It is clearly not the case that a product market policy which did not seek to encourage competition would be one likely to lead to higher economic growth. It should be noted that while 'openness' to trade will import competition, the obverse of relative 'closedness' - which is one consequence of the creation of Euroland - does not imply that competitive forces will not operate. Independently of trade as such the growing interdependence of companies via distribution and agency agreements and via transnational mergers, plus the transfer of technologies including product and process innovations means that globalization and its competitive forces affect even

large, relatively closed, economies. Moreover, the sheer size of the single market, which within Euroland will become a genuine 'home' market, will reinforce competitive forces, as in the US.

5.3.3 In terms of specific policies the following areas would seem important as far as product market reform is concerned:

(1) one area of product market reform which seems essential to permit economic and employment growth is the elimination of regulatory barriers to the rapid development of the services sectors.

(2) regulatory activity more generally, and particularly in relation to the communication technology and information technology sectors, should be *enabling* of growth and the development of new markets and not inhibiting of such developments; as with the services sector the aim is to permit economic growth to be sustained via expanded investment in developing and new sectors.

(3) continued trade liberalisation; however painful for EU sectors, should be pursued as a means of ensuring competitive forces can operate across all sectors.

(4) the removal of 'red-tape' and of an over-regulatory environment for very small companies, whether 'shut-ups' or existing firms

(5) the provisions of SME's, via more efficient capital markets and other e.g. better links with research centres, of the means to innovate and take risks.

## INVESTMENT



## 6. LABOUR MARKET REFORM

### 6.1 General

6.1.1 It has become conventional wisdom to argue that labour market reforms encouraging flexibility and adaptability in the labour market are essential to improving the efficiency of the economy via high labour productivity; rapid response to innovation, and low unit labour costs, and to reducing unemployment. It is undoubtedly true that labour market flexibility and the adaptability of the workforce is a necessary condition for overall product market efficiency and particular to assist in moving the unemployed into new jobs. However, the key issue in policy terms is the relative weight given to the efficiency of the labour market - and the specific areas targeted - as against direct product market reforms and the macro-economic policy stance (particularly in supporting public and private investment) as mechanisms to stimulate sustained economic growth and employment growth.

6.1.2 The sets of reforms which constitute the reform agenda for labour markets, following the OECD Jobs Strategy formulation are:

- ◆ transfers and taxes
- ◆ employment protection legislation
- ◆ wage formulation
- ◆ flexible employment patterns
- ◆ active labour market policy
- ◆ education and training

N.B. Clearly the latter relates to the labour market, but in this study it is, more generally, considered as a key category of public investment and also of private investment, ie as human capital investment. Hence, it will not be considered separately in this section.

6.1.3 These various labour market reforms, excluding education and training, need to be evaluated in terms of their impact on employment and unemployment. Clearly, labour market quantification in terms of its impact on economic and employment growth is possible. However, as with product market reform the impact of specific measures, though capable of econometric assessment, is problematic. Moreover, the various measures interact, making separating out their impacts difficult. Again, cultural factors, themselves difficult to quantify also play an important part in achieving a fluid and dynamic labour market, eg worker attitudes towards change, trade union strength and behaviour, etc.

6.1.4 Some commentators would argue that the term 'labour market' itself inadequately characterises the economic behaviour being addressed, at least as regards the notion of labour as an economic 'product'. Indeed, labour is now treated, more generally, as an asset, ie as human capital - as it is in this study.

6.1.5 For these various reasons, and for reasons of resource limitations, the treatment of labour market reforms in this study is limited to some aspects only of three key areas: active labour market policies (in this study, work-based training), employment patterns, and employment taxes

## **6.2 Comparative Labour Market Reform - EU Countries and the USA**

6.2.1 The crucial importance of a dynamic labour market is illustrated by the OECD statistics comparing outflows from unemployment among several countries. It is generally the case that the number of people losing their jobs in the EU countries is not in excess of those in the US. However the significant difference lies in the speed and the likelihood of finding new jobs. The OECD (1994) outflow figures for the US show that 38% of those on unemployment found jobs. The corresponding figures for some EU countries showed an average figure for Germany, Italy, and the UK of 9%, with 6% in the Netherlands, and 3% in France. In fact, most of the difference in 'dynamism' can be explained by the considerably higher rates of employment creation in the US, already examined in Section 3 of this study and attributed *principally* to higher rates of investment and of economic growth. Nonetheless, it may also be the case that better work-based training, more flexible employment patterns, less restrictions on hiring and firing, and lower non-wage employment costs are supportive factors. Very little econometric work has been done to confirm the relative weighting of these factors in comparison with the clearer evidence, supported by economic theory, by modelling structures, and by empirical evidence, of the strong influence on job creation of growth in the economy.

