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Competitive Economic Performance: USA versus EU

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Abstract

This paper analyses some of the factors behind the diverging productivity performances of the US and the EU over the 1990s and develops some conjectures regarding the likely developments for the current decade. The 1990s were characterized by two features: the disappearance of the process of productivity catching-up of Europe vis-à-vis the US which had lasted for most of the post-war period and the reversal from productivity slowdown to productivity acceleration in the US in the second half of the 1990s without the same occurring in Europe. A multitude of factors are analysed in this paper which could lie behind these developments, both at the macroeconomic and structural levels. Particular emphasis is put on differences in 'growth drivers' which can account for differences in supply-side performance, especially in periods in which major processes of innovation and diffusion of a general purpose technology (GPT) take place. There is also an analysis of the diversity of intra-European experience with some small European countries (Finland, Sweden, Denmark, Netherlands) achieving very good results in technology policy combined with policies which aim towards social inclusiveness.

Keywords: Competitiveness, USA and Europe, growth, productivity, economic structure

JEL classification: L6, N1, O3, O4, O5

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1 Introduction

The focus of this paper are two observations:

– the disappearance over the 1990s of the process of productivity catching-up of Europe vs. the US which had lasted for most of the post-war period;

– the reversal from productivity slowdown to productivity acceleration observed in the US in the second half of the 1990s and the absence of such a reversal in Europe.

Based on these two observations we shall pose two questions: (i) Have these trend changes been anchored in long-run systemic differences and/or differences in policy orientation between the US and Europe? (ii) Are these trends likely to persist over the current decade?

The following is the structure of this paper: section 2 will present very shortly the longer-run picture of trends in growth, productivity and employment since 1960. It will draw out some stylized facts which characterized different sub-periods. The longer-run sets the scene for a more detailed discussion of developments in the 1990s, both at the aggregate (section 3) and the disaggregated (section 4) level. Section 5 discusses what we can conjecture from the analysis in the previous sections about the likely developments in the current (post-millennium) decade; we shall speculate particularly whether the most recent trends of comparative US-EU performance are likely to persist. Finally, section 6 provides a summary of the overall argument of the paper.

2 Long-run shifts in productivity

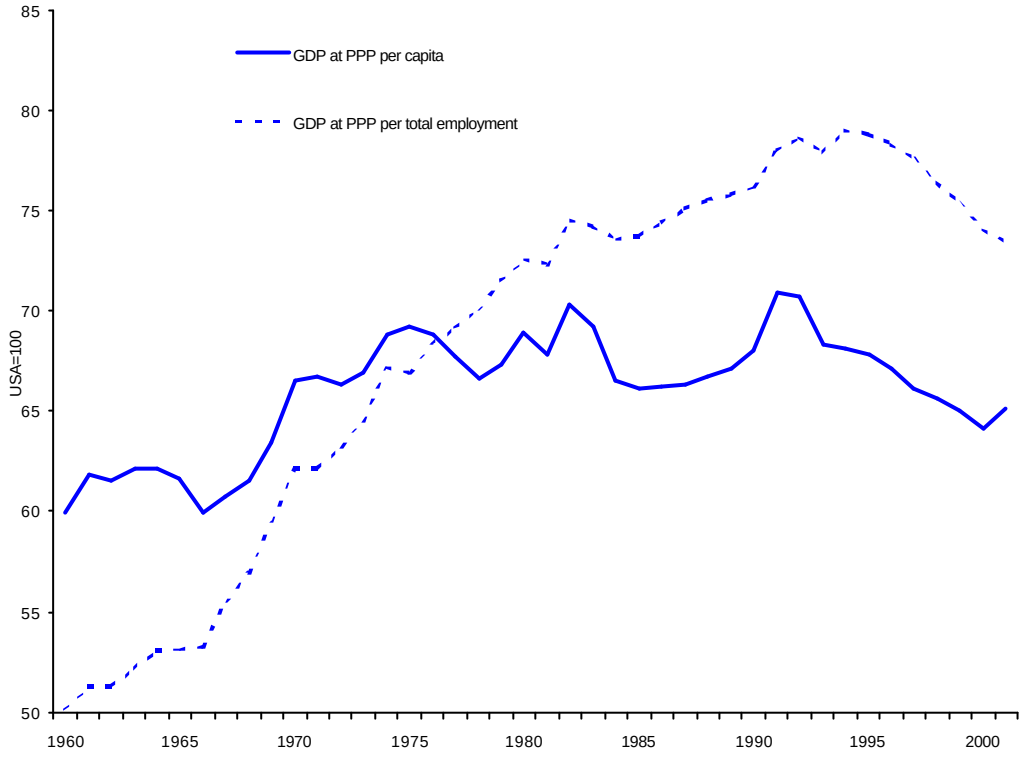
In this brief section we shall make a few observations regarding the comparative longer-term growth performance of the US and European economies which will serve as a background to the more detailed analysis carried out for the 1990s in the following sections 3 and 4 of the paper.

* The paper was originally presented at the Conference on *Transatlantic Perspectives on US-EU Economic Relations: Convergence, Conflict & Cooperation*, Harvard University, 11-12 April 2002. – The authors wish to thank Dagmar Guttmann and Traude Novak for excellent research assistance, as well as Dale Jorgenson from Harvard University and Ignazio Visco from the OECD, who were their discussants at the conference.

Figure 2.1 plots the relative GDP per capita and GDP per employee position of the EU15 relative to the US over the period 1960 to 2002. These are the two indicators which will be further discussed conceptually in section 3 so that we do not repeat this discussion over here.

Figure 2.1

EU GDP per capita and per total employment relative to the USA, 1960 to 2002



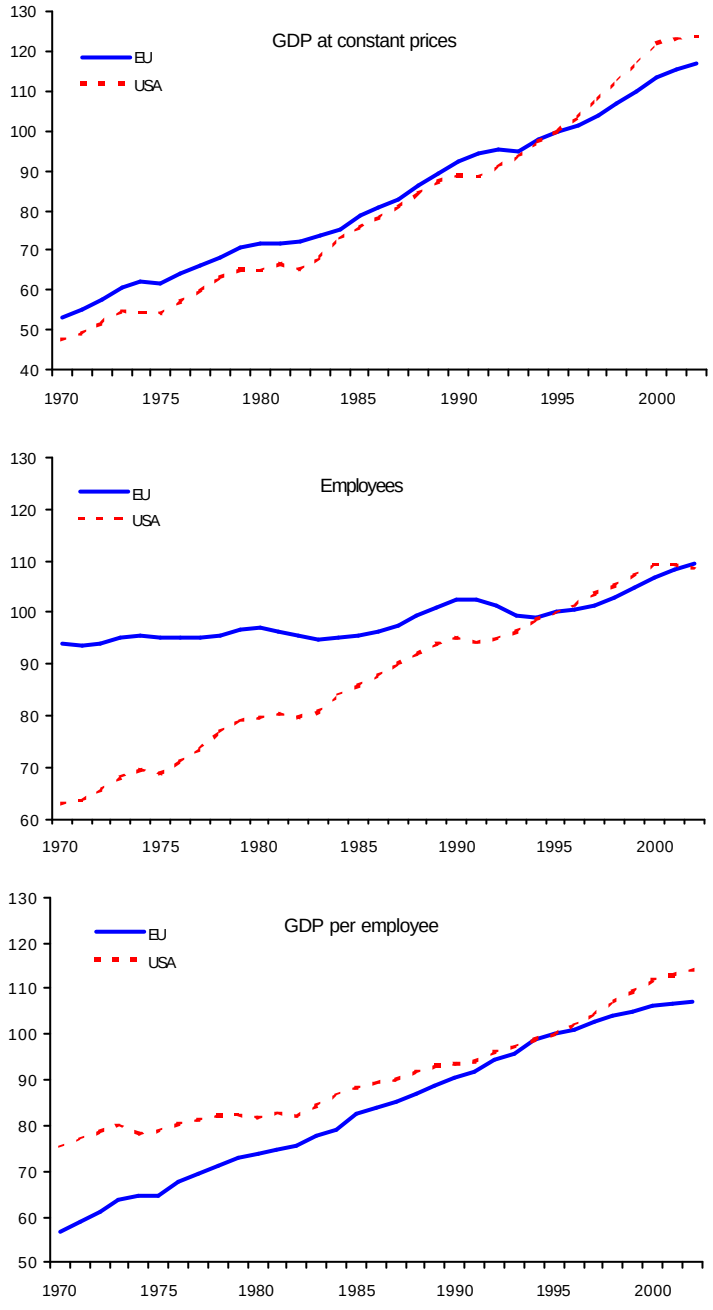
Source: WIFO calculations using AMECO (Annual Macroeconmic Database of the European Commission Directorate-General Economic and Financial Affairs, DG-ECFIN).

As regards *GDP per capita*, we can distinguish *three sub-periods*: a period of catching-up which lasts until the mid-1970s, then a period over which the gap remains roughly constant and which lasts until about 1993/94 after which the gap starts to increase. In the language of the recent growth analytical literature, the first two periods show a pattern of 'conditional convergence', i.e. after a period of catching-up it looks as if some structural/institutional conditions seem to prevent Europe to fully catch up with the US. The last period is characterized by 'divergence', i.e. by a growing gap in GDP per capita.

Figure 2.2

Long-term productivity catch-up of Europe stops in the 1990s

Real growth, employment and macro productivity, 1995 = 100



Source: WIFO calculations using New Cronos (Eurostat macroeconomic and social database).

In *GDP per employee*, on the other hand, we observe a picture typical for convergence throughout until 1993/94 when catching-up takes place but, as theory would predict, at declining rates as the productivity leader's level is approached. After 1993/94, contrary to expectations, divergence sets in. This variable hence allows a distinction of only two periods: one of convergence – and we shall discuss in section 3 whether there are enough grounds to suggest a pattern towards 'conditional' rather than 'absolute' convergence – and, as before, a more recent period of 'divergence'.

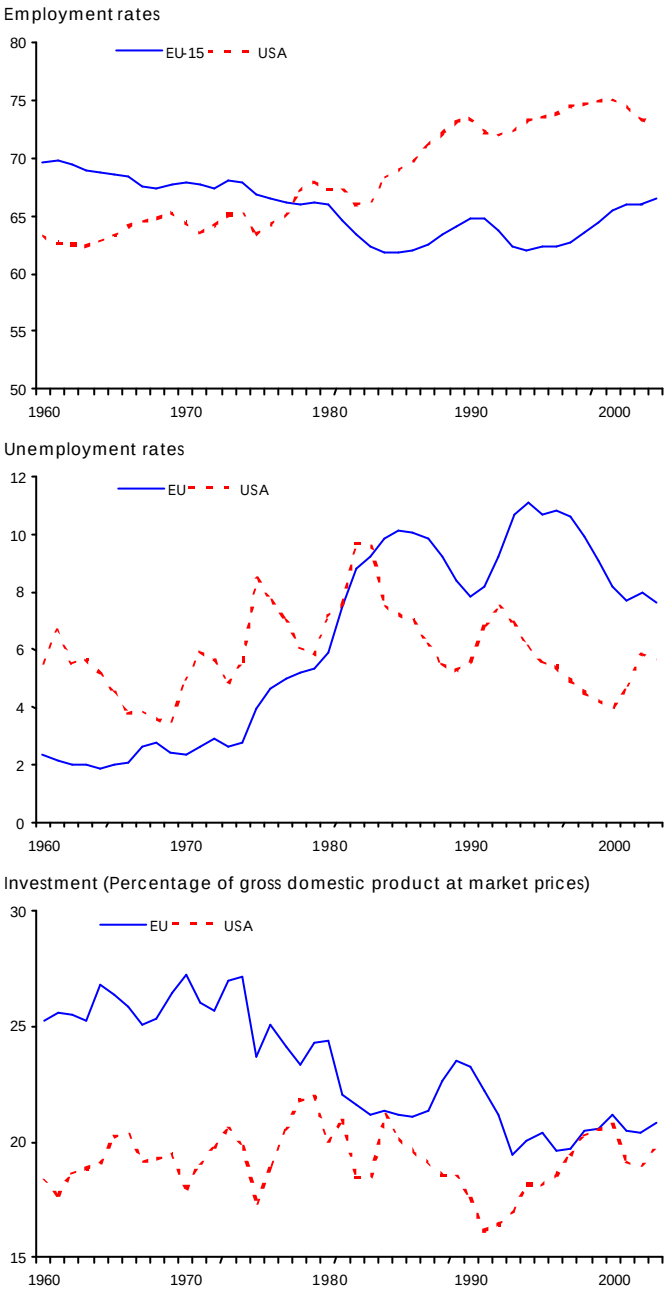
A decomposition of GDP growth into employment growth and (labour) productivity growth (see Figure 2.2) shows the well-known feature of a much higher trend growth of employment in the US than in Europe; particularly over the 1980s does the sharp increase in the US employment rate (which, however, came to a stop in the early 1990s; see Figure 2.3) lead to a major difference in relative GDP per capita and GDP per employee performance.[1] As mentioned above, the European economy maintained higher labour productivity growth until the mid-1990s.

Estimates on *total factor productivity growth* (see Figure 2.4) indicate a similar pattern as for labour productivity growth in that there was (total factor) productivity catching-up until the 1990s but at declining rates; this was happening alongside differential growth in capital per employee ('capital deepening') – see Figure 2.5 – a pattern that would again be suggested by the transitory dynamics properties of a Solow growth model. Interestingly, in the early 1990s the extent of capital deepening increased very sharply in Europe; further analysis shows that this was largely due to a fall in employment. This accounts for the fact that the positive differential in total factor productivity growth disappeared in the early 1990s while Europe still maintained a differential in labour productivity growth. In the second half of the 1990s, all the differentials (in labour and total factor productivity and in capital deepening) get reversed in favour of the US. Particularly remarkable is the strong recovery of the investment/GDP share in which ITC-related investment played a major role (on the latter, see European Commission, 2001, Schreyer, 2001, Jorgenson and Stiroh, 2000 and many others).

[1] The European Commission (see European Commission, 2000a, p. 7) estimates that European GDP would be higher by more than 10% if the European economy could generate the same employment ratio as the US under the assumption that the additional jobs would have only half of the average level of the European productivity level to date. A more detailed breakdown of the contribution of labour input to GDP per capita (see European Commission, 2000b) into the following components: (i) demography (share of those of working age in total population); (ii) labour force participation rate (share in working age population of those who work or are actively looking for a job); (iii) impact of unemployment (total employment as proportion of the labour force); (iv) average hours worked per person in employment, shows that the US outperforms the EU average in all these indicators except for (i) in the mid-1990s.

Figure 2.3

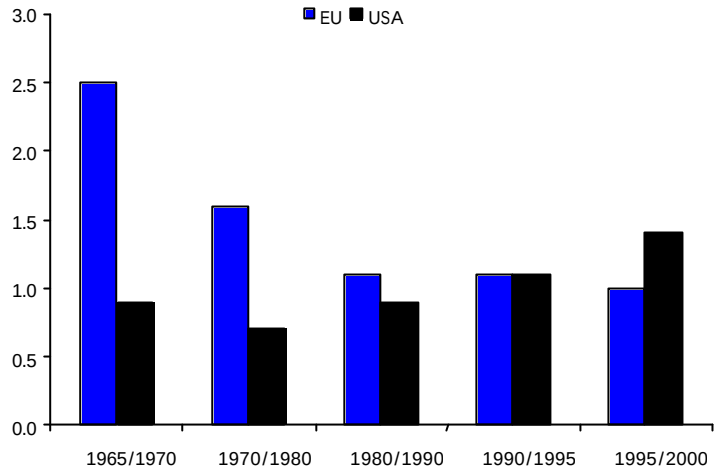
Employment, unemployment and investment rates



Source: WIFO calculations using AMECO; 2002 and 2003 are forecasts.

Figure 2.4

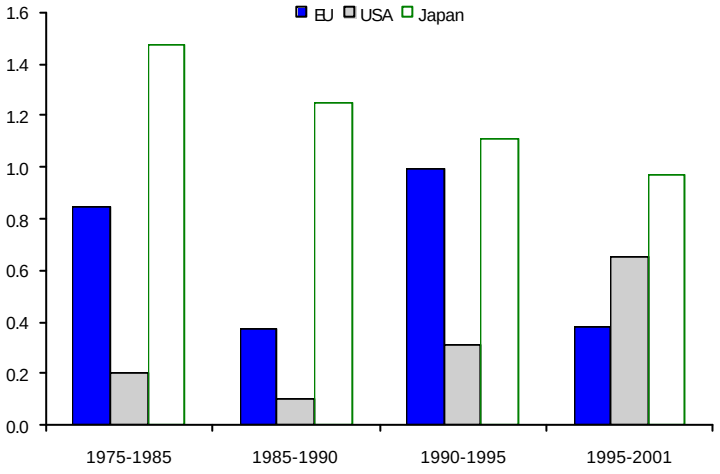
Total factor productivity in the EU and in the USA



Source: OECD: Bassanini, Scarpetta and Visco (2000); EU: McMorrow and Roeger (2001), pp. 86 f.

Figure 2.5

Capital deepening



Source: European Competitiveness Report 2001, Commission staff working document.

Let us summarize the stylized facts which emerge from the long-term comparative performance picture presented above:

(i) There was – as is well-known – a consistently much worse employment growth performance in Europe than in the US. In the 1980s the employment rate in the US was rising sharply, while both employment rate and hours worked per employee were falling in Europe.

(ii) Productivity catching-up took place until about 1993/94 although at declining levels with a worse record in total factor productivity than in labour productivity, as Europe increased its capital labour ratio at a faster rate than the US.

(iii) From 1993/94 trends get reversed: both labour and total factor productivity increase at faster rates in the US than in Europe and an important role is played by an increasing investment rate, in turn related in the literature to ICT (on this, see sections 3 and 4).

In a first, more qualitative assessment we can say that the weaknesses which emerged with regard to the European economy over the 1980s and 1990s are the following: (i) there was a very much worsening relative performance in Europe particularly over the 1980s in the utilization of labour which accounts for a substantial part of the difference between relative GDP per capita and GDP per employee growth performances between the US and Europe over that period; (ii) already before the 1990s there was an indication that Europe moved on a 'conditional' rather than 'absolute convergence' trajectory, which would imply that a significant gap in GDP per capita would remain even in the long run between the US and Europe; this in turn can be traced back to some extent to higher labour force utilization but not entirely; (iii) in the 1990s there are clear indications that existing convergence trends have moved towards divergence (this is particularly the case in the second half of the 1990s in relation to both labour and total factor productivity levels and in relation to capital deepening).

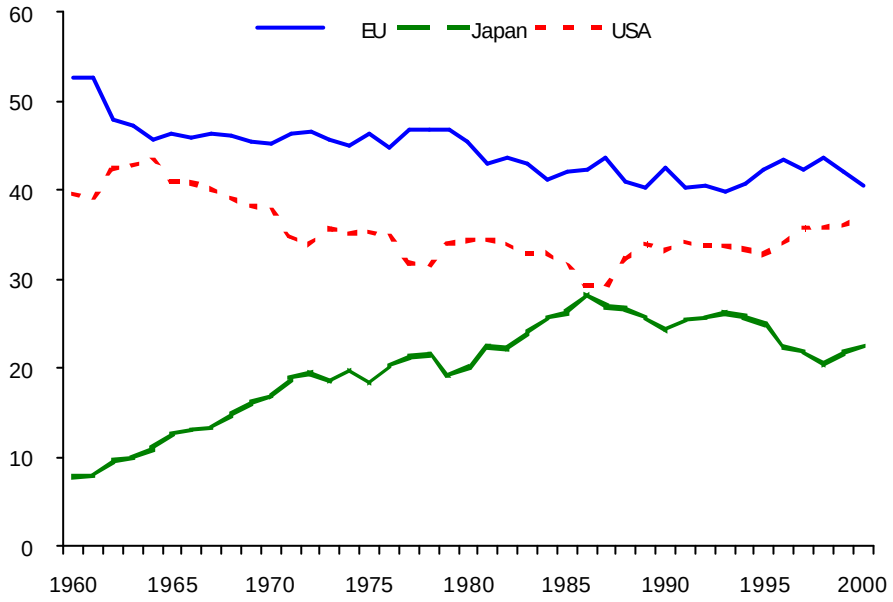
The failure of the European model in a long-run perspective is hence twofold: (i) the much worse performance concerning the labour input factor in the growth process: this is a complicated area which we shall no be able to cover in detail in this paper; it requires to study the impact of social security systems, of labour market institutions and regulations, of demographic developments and of policies on immigration; (ii) the ability to compete at the technology frontier as the main mechanism to improve productivity levels once the overall productivity gap has been reduced. It is here that both Japan and – as we shall see later on – the larger European economies have not faced successfully their challenges in the 1990s. Here one needs to examine those factors that determine the efficacy of 'Innovation Systems' (i.e. mechanisms which determine the rate of invention and then diffusion of new applicable technology).

The efficacy of the innovation system is particularly important for the overall growth performance when we are dealing with a period in which a new 'general purpose technology' (GPT, see e.g. Bresnahan and Trajtenberg, 1995) has reached a stage in which it is introduced across a very wide range of economic activities and a wide range of secondary innovations can be produced and implemented. We argue – in line with many other authors – that the 1990s was such a period. The general judgment is that the first decade of the 21st century continues to be such a period and hence the relative strengths and weaknesses of the EU vs. US models will continue to show up, possibly in a weakened manner (see section 5 below) over that decade as well.

Let us finally point to Figure 2.6 which shows a reversal in the long-term decline of relative export performance of the US within the Triad from the late 1980s onwards (the figure refers to shares in total exports from the Triad, excluding intra-EU trade).

Figure 2.6

Relative export shares in EU, USA and Japan



Source: WIFO calculations using COMEXT.

3 Competitive performance in the 1990s and its macroeconomic explanation

Productivity is one of the central concepts for comparing the performance of economies. This indicator relates some measure of output to some measure of inputs. The resulting *level* of productivity is used as an indicator for the position of a country relative to others, with the intention to reveal a lead or to show backwardness. The relative *rate of change over time* signals catching up or falling back for the laggard economy and, respectively, forging ahead or loosing part of the lead for the frontier economy.

The main focus of interest of this part of the paper is the disappearance of the long lasting process of productivity catch up of Europe versus the USA in the early 1990s and its assessment. The second focus is the reversal from productivity slowdown to productivity acceleration, which happened in the second half of the 1990s in the USA but not in Europe.

We investigate in this section of the paper the performance of Europe vs. the USA for the total economy and for manufacturing focusing mainly on labour productivity. The choice of labour productivity is partly determined by data availability. Data restrictions also influence the choice of the measures used for output and labour. Our baseline measures are real GDP per occupied person[2] for 'macro productivity' and output[3] per occupied person for productivity of manufacturing. In subsection 2 we discuss the notion of productivity, its relation to competitiveness and how much the results change if we use alternative concepts for productivity. Subsection 3 attempts to explain differences in the level as well as rates of change, by differences in so-called 'growth drivers'. Growth drivers are proxies for underlying economic factors presumed to determine long-term growth (of output and productivity). We then add macroeconomic determinants to the explanation presumed not to determine *equilibrium growth (or steady state growth)* but growth in the medium term (affecting the speed of transitory dynamics or short- to medium-term disequilibria).

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[2] We use the terms 'occupied persons', 'persons engaged', 'employment' interchangeably. If not otherwise specified productivity will refer to labour productivity (using persons as denominator).

[3] Output for manufacturing is measured by the production index. The 'parallel' variable to GDP at the sector level would be real value added per person employed. We shall, however, use the production index, as it is the variable available with the widest coverage and well monitored for investigations concerning cyclical developments. Real value added figures are not always available in the industry statistics (they are missing for example in Eurostat SBS for many industries and for some countries even for total manufacturing). National Account Statistics have to make estimates of real value added to get a complete accounting system by sectors. The main trends for Europe (EU as a whole) and the USA are similar whether we use the production index or the estimates for the real value added (however, for individual countries in Europe the differences can be surprisingly large).

Box 3.1

Defining competitiveness at the national level

The term competitiveness is not an innocent term specifically if applied at the national level or for broad industries. There are authors who deny that competitiveness is a sensible concept at the national level at all (Krugman, 1994), others equate competitiveness with productivity, or productivity growth. Analysts and consultants often stress price competitiveness or the availability of cheap resources[4] (see KPMG). Another line of studies focus on measuring 'ex post competitiveness' by looking at world market shares or external balances. Still another group of studies focus on technological competitiveness or on qualitative competitiveness to investigate whether a country is competitive in particularly interesting industries and has lost or gained a technological lead in those industries. There are also studies which evaluate performance in relation to a whole set of economic, social, equity and environmental goals, coming close to a welfare assessment. For an overview of the different approaches and choices to be made see Aiginger (1998) and Annex 3.1 to this section.

Level 1 competitiveness: productivity and employment growth

In this paper we concentrate on competitiveness as the ability of an economy to raise income in an open economy (level 1 competitiveness). To raise income per capita means that there are two elements which contribute, productivity and persons employed. Both variables themselves are difficult to measure and many concepts and methods exist to calculate productivity as well as employment. To give a flavour for the multiplicity of indicators let us name labour productivity, total factor productivity, quality adjusted productivity, cyclically adjusted productivity for the first variable and persons working, persons employed, business employment, non-farm employment, quality adjusted human capital, full persons equivalent employment, hours paid, hours worked, etc. Our choice was to focus on real GDP for the total economy and on production of manufacturing as numerator for the productivity calculation and on persons working as denominator. We add information using other concepts if available and if the use of alternatives change the main results. Productivity growth is the main focus, we complement it on this 'level 1' with employment, since a productivity increase combined with rising employment signals a better performance than productivity growth made possible at the expense of employment[5]).

Level 2 competitiveness: including backward and forward assessments

A somewhat deeper assessment of the performance or competitiveness of an economy in a specific period has to include the perspective where the economy has started and how sustainable the performance is likely to be. Such an assessment has to include the relative income position to other countries and the existence of imbalances. The first perspective is of importance since for a country lagging in income per head or productivity level theory predicts higher growth rates (absolute or conditional convergence). On the other hand above normal growth rates are exceptional if an economy is already ahead. As to the second perspective, imbalances in external balances are often included in an analysis of competitiveness, but of the same interest could be the relation of outward to inward FDI, of domestic savings to investment and of types of investment (into R&D, human capital, infrastructure, etc.).

[4] We do not follow the line of researchers (including many consultants such as KPMG) who define an economy as competitive if it uses low cost inputs. The reason is that this type of 'cost competitiveness' is in conflict with the long-term goal of achieving rising incomes. Competitiveness built on the basis of low cost inputs is self destroying over time, since eventually incomes have to rise. Without rise of income the objective of higher living standards cannot be fulfilled. Secondly, if income levels are high, a country will be well endowed with skilled inputs and has to base its competitiveness on the use of top-end technology and production in the highest quality segment. Indicators on cheap inputs become less important than those related to skills, research and new technologies.

[5] This results in a notion of competitiveness such as 'increase in income and employment' as the European Commission is using in most of its documents (see European Commission, 1998, 1999, 2000).

Looking forward serves the purpose to analyse whether a given performance is expected to persist. If exports are rising fast, this is signalling a good performance – either based on 'cost competitiveness' or on 'technological competitiveness'. If imports increase steadily faster than exports and a large trade deficit accrues, this is usually seen as a sign of weakness and a fact that has to be corrected sooner or later. Similar questions of the sustainability of a short-run position arise if savings rates are very low or budget deficits are very high. The same holds if growth is built on foreign capital inflow or on a negative technology balance. We will present some indicators on these balances in this section and discuss their importance in relation to likely future developments regarding the relative competitiveness of Europe and the USA in section 5.

Competitiveness level 3: a systemic view, and level 4: towards a welfare assessment

A broad concept of competitiveness includes an evaluation of the social system and of environmental protection, since the same level of production and exports is usually thought to be more difficult to achieve if costs for social and for environmental goals have to be carried (level 3). An even wider assessment might include health, equity, education, leisure and other intangible or soft factors, which society at large wants to achieve. Such evaluations overlap with a level 4 evaluation which emphasizes an overall welfare assessment.

In our paper we shall stick to level 1, we shall focus on productivity and take a glance at employment. In evaluating the sustainability and in predicting the future we make a step towards level 2. Implicit opinions on level 3 can be guessed by the attentive reader, but are not the objective of the paper.

3.1 The evidence for the 1990s: growth and productivity

In the 1990s, real GDP as well as macro productivity increased faster in the United States than in Europe. The growth difference is rather large and robust, the productivity difference is smaller and depends on the indicators and data used. It is pervasive and robust for the second half of the 1990s, for output per person and specifically strong for manufacturing. It is rather small for growth in Multi-Factor-Productivity (MFP) and for macro productivity per hour.

Results for the 1990s – full decade

Real GDP is used as indicator on macro growth, real GDP per person employed is used as base line indicator on 'macro productivity'. Real growth was 3.2% p.a. in the USA in the 1990s, but only 2.1% in Europe, a difference of 1.1% p.a. cumulating to a 15% growth difference over the decade (see Table 3.1). This growth difference translated into a much smaller difference in growth of macro productivity, since employment increased by 0.4% in Europe, but 1.4% in the USA. Macro labour productivity thus rose by 1.8% p.a. in the USA, which was a significant acceleration over the past decade, stopping the old trend of 'productivity slowdown'. Productivity increased by 1.7% in Europe, which was less than in the 1980s. This difference in productivity over the full decade is well within the range of

statistical errors[6]; however, what is important and robust is that over (at least the second half of) the decade the growth of productivity declined in Europe and increased in the USA.