6.2.2 Examination of one of the suggested influences on employment growth, in relation to employment patterns, is the role of part-time working. Examination of the statistics does not seem to lend unambiguous support to an important role for this factor. For instance, although until recently there had been a correlation between part-time working and unemployment reduction in the Netherlands, in the US part-time working is not out of line with the proportions working part-time in a number of EU countries. The OECD (1996) figures indicate that the US (19%) is midway between the UK and Denmark (22%) and Germany and France (16%). The exception is the Netherlands (37%) which is 50% higher than the nearest EU country, which is Sweden (24%). In attempting to explain differences in employment creation between the US and the EU these statistics suggest that, at least in respect of part-time working, differing employment patterns do not offer a sufficient explanation. The situation in the Netherlands appears to be idiosyncratic.

6.2.3 Of more apparent significance would seem to be, in line also with the study hypothesis, the actual working time spent by employees. Figures for manufacturing industry for 1990 and 1994 indicate that US workers averaged over those years 2000 hours per year. In Germany, working hours fell between the two years and averaged 1500 hours per year. The UK figure was 1875 hours and Ireland 1850 hours. France and Italy averaged around 1600 hours, and in 1994 Denmark, Sweden, and Belgium averaged around 1625 hours, as also did Finland, in line, on this occasion, with its Nordic colleagues. ( It should be noted that longer *annual* working hours is not necessarily affected by the EU-wide restrictions on the working week. Generally it is the longer holidays granted in the EU compared to the US which makes the difference. Nor is it necessarily the case that this situation with regard to leisure time in the EU should change; again one may

point to cultural differences between the US and the EU as an explanatory factor. There is ample room for increasing the employment rate in the EU - as this study has already drawn attention to - as a mechanism to enable more rapid economic growth to take place).

6.2.4 There are two, conflicting, explanations for the above suggested correlation between working hours and growth performance (aside from certain cultural factors operating in the US). First, longer working hours may indicate a mechanism whereby short-term capacity restraints can be relaxed in the sectors concerned (this seems likely to be the case in the US when the economy was moving forward quite strongly at 3.7%, compared with the EU corresponding figure of 2.6%). The second explanation is that lower productivity and over-manning requires longer working hours. Whether this is the case in some of the EU countries cannot be answered by this study, but it cannot be ruled out.

6.2.5 Active labour market policies cover a wide area and many of these have been reviewed on a number of occasions by DG 5 of the Commission and others, eg assistance with job-search, etc. In this study's restriction to consideration - in Section 3 - of training and work-based education it does not imply that other measures are not helpful in improving the working of labour markets; though it seems likely that investment in all forms of capital, including human capital has the most to contribute to employment growth, as argued more generally in this study.

6.2.6 Evidence from a number of studies, including one recently done for EMAC on wage evolution, imply that non-wage employment costs, particularly at the low-wage end of the labour market may reduce the volume of employment on offer. Indeed it would be surprising if this were not the case as the *obverse* clearly applies to job-subsidy schemes. However this will be true for a *given* level of revenue accruing to the firms/business activities involved. In so far as rapid and sustained economic growth occurs then one would expect this factor to diminish in importance, though, of course, not to be invalidated. It is also self-evidently true that national exchequers will find it easier to reduce such taxes during periods of growth when tax revenues are buoyant. Non-wage labour costs tend to be low in the US and some EU countries have taken steps in recent years to reduce their high costs for low wage workers, notably France, Belgium, and the Netherlands, while in the UK they tend to be low. It is clearly important to ensure that entry into the labour market at the lower end is not hampered by high on-costs to employers.

### **6.3 Some Conclusions**

6.3.1 The discussion of labour market reforms in this section has suggested that labour market policies should not be viewed in isolation. The encouragement of adaptability and flexibility in labour markets should be linked to the development of the physical and human capital base of the economy.

6.3.2 The aim of all economic policies, including structural reform of labour markets is to achieve a stable, high, and sustainable rate of economic growth. Any attempt to suggest that one area of reform is more important than another is likely to lead to an imbalance in policy and a less than fully effective impact on economic growth and on employment growth. Hence, the suggestion

that all that is required to eliminate the majority of European unemployment is labour market reform ignores the important role of investment (defined broadly as in this study) in achieving the sustained, high rate of economic growth which itself will contribute substantially to employment growth.