Table 3.1

Macro labour productivity decelerates in Europe

	Total economy				Manufacturing			
	Growth of real GDP		Labour productivity		Growth of output		Labour productivity	
	EU	USA	EU	USA	EU	USA	EU	USA
	Growth p.a. in %							
1970/1980	3.0	3.2	2.6	0.8	2.3	3.1	2.8	2.6
1980/ 1990	2.6	3.2	2.1	1.4	1.9	2.2	3.2	2.8
1990/2000	2.1	3.2	1.7	1.8	1.8	4.1	3.3	4.4
Acceleration80svs.70s	-0.4	0.0	-0.6	0.5	-0.3	-0.9	0.4	0.2
Acceleration 90s vs. 80s	-0.5	0.0	-0.4	0.5	-0.2	1.9	0.2	1.6
1970/ 1975	2.9	2.7	2.7	0.9	1.7	1.6	2.2	2.7
1975/1980	3.1	3.7	2.6	0.7	2.8	4.7	3.4	2.5
1980/1985	1.9	3.1	2.3	1.6	0.7	2.0	3.4	3.1
1985/ 1990	3.3	3.2	1.8	1.1	3.2	2.4	2.9	2.6
1990/ 1995	1.6	2.4	2.1	1.4	0.7	2.9	3.8	3.6
1995/2000	2.6	4.1	1.3	2.3	2.9	5.2	2.8	5.2
Acceleration 2nd vs 1st half of the 90s	1.0	1.7	-0.8	0.9	2.2	2.3	-1.1	1.6
Acceleration 1st half of the 90s vs. 2nd half of the 80s	-1.7	-0.9	0.2	0.2	-2.5	0.6	0.9	1.0

Remarks: Labour productivity is output per total employment.

Output of total economy = GDP at market prices 1995, output of manufacturing = production index.

Source: WIFO calculations using New Cronos for GDP and AMECO for manufacturing.

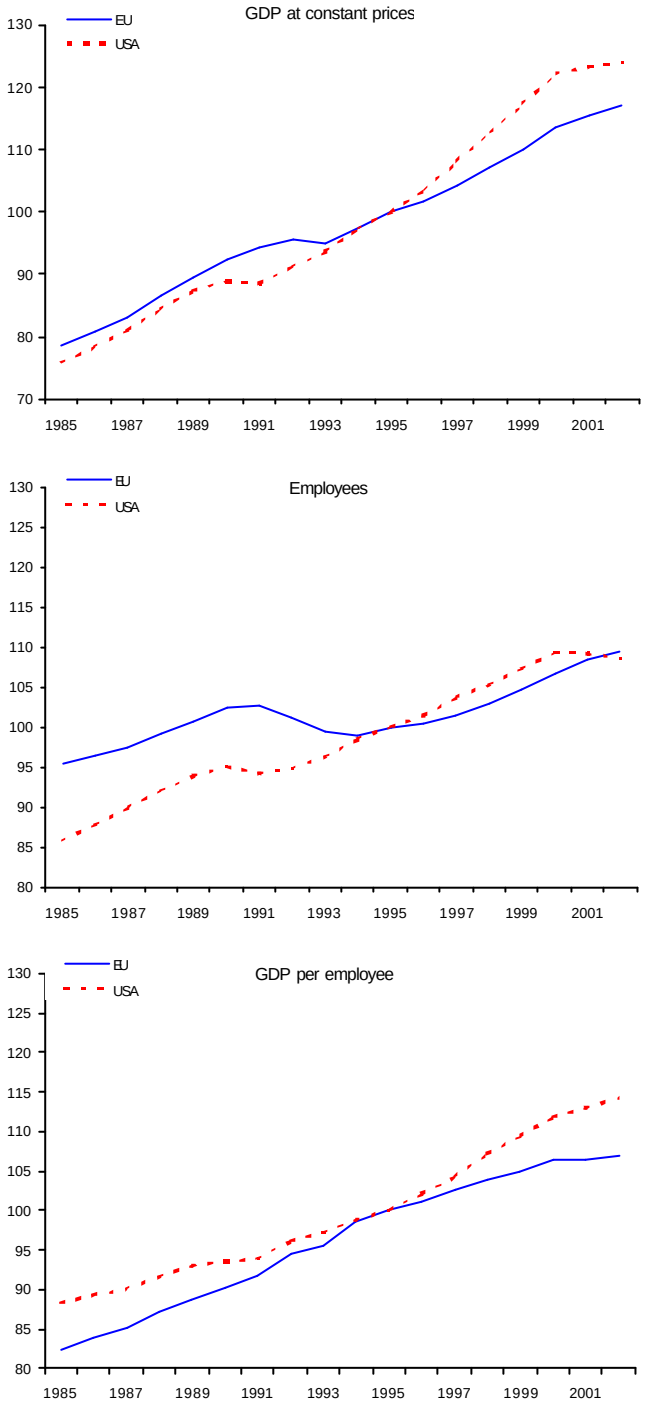
The period under attention: the second half of the 1990s

The real difference in macro productivity growth occurred in the second half of the 1990s: Europe had continued to shed employment in the first half of the decade (by mirror image leading to higher productivity growth); in the second half Europe increased employment – fast relative to its relatively sluggish output growth. As a consequence productivity did decelerate in Europe by 0.8% p.a. and accelerate by 0.9% in the USA. Thus the existing productivity gap to the USA widened.

[6] The numbers reported here are at the 'low end' of the estimated differences in macro labour productivity for the 1990s. The reason for this is that OECD data and EU data are diverging in some details and that Eurostat has recently revised GDP figures upwards for the first years of the decade, as well as for 1999 and 2000. McMorrow and Roeger (2001) report a difference of 0.35% for the decade, Aiginger et al. (2001) a difference of 0.5%, Scarpetta et al. (2000) a similar difference (if we sum up EU countries in their calculations). However the robust facts are (i) a larger difference for the second half of the decade, (ii) the reversal of productivity from slowdown to acceleration for the US and (iii) the end of the long-term catching-up of Europe.

Figure 3.1

Long-term productivity catch-up of Europe stops in the 1990s

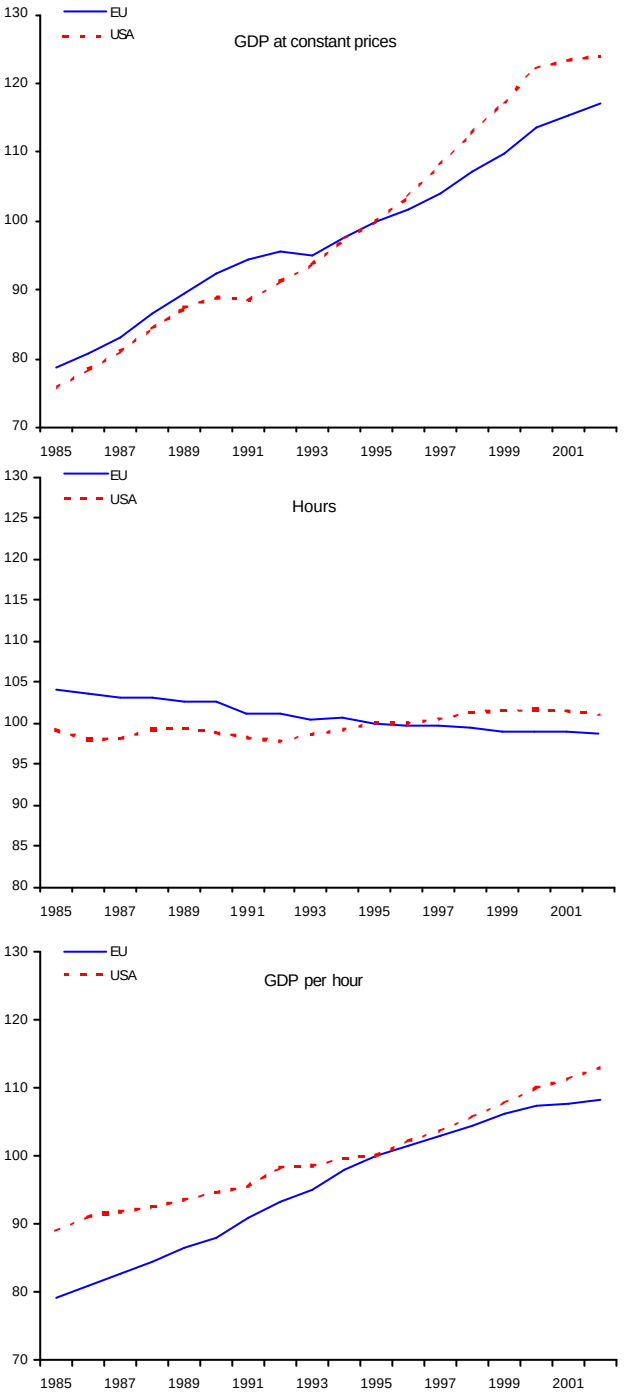


Source: WIFO calculations using New Cronos.

Figure 3.2

Real GDP per hour: smaller difference in level and dynamics

Real growth, hours worked and GDP per hour, 1995 = 100



Source: WIFO calculations using New Cronos.

We summarize these tendencies in two tentative stylized facts:

Stylized Fact No 1: After several decades of 'productivity slowdown', macro labour productivity accelerated in the USA in the 1990s relative to the 1980s and 1970s and in the second half relative to the first ('productivity rebound in the USA').

Stylized Fact No 2: European productivity had grown steadily faster than that in the USA up to the beginning of the 1990s. However macro productivity growth decelerated in the 1990s vs. the 1980s in Europe and even in the second half vs. the first. The difference between USA and Europe became very visible in the second half of the 1990s (1.3% in Europe relative to 2.3% in the USA), giving a cumulated difference in macro productivity growth of 5% for the second half of the *decade. The historic process of productivity catch-up which was evident since the 1950s had stalled or even reversed in the second half of the 1990s ('end of catching up towards the leader').*

Larger difference in manufacturing

In manufacturing these trends are even more visible. Output growth was 4.1% p.a. in the USA and 1.8% p.a. in Europe over the decade. The difference in productivity growth was smaller than growth difference, but still 4.4% vs. 3.3% p.a., accumulating to 16% for the decade. The acceleration results hold for manufacturing in the USA in its short term (2nd half vs. first) as well as medium-term version (1990s to 1980s). In Europe productivity increase is very stable: about 3% in the 1980s as well as in both halves of the 1990s. This leads to a third stylized fact:

Stylized Fact No 3: Productivity acceleration was specifically strong for manufacturing in the short run (2nd half of the 1990s vs. 1st half) as well as in the medium run (1990s vs. 1980s). In Europe productivity growth remained surprisingly constant with about 3% over the 1980s, 1990s and subperiods. This increased the existing productivity gap for manufacturing more strongly than for the total economy ('double acceleration in the USA versus stable productivity growth in Europe').

3.2 The importance of productivity and its relation to competitiveness, caveats

3.2.1 Caveats from the statistical point of view

The difference in labour productivity growth as shown in the data for the USA and Europe seems to be relatively strong in the second half of the 1990s and in manufacturing.

However there are many alternatives how

- productivity is defined, i.e. what conceptually is in the numerator and in the denominator;
- which proxy to use for the numerator and which for the denominator. This question again may refer more to conceptual or to practical (data) questions.

From the conceptual point of view, many studies prefer hours as denominator instead of number of persons, others compare output to more than one input, a third issue is to adjust output for cyclical effects.

Hours instead of persons

Using hours instead of persons does amplify Europe's catching up in the long run, and reduces the differences between the US and Europe in the second half of the 1990s. GDP per hour used to rise significantly less in the USA than in Europe over the 1980s. From 1985 to 1995 growth of the hourly based macro productivity increased by 1.2% in the USA and by 2.4% in Europe. This is the most favourable indicator for a 'catching up of Europe in productivity' and it does not show a backlash for Europe in the 1990s. It reflects the massive reduction of working time per week in Europe and the stable working hours per year in the USA. The data for total hours are however not very reliable. They are neither in the official macro databases of OECD nor in the New Cronos database by EUROSTAT. The data we used were constructed by OECD for their growth project and made available to us. From 1995 on even this measure of productivity increases slightly stronger for the USA (1.9% p.a. vs. 1.4% for Europe), but we would base no hypothesis on this small difference. For manufacturing no similar data could be provided and we can rely only on production per persons. It remains possible that the main part of the differences in the working time had been first in the public sector, which tried to spread employment and secondly in the low paid service sector in which job sharing was promoted for the same reason in Europe. The OECD Growth Project refused to accept that this measure would make the differences in productivity growth disappear and we follow this rejection. However, further research and better data are needed in this respect given that most economists agree that output per hour would be a better indicator for productivity if statistical data on hours were available and reliable.

Multi-factor productivity instead of labour productivity

OECD as well as the European Commission calculate multi factor productivity (MFP) by comparing output to labour and capital inputs. Estimation procedures are discussed intensively in the literature and consensus is that these estimates are rather difficult. The differences between labour productivity and multi factor productivity arise as a result of

capital deepening[7]. In fact the USA increased its historically low investment ratio, so that differences in multi factor productivity are lower than those in labour productivity. The business cycle also has an impact since productivity rises pro-cyclically. Measures of multi factor productivity try to correct for capital deepening and for deviation of actual from potential output, by relating the 'trend output' to all inputs.

The OECD estimates that multi factor productivity increased in the USA from 1.0% in the 1980s to 1.4% in the 1990s. For the EU, MFP increased by 1.7% in the 1980s, but only by 1.3% between 1991 and 1998. The absolute difference in the MFP growth is small, but again the deceleration for Europe versus the acceleration in the USA is the issue. Experience differs according to countries. Within the European Union, four countries, namely, Denmark, Finland, Sweden and Portugal enjoyed acceleration during the 1990s relative to the 1980s. Ireland, Denmark and Finland achieved higher growth in multi factor productivity than the USA (see Table 3.3).

McMorrow and Roeger (2001) provide an estimate up to the year 2000, with trends similar to the OECD findings. For the USA, multi factor productivity has in their estimates accelerated from 0.9% in the 1980s to 1.1% in the first half of the 1990s and to 1.4% in the second half of the 1990s. For Europe, the increase amounted to 1.2% in the 1980s and 1.1% in the first half of the 1990s, and 1.0% in the second half of the 1990s[8]. All these calculations use trend growth rates, which intend to eliminate cyclical factors, but may be late in detecting structural breaks towards the end of the time series.

Table 3.2

Multi-factor productivity growth: EU vs. USA

	EU	USA	EU	USA
	OECD estimates		EU estimates	
1965/ 1970			2.5	0.9
1970/ 1980			1.6	0.7
1980/ 1990	1.7	1.0	1.1	0.9
1990/2000[1)]	1.3	1.4	1.2	1.3
1990/ 1995			1.1	1.1
1995/ 2000			1.0	1.4

Note: 1) OECD estimates 1990/1998.

Source: OECD: Bassanini, Scarpetta, Visco, 2000; EU: McMorrow, Roeger, 2001, pp. 86 f.

7 Many estimates make furthermore quality adjustments for labour. For the necessity of quality adjustments for labour, capital and also for output, see Jorgenson and Stiroh (2000, p. 33): They particularly emphasize that the first priority for empirical research must be constant-quality price indices for a variety of high-tech assets.

8 McMorrow and Roeger (2001) apply several methods to eliminate trends and to measure inputs; we report here the HP filtered trends (pp. 86f).

Table 3.3

Multi-factor productivity growth for countries

	1980/1990	1990/1998	1995/1998
		Growth p. a.	
Belgium	1.4	1.0	0.8
Denmark	1.0	1.8	1.7
Germany	1.6	1.4	1.5
Greece	0.6	0.3	0.6
Spain	2.2	0.6	0.4
France	2.1	1.1	1.1
Ireland	3.9	3.9	3.6
Italy	1.5	1.2	1.0
Netherlands	2.2	1.7	1.2
Austria	1.2	1.1	1.4
Portugal	1.9	2.2	-
Finland	2.4	3.2	3.5
Sweden	0.8	1.3	1.3
United Kingdom	-	1.3	1.4
EU[1)]	1.7	1.3	1.3
Japan	2.0	1.6	1.6
USA	1.0	1.4	1.5

Note: 1) Weighted average over EU countries (weighted with real GDP 1990).

Source: WIFO calculations; Bassanini, Scarpetta, Visco, 2000.

Box 3.2

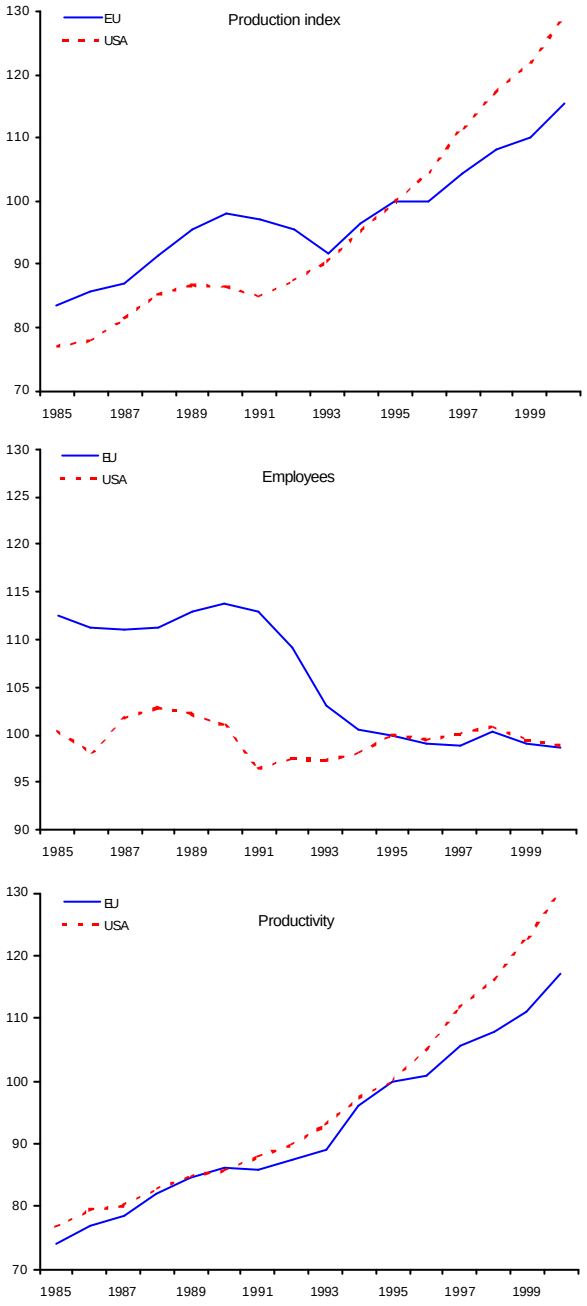
Recent European studies on growth performance and its underlying forces

Author/Institution	Title	Scope	Additional features
Aiginger, K. et al., Enterprise DG, 2000	Europe's position in quality competition	Country shares in price or quality sensitive industries and in high/low price segments	Importance of quality competition for Europe
Aiginger, K. et al., Enterprise DG, 1999	Specialisation and (geographic) concentration of European manufacturing	Degree and change in specialisation and geographic concentration	Survey on trade theory, growth differences
Braunerhjelm, P. et al., CEPR, 2000	Integration and the Regions of Europe	Concentration and specialisation of regions	Policy impact on income differences agglomeration, catching up
Davies, St., Lyons, B., Oxford Press, 1990	Industrial organisation in the EU	Strategies of leading firms	Matrix on 300 leading firms
EU, EC/FIN European Economy 71/2000	The EU Economy, 2000 Review	Is there a new pattern of growth emerging?	Prospects and challenges for Europe
European Commission, 2001	The competitiveness of European industry 2001	Productivity and innovation	Increasing gap to USA; biotec
European Commission, 2000	The competitiveness of European industry 2000	Competition in quality	Service inputs, pharmaceuticals
European Commission, 1999	The competitiveness of European industry 1999	Adaptability and change	Intangible investment, Asian crisis
European Commission, 1998	The competitiveness of European industry 1998	Competitiveness in the triad	Taxonomies, small firms, multinationals
EUROSTAT, 1999	Panorama of European business	Main trends for industries	Overview on structure and performance
Ilzkovitz, F., Dierx, A., European Economy, 2000	European integration and the location of industries	Overview on studies concerning specialisation	Survey on liberalisation, growth differences
McMorrow, K., Roeger, W., European Commission, Economic papers no 150	Potential Output: Measurement Methods	New Economy effect on Potential Growth	Growth scenarios for the EU and the USA
OECD, 2001	The New Economy: beyond the hype, Final report on the OECD Growth Project	Explaining differences in growth performance of OECD countries	Policy conclusions
OECD, 2001	Growth Project, Draft Ministerial Paper	Explaining growth pattern	Specifically: ICT, Diffusion of technologies, human capital, firm creation
Peneder, M., Edward Elgar, 2001	Entrepreneurial competition and industrial location	Theoretical and empirical overview	Background for three taxonomies

Figure 3.3

USA forges ahead in productivity, specifically in manufacturing

Growth (production index), manufacturing employment and labour productivity, 1995=100



Source: WIFO calculations using New Cronos.

In summary, the evidence of higher growth of labour productivity per hour and in multi-factor productivity is not so strong that it can assuage all doubts which could arise due to measurement issues or from assessments of the cyclical component. If the slowdown which started in late 2000 proves stronger and lasts longer in the USA than in Europe (recent developments suggest the opposite), the estimate for 'trend growth' will be revised later, perhaps eliminating the currently reported differences in multi factor productivity growth.[9] To learn more about the robustness of the revealed trends we have to investigate the determinants behind growth of output and productivity and investigate the differences according to sectors and industries. Using material presented so far, we draw the tentative conclusion, that the overall performance of the US economy in the 1990s was exceptional by many criteria. The USA forged ahead in growth, and production per persons employed. And the USA kept its lead, or increased it slightly in multi factor productivity and productivity per hour; output growth was accompanied by capital deepening and was strong enough to accelerate productivity and to increase employment at the same time.

Quality adjustments and statistical differences

The data on GDP comprise some sectors in which quality adjustments have been made, and others in which they were not made. An enormous literature on this issue exists. Quality adjustments of output are using hedonic price indices, specifically in high-tech sectors[10]. And more adjustments had been performed in the USA, upgrading real growth in the high-tech sector in general and in ICT industries in particular. This adjustment boosts real growth and productivity for the USA and it may tend to overstate the productivity increase in the USA as compared to Europe.

On the other hand there may be counter tendencies which tend to overstate the productivity level and its rate of change in Europe: one candidate for this is the scope of the service sector in Europe, another the way the public sector is treated in European National Accounts. Low productivity services increasingly drift out of the official statistics in Europe (hiding in the 'shadow economy')[11]. If the low paid and low productivity services escape the official statistic to an increasing extent (and no parallel movement is to be seen in the USA), this biases productivity growth in Europe upward. Secondly, the contribution of government to GDP is estimated by its wage bill. If real wages increase, the statistics assume productivity to increase in parallel. If, however, people are kept in the government

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[9] The latest data made available show however a significant productivity rebound in the last quarter of 2001 and the first half of 2002 for the USA, not for Europe.

[10] For a convincing argumentation for further quality adjustments, specifically for labour input, see Jorgenson and Griliches (1967), Jorgenson and Yip (1999) and Jorgenson and Stiroh (2000). Jorgenson and Yip (1999) show that if we take quality increases in labour and capital into account (each +0.6% p.a.) two thirds of growth of output per capita is due to the increase in inputs and only one third to productivity growth (1960-1995, USA). Jorgenson and Stiroh (2000) calculate that the remarkable resurgence of productivity in the second half of the 1990s was retarded by lower labour quality growth (-0.12%, for the later 1990s relative to the earlier).

[11] Schneider (2000) gives an overview on measurement and size of the shadow economy.

sector to prevent long-term unemployment (labour hoarding in the government sector), employment in the public sector may increase social welfare, but not the amount of goods and services available to the same extent.

3.2.2 European countries experience different trends

The highest macro productivity growth (GDP per person) was achieved by Ireland, Finland, Denmark, Portugal and Sweden. The Nordic countries managed this on top of above-average productivity levels at the start of the 1990s. Ireland made a considerable jump upward during this decade and Portugal managed to reduce its gap towards the European average. In the majority of European countries, macro productivity growth decelerated during the second half of the 1990s (most strongly in Spain and Italy; the impact of fiscal consolidation due to the Maastricht criteria played here an important role[12]). Higher productivity growth in the second half compared to the first occurred in Greece and Belgium. Cyclical factors and changes in policy towards labour sharing among a larger number of persons seem to have influenced measured productivity between the first and second half of the 1990s.

For manufacturing the fastest productivity growth in Europe during the 1990s were achieved by Ireland, Finland, Austria and Sweden; in these four countries, productivity in manufacturing rose faster than in the USA. The lowest growth rates occurred in Portugal, Spain and France (less than 2% p.a.). Taking productivity growth in the second half of the 1990s separately, three countries managed to increase productivity in manufacturing faster than the USA. Eleven countries were not able to match US productivity growth during the last five years; in Italy labour productivity stagnated, in Spain output per person was decreasing.

3.2.3 Productivity and competitiveness

We have focused so far on output and productivity growth. Not by choice, but influenced by data availability we mainly analysed labour productivity. Level 1 assessments of competitiveness give additional weight to employment. In this perspective, the performance difference between the USA and Europe gets even bigger since the USA increased aggregate employment by 1.4% over the 1990s and Europe only by 0.4%[13].

[12] Productivity also decelerated in Sweden rather strongly during the second half of the 1990s, but this happened after an extreme jump during the first half (which itself occurred due to employment shedding).

[13] For the second half of the 1990s employment growth was 1.8% in the USA and 1.3% in Europe. For manufacturing the relation was -0.3% in the USA vs. -1.5% in Europe for the 1990s as a whole (and -0.1% for the second half of the 1990s in both the USA and Europe).

Turning to the level 2 we have to assess the starting position and the external balances. GDP per capita as well as GDP per person engaged and GDP per hour is well known to be higher in the USA, with the US lead highest for GDP per capita at PPP and lowest for GDP per hour. GDP per capita at PPP is about 46% higher in 1990, GDP per person by 30%, in the per hour comparison the lead is shrinking towards about 10%[14]. Nevertheless the common element of all these comparisons is that the US is leading in productivity (and income per head) and that contrary to long-term expectations and past experience the leader in productivity has been increasing its lead over the 1990s.

Switching to the trade balance or the current account highlights a different perspective. The US trade balance had been negative in 1990 at about 1.9% of GDP, this negative balance increased to 4.7% in 2000. Nearly in parallel the deficit in the current account increased from 1.2% of GDP to 3.7% in 2000. The difference between trade and current account – the services balance – is positive and moderately increasing from 0.7% to 1.0%. Taking the flows separately, the imports determine the trend. The US world market share defined as exports in total trade increased in the 1990s from 11.6% to 12.3% in 2000. The trade balance deteriorated, since exports increased much less than imports: US imports in world trade jumped from 14.1% to 18.4%.

The importance of this negative trade balance for an assessment of competitiveness is controversial. On the one hand, the US exports do not rise 'enough' to cover the imports, which is considered as negative evidence on ability to sell products abroad. On the other hand, the imports to be covered increased specifically fast due to buoyant domestic demand. There is consensus that even a cyclically adjusted trade balance (taking the difference in output growth into account) is negative. But it is frequently argued that this is no a real problem as long as foreign investors are willing to engage in the US economy through direct investment or by buying stocks (*Economic Report of the President*, 2001). The controversy cannot be settled here, it will be further discussed in section 5. However the current account deficit and its sustainability is one of the question marks related to the US performance.

A parallel debate exists on the assessment of trade balances for the EU – however seen from the opposite perspective. Europe's positive trade balance, specifically in manufacturing, is one of the indicators often cited to demonstrate the strength of the European economy. The total trade balance switched from -0.5% to 0.5% of GDP in the 1990s. It may be higher due to sluggish domestic growth, but even the structural position is positive. Furthermore, the EU is a net investor in other countries, using lower costs specifically in the former transition countries to supply the lower price segments or for producing components (and of course serving the local markets).

[14] Differences in GDP not adjusted for purchasing power differences are smaller than those adjusted; however, economists agree that comparisons based on PPP are preferable.

Budget deficits are now eliminated also in the majority of European countries, but the debt/GDP position is still high. Europe has no parallel problem with a low savings ratio and savings are not predominantly invested in assets which have been subject to sharply rising (and then falling) stock market valuations. These factors will be discussed further in the section about future uncertainties.

A level 3 or level 4 assessment of competitiveness is beyond the scope of this paper. Probably the US would get low marks for its high inputs of energy, its high and increasing output of greenhouse gases and the low priority given to environmental preservation. Such an assessment would take the high costs of the more comprehensive social and pension systems in Europe into account (with its negative impact on price competitiveness and its positive impact on social welfare). It would discuss the differences in the health system, the higher degree of leisure and equity in Europe, etc.