6.3.3 The conclusions from this preliminary comparative evaluation of labour markets are:

- ◆ the labour markets in the US is more fluid and dynamic, both in the sense of hiring and firing being easier and also in the sense of 'cultural' attitudes of American workers who are willing to change jobs more readily (even where a fall in wages is involved); to work longer hours than European workers, and to have more than one job;
- ◆ the functioning of the US labour markets is, therefore, geared - partly via work-based training - to increasing the labour supply rapidly where new jobs are being created and expanded, i.e. in the services sector, via new investment;
- ◆ the US willingness to accept new technology and a commitment to customer service means that technical progress can be rapidly assimilated in existing and new sectors, so enhancing total factor productivity, along with growth in capital and labour supply;
- ◆ comparisons between the UK and other large European Union countries do not suggest that the UK labour market is, intrinsically, significantly more flexible than other EU labour markets; the main differences seem to relate to the higher rate of growth of the *services sector* in the UK (even higher than the US growth during the 1990s and substantially greater than the German services sector growth rate), and the *long-lived*, though moderate, rate of economic growth;
- ◆ the lack of unionisation in the services sector of the UK economy *may* have permitted freer movement of workers in and out of jobs, however *part-time employment* is similar in the UK to that in the US, as a proportion of total employment; only in the Netherlands is part-time employment a significant factor and here its significance is unclear, though it may have helped to reduce unemployment in the short-term;
- ◆ work-based training and education appear to be factors improving labour market dynamism in the US and in some EU countries, the statistics seem to point to the need for considerably increased investment in this area;
- ◆ longer working hours, combined with an expanding economy, as in the US manufacturing sector in the 1990s are likely to alleviate sector capacity restraints in the short-term; however, in some EU economies they *may* also represent lower productivity, at least in the manufacturing sector;
- ◆ one area of reform, where further progress seems to be indicated, at least in some member states, is in reducing the high level of non-wage employment costs resulting from employment taxes; these costs lead to higher apparent wage costs to the employer, thus

leading, in some cases, to lower than otherwise employment; such taxes are lower in the US and the problem is particularly acute - as the European Commission has indicated - with regard to the lower end of the employment market, where entry should be easiest;

- ◆ overall, labour market reform - to permit incremental growth and qualitative enhancement of the labour supply - is an important factor supporting the role of on-going investment in all types of capital in continuously developing the capacity of the economy and so achieving *sustained* economic growth; the evidence from the US during the 1990s, and to a lesser extent the UK (leaving aside the successful performance of some of the smaller EU countries), suggests that labour market reform on its own will not achieve this result; it is probably better seen as an essential accompaniment to the augmentation of the broad capital stock of the economy and not as a substitute;

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## **7. LINKS TO BROAD ECONOMIC GUIDELINES**

### **7.1 Importance of Broad Economic Guidelines**

7.1.1. The Broad Economic Guidelines (BEGs) are set to become a key tool for ensuring a higher degree of economic policy co-ordination than has been the case before the movement to the third stage of EMU. In effect the BEGs provide a mechanism for embryonic economic governance. The BEGs will cover macro-economic as well as structural policies. They will, eventually, provide a coherent framework within which the macro-economic and micro-economic policies of the Member States will be formulated - targeted on the positive evolution of the Euroland economy, and the other European Union economies.

7.1.2 The BEGs will, therefore, provide a mechanism for reconciling conflicts between macro-economic policies, monetary policies, and structural policies. This will include those policies which are dealt with at a European level and those which remain at the level of the individual Member-States. The principle of subsidiarity will ensure that, over time, policies which are appropriately handled at national level will remain at that level and others will be best handled at European level. However, all will require varying degrees of co-ordination and harmonisation. The BEGs will, therefore, continue to provide for some time to come the operational framework, together with the stability and convergence programmes, to achieve the necessary European level co-ordination and harmonisation.

### **7.2 Relevance of Study Conclusions to Broad Economic Guideline**

7.2.1 The current debate between the Commission and the Council, and within the Council, and also between the Parliament and the ECB is relevant not only to this study, as revealed earlier, but also to the shape and content of the BEGs. The three main areas of debate relate to the relative importance of the three policy areas: fiscal policy, monetary policy, and structural policies, involving policy actions both at the European Council and with the Member States.

7.2.2 The principal concern of the BEGs in 1998 was with structural policies, as is intended, even more strictly, to be the situation in 1999. However, though policies for structural reform in product, labour, and capital markets will figure strongly in the 1999 BEGs, issues relating to the macro-economic policy stance - and particularly concerns that growth and investment may be inadequate - have also surfaced. The relevance of the issues discussed in this study - which can only be regarded as preliminary in both analysis and conclusions - to the 1999 BEGs is clear. On the assumption that the discussion of policies at European level is based, broadly, on endogenous growth models - as discussed in this study - then the BEGs should seek to achieve an appropriate policy mix, taking into account also the monetary policy stance of the ECB.

7.2.3 In effect any reform, whether classifiable as macro-economic policy (fiscal and monetary) or as structural policy (product, labour, and capital markets), which can have a positive impact on growth and investment should be explored in the BEGs. Obviously any discussion of monetary conditions must involve the ECB, whose independence of action must, nonetheless, be respected.