3.2.4 Differences in the level (of GDP per head and per occupied person)

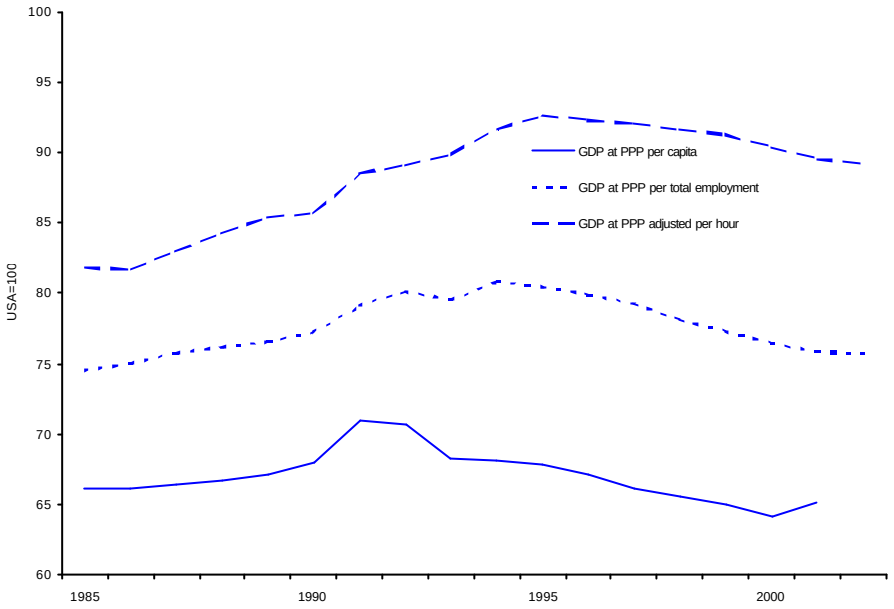
We have reported the absolute difference in productivity measures in section 2. Here the focus is the change over time. Taking GDP per inhabitant, the EU steadily approached the USA up to 1982. Europe's GDP per inhabitant reached 70% that of the USA in 1982. After a transitory decrease it then climbed to an all time high of 72% at the beginning of the 1990s. Thereafter it dropped to 65% in 2000/1. This leaves the result that the laggard economy stopped its trend of catching up and instead the leading economy increased relative GDP per inhabitant, GDP per person employed and of hours worked, all at the same time.[15] This tendency is rather unusual in historical perspective. The absolute difference of Europe vs. USA is smaller for GDP/worker (the EU reaches 76% of the USA) than for GDP per capita, since the employment rate is much higher in the USA[16] than in Europe. It is even smaller for GDP/hour (Europe 2001: 90% of the USA), since working hours per person are higher in the USA. And we know that absolute differences as revealed by published productivity indicators depend on currency value, on prices and the ability of PPP measures to account for the differences, and by legal and institutional factors (e.g. official vs. shadow economy). However all the variables show an identical development over time, and all underline the exceptional performance of the USA in the second half of the 1990s. Economies lagging in productivity should usually have a higher growth rate, specifically in a world with decreasing 'transaction costs' and increasing speed of dissemination of technologies.

[15] A general pattern of growth according to all these indicators is not uncommon amongst successfully catching-up countries, but is very unusual for leading countries (Scarpetta et al., 2000).

[16] 2000: 74.8% in the USA vs. 65.4% in Europe.

Figure 3.4

GDP per capita difference increases in the 1990s



Source: WIFO calculations using AMECO.

Table 3.4

Gap in GDP per capita and per employee (USA = 100)

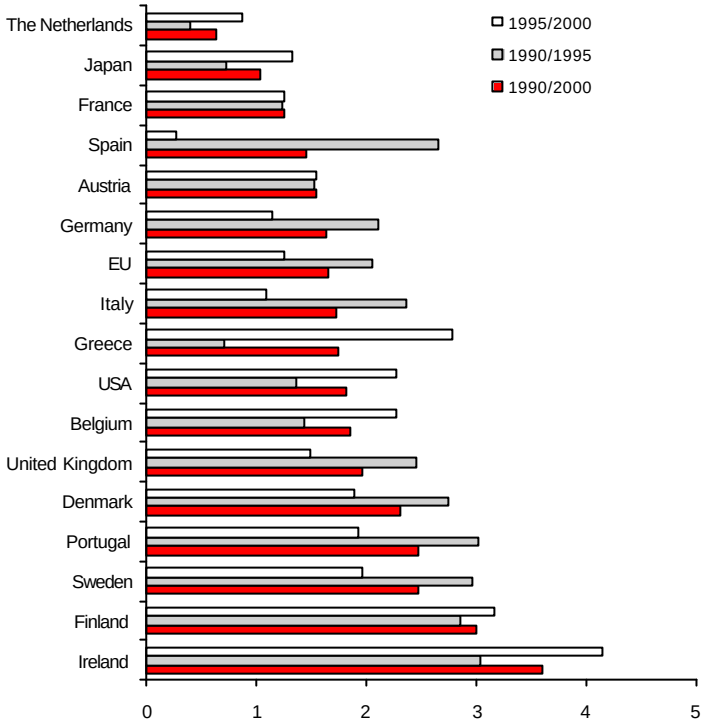
	GDP at PPP per capita				GDP at PPP per total employment[1)]			
	1985	**1990**	**1995**	**2001**	**1985**	**1990**	**1995**	**2001**
Belgium	70.79	72.77	76.28	72.66	87.31	91.50	97.08	91.38
Denmark	78.44	74.13	80.17	77.94	69.35	67.23	76.63	76.83
Germany	69.70	70.83	74.78	68.02	76.57	71.59	77.61	70.47
Greece	43.49	40.67	44.82	45.09	53.97	52.81	58.61	59.48
Spain	48.21	53.05	53.18	53.15	75.03	76.06	81.23	70.11
France	73.41	74.84	70.31	63.60	85.85	91.51	88.97	80.13
Ireland	45.47	51.27	63.30	80.32	65.79	71.34	83.54	83.58
Italy	69.39	71.13	70.27	66.45	85.65	91.47	96.21	90.21
Netherlands	71.56	72.12	74.24	76.68	92.24	91.38	89.44	84.49
Austrla	71.88	73.62	74.97	71.37	66.00	71.21	73.51	69.25
Portugal	36.22	42.74	47.98	48.36	40.16	45.39	53.86	51.11
Finland	69.07	71.32	65.88	67.82	63.40	67.71	76.17	71.06
Sweden	78.44	76.48	69.70	66.48	70.10	69.26	73.12	69.35
United Kingdom	67.35	69.63	65.08	67.37	69.86	70.55	69.72	71.72
EU	66.13	68.04	67.85	65.11	74.51	77.24	80.46	75.84
Japan	70.60	79.43	80.63	71.20	66.98	74.80	74.52	69.18
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: WIFO calculations using New Cronos.

Figure 3.5

Macro productivity growth in the 1990s in European countries

Per annum growth of real GDP per employee (ranked according to growth 1990/2000)



Source: WIFO calculations using AMECO.

3.3 Towards an interpretation of the 1990s: macro level

There are alternative roads for explaining the differences in dynamics between the US and Europe as described by the three stylized facts. Among these there are cyclical explanations, economic policy, differences in the innovation system and in the structure of the two economies. We concentrate here first on what we think to be the most important explanation. Our main hypothesis is that the USA concentrated in the first half of the 1990s more on those factors determining long-term growth, while Europe's efforts were distracted by other policy priorities. These were cutting budget deficits, eliminating national trade barriers within the European Union and towards transition countries, combating the unemployment rate, and liberalization of network industries. All these priorities had their own merits, but led to an under-emphasis of technological innovation and diffusion of such innovations in comparison to the US. We shall sharpen this view in the form of a hypothesis and we shall then present empirical evidence on what we call 'growth drivers'. Afterwards we discuss complementary hypotheses to our main argument. The contribution of the economic structure, specifically of manufacturing is postponed to the next section.

Hypothesis 1: The USA had traditionally invested more in research and development and education. In the 1990s it enjoyed and enhanced a first mover advantage in the upcoming ICT technology and continued to invest heavily in those factors which determine long-term growth in productivity. The potential output (or long-term growth) of an advanced economy is determined in general by research, human capital and appropriation of new technologies; in other words, supply side determinants dominate. In a period of radical innovations these factors constitute an even greater competitive advantage than in a period of small incremental innovations.

Growth drivers

Economic theory offers a wide range of explanations for factors determining long-term growth. New growth theory and less formalized theories like evolutionary growth theory surprisingly converge insofar as they both point at human capital, research input and appropriation of new technologies for production and consumption as the main factors of long-term growth.[17] Each of these factors of long-term growth is difficult to measure and has many dimensions. Aiginger et al. (2001) have developed a set of 16 indicators which try to pin down the investment of countries in these 'growth drivers'. For research these are partly input indicators, partly output indicators, for human capital the data set includes education expenditures, but also shares of workers with secondary and tertiary education. For ICT – the dominant technology in the 1990s – indicators on ICT production shares and indicators on the use of ICT are available. Aiginger et al. (2001) investigate the correlation between these indicators and productivity growth and find – though this relation is rather weak for some individual indicators – that the set of indicators together is robustly related to the growth of production and productivity (especially in manufacturing). See Annexes 3.1 and 3.2 for some basic statistics and illustrations for European countries.

Comparing Europe as one area to the USA, gives the result that the USA was leading in every one of the 16 growth drivers at the beginning of the 1990s[18]. Research inputs in manufacturing and in the total economy, but also research output were 30% to 40% lower in Europe. Education outlays and the share of secondary and tertiary education was lower by about the same extent. ICT indicators showed a large lead for the USA – again for expenditures as well as for the use of computers. As seen from this position the higher growth of output and productivity in the USA in the 1990s could have been expected. What is surprising is that this perspective had not been taken at the start of the 1990s. The beginning of the 1990s had, on the contrary, been a period in which the USA was very anxious about losing competitiveness, specifically versus the fast growing economies in

[17] For a survey see Hollenstein and Hutschenreiter (2001).

[18] See Table 3.5 and Figure 3.6.

Table 3.5

Differences in determinants of long-term growth (growth drivers): EU vs. USA

	Position of EU to USA		
	EU/ USA First year	EU/ USA Last year	Absolute change
Indicators an R&D: input and output			
Total expenditure on R&D in %of GDP 1992/98	0.693	0.661	-0.033
Business Enterprise expenditure on R&D (BERD) in % of GDP 1992/98	0.606	0.564	-0.042
Research intensity in manufacturing 1990/98	0.652	0.623	-0.029
Publications per inhabitant 1992/99	0.646	0.878	0.232
Patents per resident 1990/97	0.617	0.554	-0.064
Indicators on education system: input and output			
Percentage of the population that has attained at least upper secondary education by age group (1998)	0.609	0.795	0.186
Percentage of the population that has attained at least tertiary education, by age group (1998)	0.514	0.694	0.181
Indicators an ICT production and use			
ICT expenditure in % of GDP 1992/2000	0.654	0.731	0.077
Information technology (IT) expenditure in % of GDP 1992/2000	0.568	0.493	-0.075
Telecommunication (TLC) expenditure in %of GDP 1992/2000	0.749	1.135	0.385
PCs per inhabitant 1992/99	0.369	0.481	0.112
Internet users per inhabitant 1992/99	0.178	0.584	0.406
Cellular Mobile Subscribers per 100 capita 1992/99	0.356	1.271	0.914
Indicators on share of 'progressive' industries (see Section 4)			
Share of technology driven industries in nominal value added 1990/98	0.826	0.757	-0.069
Share of skill-intensive industries in nominal value added 1990/98	0.920	0.895	-0.025
Share of ICT industries in nominal value added 1990/98	0.723	0.475	-0.248

Remarks: First (last) year means that year in the 1990s for which earliest (or latest) data are available (both are indicated after the name of the variable). For percentage with secondary and tertiary education the older (45-54) and the younger (25-34) age groups are compared.

East Asia. It may be that specifically this competitive threat – which proved wrong as could be seen with hindsight – had acted as a pressure in the USA to invest into the future. Europe – though it discussed its sluggish growth under the heading of 'Eurosclerosis' – did not feel such a threat of its position and did not increase its investment into the growth drivers.

One strand of the literature definitely tries to single out one factor for the growth difference between Europe and the USA. This is the literature on the impact of ICT on growth. While this literature itself is not without controversies, the main upshot is summarized in Leo (2001) and Aiginger (2001), in so far as ICT contributed in the 1990s about 0.9% p.a. to growth in the USA but only 0.4% to 0.5% in Europe, resulting in a 'growth penalty' of about

one half of a percentage point for Europe's late start and less intensive use of this new technology.[19]

Table 3.6

Large countries persistently behind, while top performers catch up with the USA

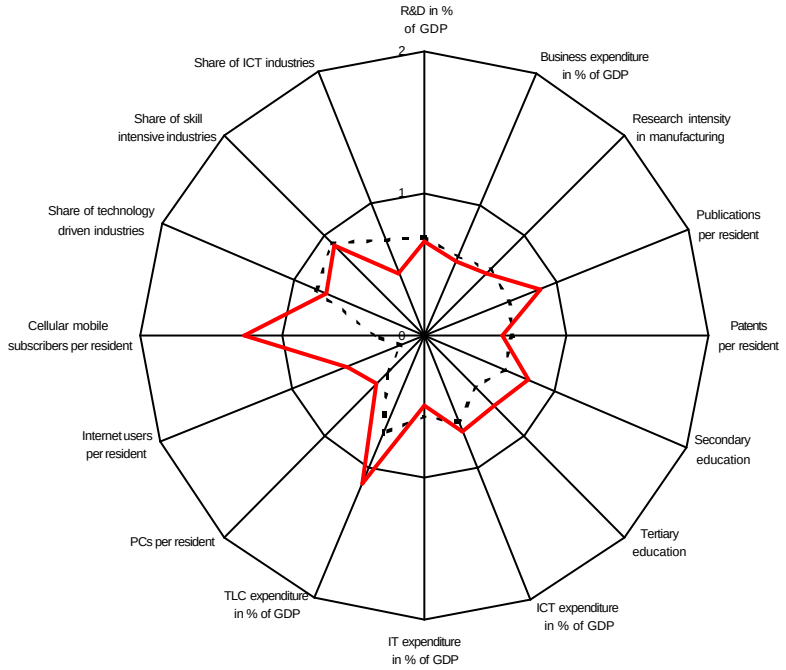
	Position of large countries EU to USA			Position of leading 3 EU to USA		
	Large EU/ USA First year	Large EU/ USA Last year	Absolute change	EU/ USA First year	EU/ USA Last year	Absolute change
Indicators on R&D: input and output						
Total expenditure on R&D in % of GDP 1992/98	0.838	0.766	-0.072	0.861	1.036	0.175
Business Enterprise Expenditure on R&D (BERD) in % of GDP 1992/98	0.766	0.672	-0.094	0.753	0.967	0.215
Research intensity in manufacturing 1990/98	0.766	0.690	-0.075	0.636	0.834	0.198
Publications per inhabitant 992/99	0.767	0.990	0.223	1.158	1.589	0.430
Patents per resident 1990/97	0.961	0.803	-0.159	0.953	0.888	-0.086
Indicators on education system: input and output						
Percentage of the population that has attained						
At least upper secondary education by age group (1998)	0.759	0.856	0.097	0.816	0.970	0.154
Percentage of the population that has attained						
At least tertiary education, by age group (1998)	0.595	0.722	0.128	0.748	0.870	0.123
Indicators on ICT: production and use						
ICT expenditure in % of GDP 1992/2000	0.740	0.736	-0.004	0.703	0.796	0.093
Information technology (IT) expenditure in % of GDP 1992/2000	0.692	0.596	-0.097	0.681	0.680	-0.001
Telecommunication (TLC) expenditure In % of GDP 1992/2000	0.794	0.974	0.180	0.730	0.993	0.262
PCs per inhabitant 1992/99	0.445	0.529	0.084	0.556	0.790	0.234
Internet users per inhabitant 1992/99	0.169	0.585	0.416	0.712	1.363	0.651
Cellular Mobile Subscribers per 100 capita 1992/99	0.359	1.116	0.757	1.461	1.841	0.380
Indicators on share of 'progressive' industries (see Section 4)						
Share of technology driven industries in nominal value added 1990/98	0.945	0.859	-0.086	0.561	0.696	0.135
Share of skill-intensive industries in nominal value added 1990/98	0.978	0.933	-0.045	0.980	0.976	-0.003
Share of ICT industries in nominal value added 1990/98	0.819	0.535	-0.284	0.628	0.715	0.087

Remarks: First (last) year means that year in the 1990s for which earliest (or latest) data are available (both are indicated after the name of the variable). For percentage with secondary and tertiary education the older (45-54) and the younger (25-34) age groups are compared. – Large European countries: Germany, France, United Kingdom. Leading European countries: Sweden, Finland, Denmark.