### **7.3 Suggestions for the 1999 Broad Economic Guidelines**

7.3.1 The 1999 BEGs should not exclude reference to monetary policy or to fiscal policy in so far as it relates to the stimulation of investment in physical and human capital and the stimulation and particularly the diffusion of technical progress. Clearly, however, labour market reform is of critical importance in so far as to enable movement of labour from manufacturing to services; greater flexibility, and better training in relation to new technologies.

7.3.2 Areas for discussion in the BEGs should be the development of physical and human capital and the incremental growth of the labour supply. In combination these developments should permit economic growth to be sustained, with incremental improvement in total factor productivity.

7.3.3 Hence, while it is not the task of this study to recommend specific policy options, these broad areas for policy development should be part of the discussion of what specific policy actions might become part of the BEGs.



## 8. CONCLUSIONS

### 8.1 Overall Conclusions

8.1.1 This study has attempted - inter alia - to show that the implications of the underlying theoretical model - a variant of existing endogenous growth models - are supported by statistical correlations. These correlations are derived from cross-sectional and time-series comparisons between European Union countries and the US and between some of the European Union countries. The resources available to this study have not allowed econometric testing of the hypotheses advanced. However, partly because of the intuitive nature of the underlying model assumptions and partly related to empirical studies and econometric testing of other similar models, it is believed that the conclusions derived from this study are relatively robust. Nonetheless, further econometric testing would be advisable.

8.1.2 The most important overall conclusion to be derived from this study is that to achieve and sustain economic and employment growth and to increase the long-run growth rate of the European economy what appears to be required is an appropriate policy mix in which consumption, investment, and labour, and other market, flexibility all play their part. In particular, the study casts doubt on the proposition that the unemployment problem of the Euroland economy can be resolved *solely* by structural reform of the labour market. Structural reform - the evidence presented in the study suggests - needs to be accompanied by a dynamic overall policy mix, appropriate to changing circumstances and targeted on stability, and having as a *primary* concern the stimulation of *sustained, high levels of capital investment*.

8.1.3 However, this overall conclusion emphasises that structural reform of the labour market, or for that matter product and capital markets, *is an essential element* of a policy aimed at economic and employment growth. The study suggests that both from a theoretical and a policy perspective an increase in the long-run rate of economic growth (in terms of income/output per head) can only to be achieved and *sustained* if substantial output potential growth can be achieved, by a *combination* of investment, particularly that relating to technical progress, and a fluid labour market assisted by a flexible product market.

8.1.4 Achievement of this objective entails a number of essential, complementary features:

- ◆ augmentation of the physical capital stock, including public infrastructures, embodying new technologies
- ◆ augmentation of the human capital stock by public and private investment in education, training and, particularly, research and development.
- ◆ capital-widening investment, in manufacturing and particularly in services.
- ◆ creation of a dynamic, fluid labour market, with new technology skills among the workforce as a key feature, assisted by flexible and competitive product markets .

8.1.5 These features will need to be accompanied also by continuing structural reform of product markets in the EU and by the establishment of more dynamic and deep capital markets, including those providing capital to SME's.

8.1.6 The above elements appear to have characterised the U.S. economy during the 1990s, and some EU countries in the 1990s and in the past. They help to explain why the US economy has managed eight years of sustained economic and employment growth. The most striking and important feature of the US economy has been the high overall level of private and public investment and the linked increase in technical progress in the economy during the 1990s. The augmentation of physical and human capital and of research and development, via *sustained investment*, has been accompanied by a dynamic, fluid labour market which has shifted labour substantially from the manufacturing sector to the services sector and out of unemployment into employment. Appropriate macro-economic policies, *stable, but not static*, will be required in the EU to achieve the *necessary*, substantial and sustained, increase in all types of investment, as well as continuing and deepening structural reform, to achieve the desired, sustained economic and employment growth.

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**Technical Notes***Returns to R&D Investment*

The methodology adopted in the US study (see Bibliography) utilises both a production function for new ideas and a production function for consumption/output goods. (The model used is a generalised version of Romer's variety-based endogenous growth model). The researchers then established that the functional relationship between the social rate of return and the share of resources devoted to R&D depends only on the production possibilities of the economy. Hence, the model abstracts from any assumptions relating to market structures, patents systems, or distortionary taxes. This allows the rate of return to society from performing an additional unit of R&D to be established. Market distortions may affect the allocation of resources but not the functional relationship between the social rate of return and the amount of resources devoted to R&D. The study strongly supports the considerable empirical literature suggesting large rates of returns to R&D investment. Indeed the study suggests that, if anything the empirical studies underestimate the potential benefits.