[19] For seminal contributions see Jorgenson and Stiroh (2000), for a summary of the findings and the literature see Leo (2001), for a sceptical view on the contribution of ICT to growth see Gordon (2000). For a review on the very latest results, which tend to prove that the impact of ICT works via the ICT producing as well as the ICT using sectors, see Stiroh (2001a), who also supplies industry evidence. He also shows that technology is more important than cyclical factors. For comparative European performance see Daveri (2000, 2001), van Ark (2000).

Figure 3.6

Growth drivers in Europe vs. USA



Remark: Each indicator outside the unit circle shows a superior performance of Europe vs. the USA.

The impact of ICT: from production to use

Going into more details the literature emphasizes three channels of the impact of ICT: first the increase in multi factor productivity in the ICT producing sector, secondly the impact of this new technology on boosting investment (capital deepening) and thirdly the spillovers of ICT into other sectors (increasing multifactor productivity in the ICT using sectors). The debate had a long way to go, starting from the Solow paradoxon, that computers were to be seen anywhere but not in the productivity statistics, to the controversy whether the productivity increase was confined to the ICT-producing sectors and/or was only cyclical. The controversy is settled today in favour of a significant non-cyclical contribution of ICT to productivity growth and evident both in ICT-producing as well as in ICT-using sectors. Some of the main results are:

Gordon (2002) distinguishes between 3 phases of productivity growth in the very long run. In the 'golden age' – located between 2nd quarter 1950 and 2nd quarter 1972 – macro labour productivity increased by an annual rate of 2.6%, it fell in the 'dismal period' ending with 4th quarter of 1995 to 1.4% and then rebounded in the second half of the 1990s to 2.9% in the 'acceleration period'. Gordon is as reluctant as ever to concede that ICT was the cause of the acceleration in output and productivity. His explanation starts with

a low inflation rate[20], leading to 'non-restrictive monetary policy'. This fuelled real growth. He maintains that the impact had been in MFP growth in durable manufacturing, with the main impact outside attributable to the use of computers not to an increasing rate of return (p. 28). He then emphasizes that maybe hardware investment was not the most important source of productivity acceleration, but software, telecommunication, pharmaceuticals and biotech. He then enumerates the following permanent sources of economic advantages of the USA:

- mixed government/private funded universities
- government agencies providing funds on peer review
- patents and security regulation
- leading US business schools
- US owned investment banking, accounting, management consulting firms
- high-tech financing (venture capital)

Baily and Lawrence (2001) show that none of the acceleration of productivity was cyclical, and that there is now clear supportive evidence on an acceleration of productivity in service industries that are major purchasers of information technology like finance, wholesale and retail trade. These gains are shown to reflect not only increased investment, but also complementary innovations in business organization and policy. Baily and Lawrence maintain that speculative excesses should not obscure the fundamental gains.

An important statistical finding by Nordhaus (2001) is that the acceleration of productivity which is 1.2% for GDP is even larger for the business sector (1.8%), and again larger for 'well measured output' where it is 2.1%. Nordhaus thus shows that the acceleration rates are lowest for GDP (the indicator we used) namely 1.2%. Additionally the author traces a substantial upturn in labour productivity outside the new economy (it is 0.54% for total GDP, 0.65% for business output, 1.18% for well measured output). And he concludes that the productivity rebound is not narrowly focused on the new-economy sectors.[21]

Stiroh (2001) presents a summary of the macro studies, claiming the new consensus that both ICT producing and ICT consuming sectors are responsible for productivity acceleration. Additional evidence comes from longitudinal studies, showing that costs of adaptation to the new technology may exist but do not dominate the picture. In his own research Stiroh finds that one fifth of the productivity acceleration (between 1987-1995 to 1995-1999) was due to two ICT-producing industries (SIC 35 and 36), the IT using

[20] These factors are seen as accounting for the low inflation rate: low non-oil import prices, low energy prices up to 1999 and a cessation of medical care prices.

[21] Among the methodological innovations Nordhaus presents is to measure GDP from the income side, to use chain indices and to present decomposition into within growth ('pure productivity'), a Denison effect and a Baumol effect.

industries account for most of the remainder of 0.66%, while the remaining industries made a direct contribution of only 0.07%.

The message we take from the literature and own research

Hypothesis 2: ICT contributed about 1 percentage point to US growth of output and productivity in the 1990s, but only about half a percentage in Europe. This gives a 'growth penalty' of about half a percentage point for insufficient use or inadequate innovation in Europe for this sector alone. For biotechnology no such calculations exist.

During the 1990s Europe has been able to narrow the gap towards the USA, however only for a few indicators and at a low speed. Europe has taken the lead in mobile phones per capita and for expenditures on telecommunications (TLC)[22] relative to GDP. Europe is catching up with the USA significantly in publications, in secondary and tertiary education and in Internet and PC use (see Table 3.5 and Figure 3.6). The gap with respect to US figures widened in IT expenditures, in the share of ICT industries, technology driven industries, and skill-intensive industries. Europe is not catching up in patents. For research, the gap widened if we measure total expenditures relative to GDP.

The upshot of these tendencies is that Europe is leading according to two indicators instead of none at the start of the 1990s. In the other 14 indicators, the USA has maintained its lead, and in none the margin is less than 10%.

Hypothesis 3: Europe did not sufficiently catch up with the USA in terms of growth drivers over the 1990s. This leads to the prediction that growth of output, growth of productivity and growth of potential output could still be higher in the USA over the next decade – maybe not to the extent of the 1990s. Three European countries excel in growth drivers and started to enjoy higher growth in productivity. However, specifically the large European countries are lagging, thus biasing the European average downwards.

Why growth drivers may have mattered more in the 1990s

The upshot of these tendencies is that Europe had been lagging to the USA in all 'growth drivers' at the start of the 1990s. However, the lion's share of this lag had already existed in the 1970s and 1980s, in which US growth in productivity had been lower than Europe's. The main indisputable 'new' difference to the 1980s is the lead of the USA in ICT (and less easy to be measured – but qualitatively established[23] – the US lead in biotech). There may

[22] This indicator shares with some others the problem that it measures input but not output.

[23] European Commission (2001).

Table 3.7

Long-term indicators on research and education

	Gross expenditures on research and development in % of GDP		Business expenditures on research and development in % of GDP		Average years in training and education	
	EU	**USA**	**EU**	**USA**	**EU**	**USA**
1981	1.69	2.37	1.05	1.67	9.52	12.30
1982	1.72	2.53	1.07	1.82	9.63	12.30
1983	1.74	2.60	1.08	1.86	9.72	12.40
1984	1.78	2.65	1.12	1.92	9.79	12.40
1985	1.87	2.78	1.20	2.02	9.91	12.50
1986	1.90	2.76	1.23	1.99	9.99	12.50
1987	1.93	2.72	1.25	1.96	10.09	12.50
1988	1.93	2.68	1.26	1.92	10.19	12.50
1989	1.94	2.64	1.27	1.88	10.27	12.60
1990	1.96	2.65	1.27	1.91	10.41	12.60
1991	1.90	2.72	1.21	1.97	10.52	12.60
1992	1.89	2.65	1.19	1.90	10.63	12.60
1993	1.88	2.52	1.18	1.78	10.75	12.60
1994	1.83	2.42	1.14	1.71	10.89	12.60
1995	1.81	2.51	1.13	1.80	11.00	12.60
1996	1.81	2.55	1.13	1.87	11.10	12.70
1997	1.80	2.58	1.14	1.91	11.20	12.70
1998	1.80	2.60	1.15	1.94	11.28	12.70
1999	1.86	2.65	1.21	1.98		

Source: WIFO calculations using MSTI and Education at a glance (OECD).

be a difference in the structure of research, with a higher share in the military sector in the 1970s and 1980s[24], and there may be greater efforts to increase efficiency in the educational system and to increase college and university participation in the 1990s[25]. And there is the empirical fact that the large European countries all decreased research relative to GDP between 1990 and 1999[26].

[24] There is evidence that public sources for R&D declined, while private investments increased strongly at least since the middle of the decade.

[25] For an overview see the *Economic Report of the President* (2001), section 5.

[26] For Europe the ratio of R&D/GDP is slightly lower in 1999 than in 1990, for the US it is slightly higher (see table 3.8). However more important than this relatively small difference is that the lagging region did not catch up and that the US could shift resources from military research to civilian research.

There is a certain plausibility that in a period of the emergence of a new general purpose technology (GPT)

– it is important to be the first mover, and that

– in the first stage of the implementation of a new technology– in which many adaptations are to be done to make it operational, it is more important to have qualified people, large research communities and high level of research than in the later phase of diffusion when standardized products are available.

– Furthermore the close links between universities and firms is especially important, as is the availability of venture capital and an open attitude towards risk.

This may underline why a given advantage in the growth drivers and the defining elements of the US innovation systems may have been specifically important for the implementation of the ICT technology. We expect that these hard and soft facts of quantitative expenditures and qualitative elements of the innovation system respectively, are also important for the biotech technology.

Differences for small vs. large countries

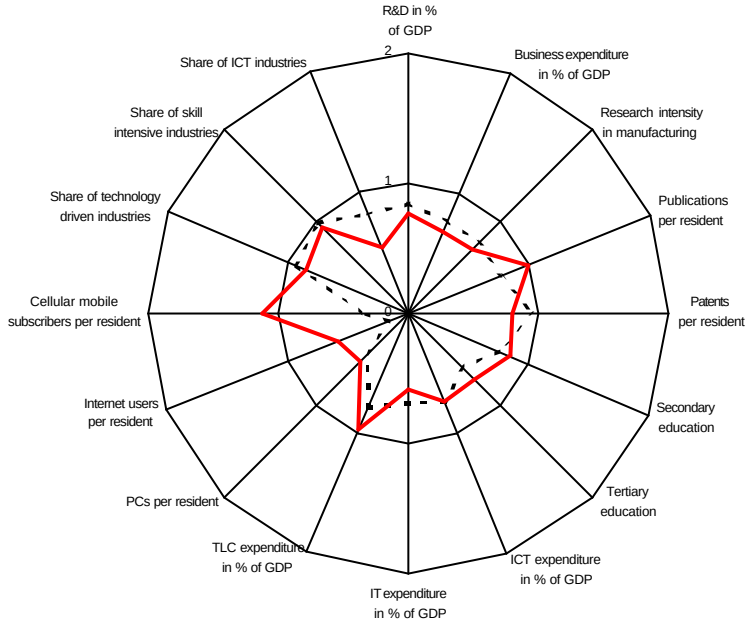
The picture is definitely better for some European countries.[27] The top three European countries – Sweden, Finland and Denmark – have improved their positions relative to the USA for twelve of 16 indicators. The leading European countries surpassed the USA in publications per inhabitant, Internet use and the share of skill-intensive sectors (in addition to mobile phones and telecom expenditures, where Europe was already ahead). The only areas where the top three European countries are not improving their relative positions are patents, the share of IT expenditures and the share of ICT industries in production (Table 3.6).[28] One of the reasons why Europe is not catching up more is the disappointing development of the large European economies, specifically Germany, France and the United Kingdom (see Table 3.6 and Figure 3.7). These countries did not concentrate on investment in the growth drivers and their position deteriorated relative to the EU average as well as relative to the USA.

[27] Remember that the top five were determined at the beginning of the 1990s; and that they vary according to the indicators.

[28] The top five European countries are falling back marginally in their shares of skill-intensive industries.

Figure 3.7

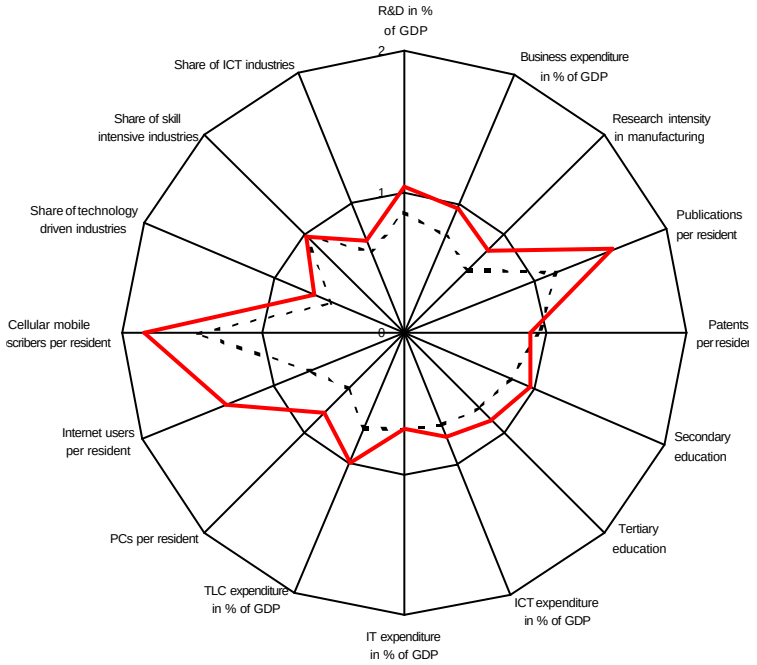
Growth drivers large European countries vs. USA



Large 3 countries: Germany, France, United Kingdom.
Remark: Each indicator outside the unit circle shows a superior performance of Europe vs. the USA.

Figure 3.8

Growth drivers Sweden, Finland and Denmark vs. USA



Top 3: Sweden, Finland, Denmark.
Remark: Each indicator outside the unit circle shows a superior performance of the top 3 European countries vs. the USA.

Non growth driver related explanations

Economic growth in the short and medium run depends on many more factors than those determining the long-term path.

Europe's efforts to create a Single Market and finally a common currency reduces transaction costs and consequently should boost growth. On the other hand, the 1990s were dominated by the attempts of government to reduce budget deficits, which resulted – at least in the short run – in losses in demand. Balancing the budget and decreasing debt/GDP ratios were necessary requirements to meet the Maastricht targets, which themselves were seen as requirements for creating the European Monetary Union[29]. This is an investment into the future and European integration has been a success story as such. However, the attempt to reduce government expenditures prevented also more courageous initiatives for increasing research and education and the enforcement of technology promotion. Three or rather four[30] smaller countries successfully followed a double strategy, by reducing deficits and increasing investment into the growth drivers at the same time. The larger economies however concentrated on budget goals, in pursuing liberalization or in fighting unemployment by rather defensive measures (increasing the employment intensity of growth).

A further explanation refers to a more restrictive monetary policy in Europe, first by the leading central bank in Europe – the Deutsche Bundesbank – which gave a very high priority to stabilization and then by the European Central Bank, which had to build up a reputation for an anti inflationary stance, while the US Fed could stabilize the business cycle by a more expansionary and highly anticyclical monetary policy[31]. How cause and effect interact can be shown in that Europe experiences a relatively high inflation rate for rather weak growth rates due to a lower potential output path. Thus a restrictive monetary policy inhibits growth on the one hand, while, on the other hand, a more restrictive monetary policy is necessary if potential output grows more slowly (and reputation of an anti-inflationary stance has yet to be established).

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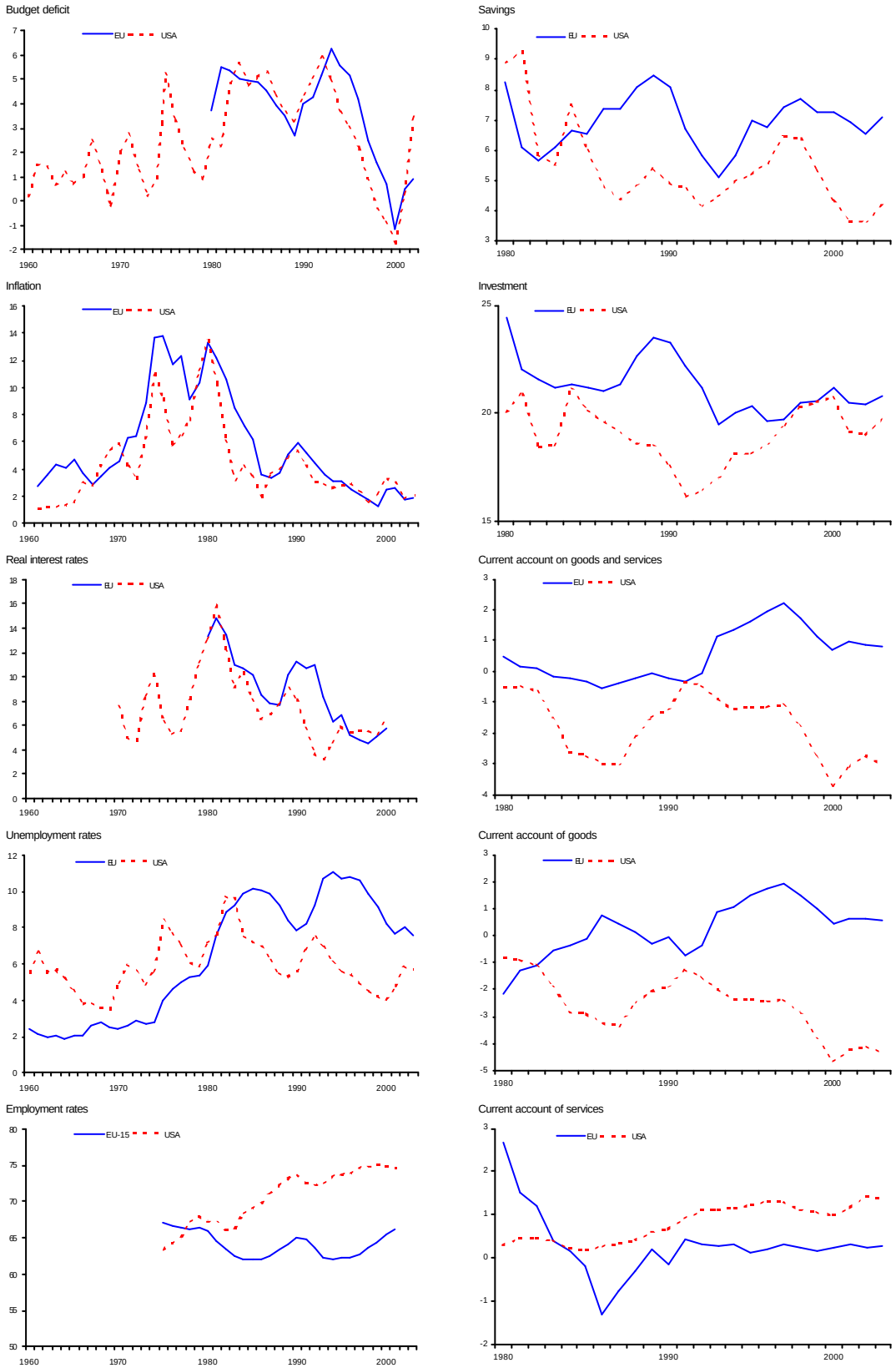
[29] Looking at the budget deficits and surpluses in Figure 3.9 warns to give this explanation too large an importance, since the deficits developed pretty much in parallel. The difference is that the US could do this at a higher level of growth. The discretionary part of cutting the deficit is therefore smaller (though there were two big discretionary deals done, the omnibus act of 1993 and the budget programme 1997; see *Report of the President*, 2001).

[30] Netherlands is rather near to Sweden, Finland and Denmark according to many indicators on future growth. It has however intentionally reduced growth in macro productivity in a national consensus to reduce unemployment (among other instruments by spreading employment among more workers).

[31] The importance of differences in the behaviour of central banks for the disappointing performance of Europe is stressed in Schulmeister (2000a, 2000b), that of fiscal policy is analysed in Marterbauer and Smithin (2000). See Schulmeister (2000a and b) also for the arguments that policy and demand side measures and a more systemic approach in the US explain the growth differences in US and Europe. Gordon (2002) takes technological progress as exogenous and starts the virtuous cycle in the USA with low inflation, which allowed the Fed to be non restrictive, leading to higher growth.

Figure 3.9

Budget deficit, inflation, interest rates, employment; Savings/investment and current account



Source: WIFO calculations using AMECO.

A third demand side difference is that the USA experienced an unprecedentedly long uninterrupted growth cycle, while Europe suffered a recession in 1993. While a series of external shocks (Russian and Asian crises) were to some extent comparable, they did impact the USA and the European economies differently, indicating a greater robustness of the USA. Further, success feeds further success: as a result of the difference in the 'growth cycle' it is plausible that part of the strong investments in the growth drivers was not a difference in behaviour, but itself the consequence of generally higher investments induced by the more favourable demand growth. The expenditures on and application of new technologies in the USA were 'biased upward' by an investment boom made possible by higher growth of output and earnings. These cumulative effects make it more difficult to determine which trends were the cause of higher growth in the USA and which originated in this higher growth. The fact that growth drivers were already higher at the beginning of the decade supports the view that the cyclical effect may not be the dominant one. Maybe Europe would have lowered its gap faster if it had experienced a similar period of consistently high growth as in the USA.

*Hypothesis 4: European countries did abandon anticyclical fiscal and monetary policy in the 1990s, while the USA – whose economists had initiated this policy shift – had returned to an active monetary policy and finally to fiscal stimuli. This was easier since budgets had turned into surplus (by two discretionary programmes and by the strength of growth) and inflation did not rise even in a strong and long growth period (*implying that *NAIRU,* if it exists, has fallen in the USA*).*

We cannot close the analysis of productivity without referring to labour market conditions. Labour supply was very flexible in the USA at the beginning of the 1990s. High growth reduced unemployment and low wage labour reserves in the first half, stimulating investment and shifts to more capital-intensive techniques in the second. In Europe unemployment rates continued to rise and government – at least in some countries like France, Netherlands, Denmark – tried to spread employment among more persons. These tendencies explain part of the difference in the dynamics of productivity over time.

We conclude that the picture as well as the explanations proposed here are not without open questions and any hypothesis based on evidence from a very short period should stress the caveats. But we maintain – well in line with the literature – that there is a reversal of the long lasting trend of productivity slowdown in the USA, which did not occur in the majority of the European countries. Secondly, Europe did leave its path of productivity catching up at least in the latter half of the 1990s. Furthermore differences in the growth drivers indicate that these trends may not be transitory, or cyclical, or only induced by restrictive fiscal and monetary policy. They have been supported by certain trends in investments, such as investment in education, research and development and an innovative system which is superior at least in periods of major innovations. This picture can be further substantiated if we switch to a more disaggregated level.

Annex 3.1

Closeness of fit between growth and growth drivers in European countries

(Rank correlation coefficients, with p values underneath the coefficients)

	Production growth Manufacturing[1)]	Productivity growth Manufacturing[1)]
R&D/GDP	0.3319	0.3187
	0.2464	0.2668
R&D personnel in % of the labour force	0.4374	0.3626
	0.1178	0.2026
Patents per resident	0.3670	0.5253
	0.1967	0.0537*
Publications per resident	0.4593	0.3363
	0.0985*	0.2398
Public expenditure an education	0.4813	0.1736
	0.0814*	0.5528
at least upper secondary education by age group (1998)	0.3758	0.4110
	0.1854	0.1443
Percentage of the population that has attained at least tertiary education (1998)	0.4316	0.4094
	0.1234	0.1460
Human resources in science and technology by country	0.3451	0.2703
	0.2269	0.3499
Working population with tertiary education	0.4681	0.3670
	0.0914*	0.1967
ICT expenditure in % of GDP	0.3011	0.2440
	0.2955	0.4006
ICT production in % of total manufacturing	0.4559	0.2967
	0.1022	0.3030
PCs per inhabitant	0.6484	0.4681
	0.0121**	0.0914*
Internet users per inhabitant	0.6088	0.5341
	0.0209**	0.0492**
Cellular mobile subscribers per 100 capita	0.4286	0.2396
	0.1263	0.4094
Innovation expenditures in % of sales	0.5431	0.3444
	0.0447**	0.2278
Share of new/improved products in % of sales	0.4462	0.3495
	0.1098	0.2207
Share of co-operations	0.6084	0.4596
	0.0210**	0.0983*
Share of firms with continuous research	0.7582	0.6396
	0.0017**	0.0138**
Structural change indicator (speed of change)[2)]	0.4154	0.4637
	0.1397	0.0949*
Combined indicator	0.6264	0.4593
	0.0165**	0.0985*

Notes: 1) Growth 1991/2000. - 2) Aiginger (2001).

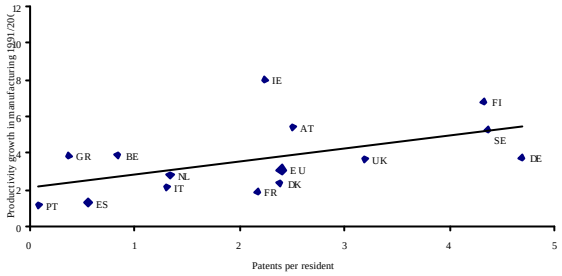
Remark: * (**) denotes significance at 10% (5%) level.

Source: WIFO calculations using AMECO.

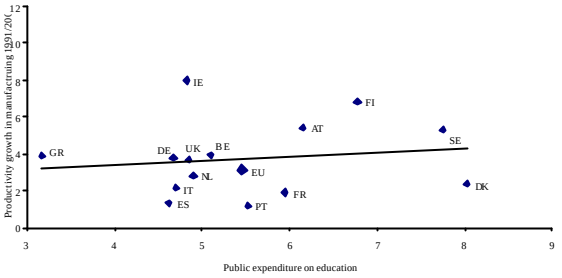
Annex 3.2

The underlying forces (growth drivers) for productivity growth

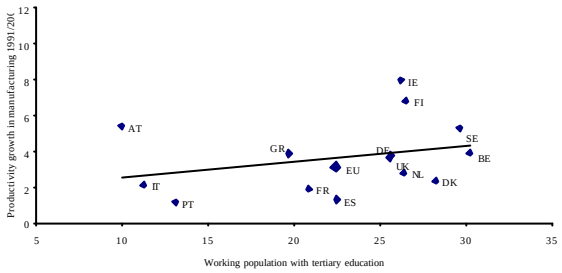
Relation between productivity growth and patents per resident



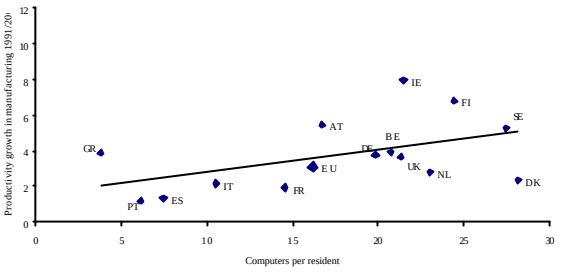
Relation between productivity growth and public expenditure on education



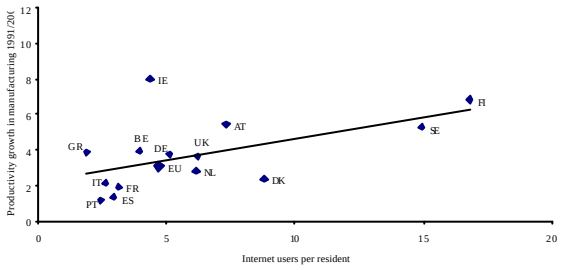
Relation between productivity growth and working population with tertiary education



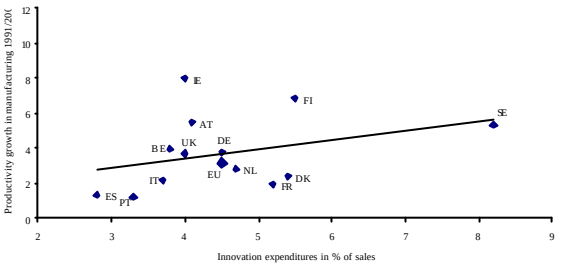
Relation between productivity growth and computers per resident



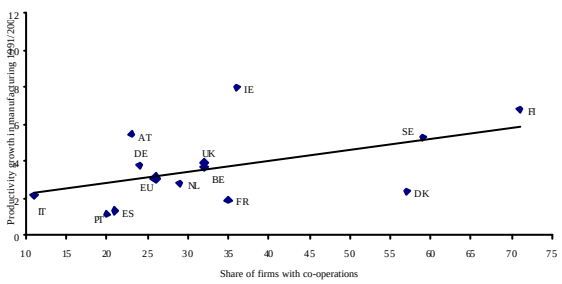
Relation between productivity growth and internet users per resident



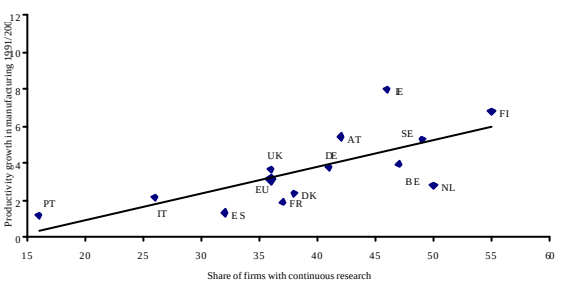
Relation between productivity growth and innovation expenditures in % of sales



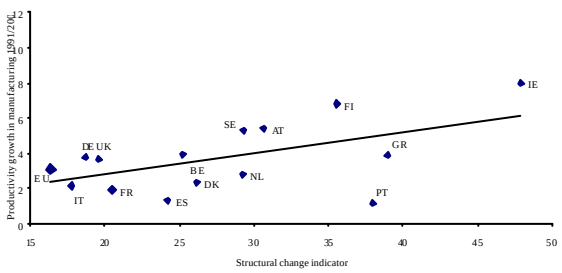
Relation between productivity growth and share of firms with co-operations



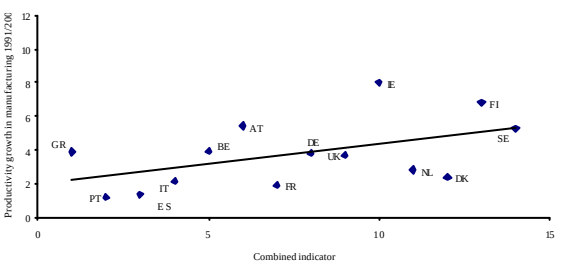
Relation between productivity growth and share of firms with continuous research



Relation between productivity growth and speed of change



Relation between productivity growth and the combined indicator



Annex 3.3

A small sample of definitions for the 'competitiveness' of a nation[32]

Uri (1971), 'the ability to create the preconditions for high wages'

The German Sachverständigenrat (1981, p.459), 'the ability to develop speciality products and technical solutions which generate income growth under full employment, despite the emerging competition of newly industrialized countries'

Orlowski (1982, p.70), 'the ability to sell'

Scott and Lodge (1985, p.15), 'a nation state's ability to produce, distribute and service goods in the international economy ..., and to do so in a way that earns a rising standard of living'

Fagerberg (1988, p.355), 'the ability of a country to realize central economic policy goals, especially growth in income and employment, without running into balance of payment difficulties'

Porter (1990, p. 6), 'The only meaningful concept of competitiveness at the national level is national productivity'

Sigurdson (1992, p.237), 'to produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding domestic real income'

Competitiveness Policy Council (USA, 1994), 'the ability to sell products on international markets, while incomes in the domestic markets increase in a sustainable way'

EU (1994, p. 117), 'competitiveness as the ability to "combine growth with balanced trade" '

World Economic Forum (1994), 'World competitiveness is the ability of a country or a company to, proportionally, generate more wealth than its competitors in the world markets.' No definition up to that year, only 'factors of competitive strength' and a 'formula for competitiveness'. It reads, 'competitive assets x competitive processes [plus internationalization] gives competitive results.'

EU (1995, p. 122), 'ability to increase or to maintain the living standard relative to comparable economies (e.g. developed industrialized countries), without long-run deterioration of external balance'

OECD (1996, p. 8), 'competitive policy ... (is) supporting the ability of companies, industries, regions and nations or supra-national regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis'

Oughton and Whittam (1996), 'long-run growth in productivity and hence rising living standards, consistent with increasing employment or the maintenance of near full employment'

Tunzelmann (1995), Historians have tended to equate 'competitiveness ... with political, technical, commercial leadership'

Aiginger (1998), 'Competitiveness of a nation is the ability to (i) sell enough products and services (to fulfil an external constraint); (ii) at factor incomes in line with the (current and changing) aspiration level of the country; and (iii) at macroconditions of the economic, environmental, social system seen as satisfactory by the people.'

European Commission (1998), 'An economy is competitive if its population can enjoy high standards of living and high rates of employment while monitoring a sustainable external position.'

European Commission (2001), 'the ability of an economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis'

World Economic Forum (1996, p. 19), 'The ability of a country to achieve sustained high rates of growth in GDP per capita'

World Economic Forum (2000), 'Competitiveness is the set of institutions and economic policies supportive of high rates of economic growth in the medium term.'

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[32] Taken from Aiginger (1998).

4 Differences in structure and dynamics between Europe and the USA

The last section presented the stylized facts of higher growth of productivity in the USA in the 1990s both for the total economy and for manufacturing. Our main explanation is that the USA invested more into the fundamental determinants of long-run growth in general and specifically in the most important upcoming general purpose technology (the ICT technology). Even if some of these factors had existed also in the decades before, they became more important in a period of radical technological change. We acknowledge the importance of policy factors and persistently growing demand in the USA, but assess these forces as complementary to the supply side push stimulated by R&D, education and ICT.

Looking into the disaggregated data on sectors and industries should further indicate whether this assessment is correct. If demand was the driving force, we would expect industries and sectors to grow approximately in parallel[33] and differences in the structure and dynamics between Europe and the USA should be rather small. If technology was the driving force, and with the 'growth drivers' playing a major role, productivity growth should be (i) higher in high-tech industries and in industries using new technologies, (ii) productivity increase in these sectors should be faster in the USA relative to Europe and (iii) a technology-based push in the USA would have a larger weight, if the share of these industries in value added were higher in the USA at the start of the 1990s.

In this section we analyse structural differences between the economies, and whether they can contribute to explain the stylized facts. In subsection 1 we start with broad sectors and investigate differences in their shares and growth. Subsection 2 focuses on manufacturing, the sector where data are available at a very disaggregated level[34] and the difference in productivity growth between Europe and the USA is specifically strong in the 1990s. We analyse manufacturing according to the main factor inputs used, to skill levels and to the type of external services used. Subsection 3 presents the core evidence using structural data to analyse the importance of supply side factors. While any structural analysis focusing on high-tech shares and productivity gives a very favourable picture for current and probably also future US development, the next section summarizes evidence that Europe may go a slightly different way than the USA. In subsection 4 we investigate upgrading in product quality, which is an alternative to shifts between sectors. We then investigate the industry structure in the USA and in Europe according to whether price competition or quality competition defines the competitive edge. We report differences in regional structures in subsection 5 and show that in some fast growing European countries growth drivers as well as industrial structures are more similar to the USA than in other European countries (subsection 6). We then summarize what the disaggregated data tell us about the underlying forces of the macro results.

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[33] Differential production growth would arise due to different income elasticities.

[34] We use data produced by Eurostat- SBS for Europe and US. Missing data were estimated by WIFO. Nominal data had been more complete than real data, and data up to 1988 seem to be of poor quality.

4.1 Macro shares

GDP can be split into nine broad sectors, four of them belong to manufacturing (mining and quarrying; total manufacturing; electricity, gas and water supply; construction), four of them to the service sector (wholesale and retail trade; restaurants and hotels; transport and storage and communication; finance, insurance, real estate and business services, community social and personal services), the ninth sector is agriculture. We are specifically interested whether the shares of manufacturing and services differ in the USA and Europe, and how this has changed in the 1990s. We then compare productivity and look into the services sector which could be at the heart of new developments, namely business services.[35]

The size of manufacturing is slightly larger in Europe compared to the USA. The difference, which had grown from 1980 to 1990 from 3.4% to 4.9%, decreased in the 1990s to 3.6%. Manufacturing is responsible for 19.8% of GDP in Europe and 16.2% in the USA in 1999.

Table 4.1

Differences in structure and productivity: broad sectors

	Snares in GDP								Growth of value added p.a							
	1980		1990		1995		1999		1980/1990		1990/1995		1995/1999		1990/1999	
	EU	USA	EU	USA	EU	USA	EU	USA	EU	USA	EU	USA	EU	USA	EU	USA
Manufacturing	25.9	21.5	23.2	18.3	20.8	17.7	19.8	16.2	7.9	7.5	1.7	3.7	2.4	7.3	2.3	6.2
services	58.1	64.5	64.4	70.6	67.8	72.6	69.9	74.3	10.3	10.3	4.9	5.0	4.1	9.8	5.0	8.2
of which																
Finance, insurance, real estate																
and business services	19.3	20.1	23.1	25.4	25.5	26.8	27.5	29.2	11.1	11.9	5.9	5.4	5.0	11.2	6.1	9.2
GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.1	9.2	3.8	4.3	3.4	9.0	4.0	7.4
	value added per person								Growth of productivity p.a.							
Manufacturing	15356	19089	35414	41723	40900	51709	49110	73625	8.7	8.1	2.9	4.4	3.7	7.3	3.7	6.5
services	15863	16167	33898	33276	37889	39160	46890	56882	7.9	7.5	2.3	3.3	4.4	7.8	3.7	6.1
of which:																
Finance, insurance, real estate																
and business services	32959	32281	62659	62684	70310	73448	83485	104030	6.6	6.9	2.3	3.2	3.5	7.2	3.2	5.8
GDP	15488	17643	33946	35604	38424	41639	47216	59107	8.2	7.3	2.5	3.2	4.2	7.3	3.7	5.8

EU: 9 countries for value added: Denmark, Germany, France, Italy, Netherlands, Austria, Finland, Sweden, United Kingdom

6 countries for productivity: Denmark, France, Italy, Finland, Sweden, United Kingdom.

Output of total economy = GDP at market prices 1995, output of manufacturing = production index

Source: WIFO calculations using New Cronos for GDP and AMECO for manufacturing.

[35] The data we use are in the OECD STAN database, which supplies comparable data for nine European countries and the USA. These nine European countries are Denmark, Germany, France, Italy, Netherlands, Austria, Finland, Sweden, and United Kingdom, for productivity only six countries are available (since employment data are not available for Germany, the Netherlands and Austria).

Not unexpectedly, the reverse picture is seen for services, it amounts to 74.3% in the USA and 69.9% in Europe. Europe has here converged to the higher US level; the difference had been 6.2% in 1990. Over both decades together – 1980s and 1990s – the service sector gained 10 percentage points. Specifically in the USA the increase in percentage points had been larger in the 1980s. This lower increase may reflect a saturation effect or it may come from the rejuvenated dynamics of manufacturing through new technologies.

The sector in which business services are embedded comprises 'finance, insurance, real estate and business services'. This sector is responsible for the whole increase in the service share in the USA, increasing from 25.4% in 1990 to 29.2% in 1999. Again, growth had been higher from 1980 to 1990. In Europe this sector falls short of the US position only by 1.7% in 1999, and the gap has widened over the latter half of the 1990s.[36]

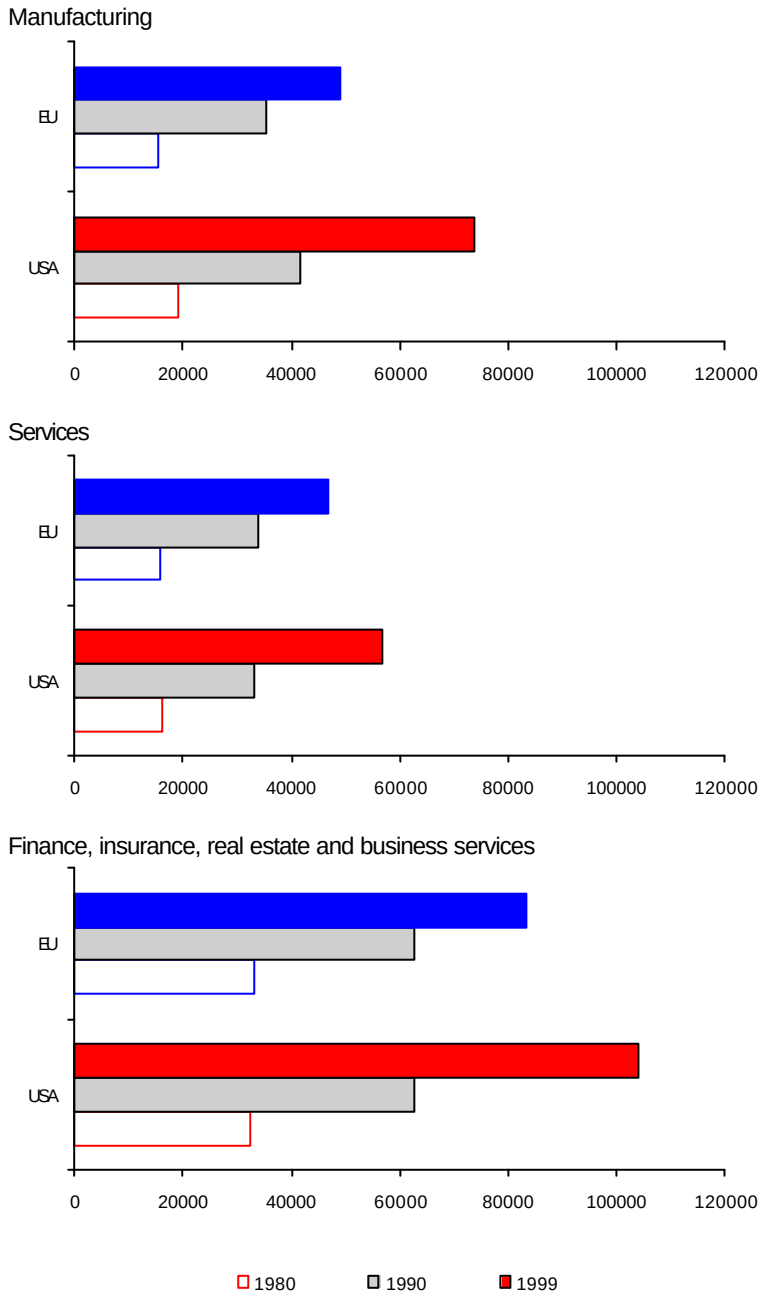
Productivity – as often in disaggregated studies inadequately measured by nominal value added per employee – is 25% higher in the USA for all sectors together. The US lead is larger for manufacturing (50%) than for services (20%) and it had widened in manufacturing (1990: 18%) as well as for services. For services productivity had been rather similar in Europe and in the USA in 1990 (33,900 EUR vs. 33,300). The 'new' productivity differential comes from the business services sector. Here productivity was the same in Europe and in the USA in 1990 (63,000 EUR), and it is now 25% higher in the USA (104,000 EUR in USA versus 83,000 in Europe). The absolute value added per worker is much higher in business services than in manufacturing (see Figure 4.1).

The upshot of this is that the higher productivity growth of the USA is on the one hand the result of the rebounding manufacturing sector (which decelerated its decline to some extent for the USA) and on the other hand to the remarkable increase in productivity of the business services sector. The last mentioned sector is larger in the USA, responsible for the full extent of the rising service share and increased its productivity very fast. Europe could nearly reach the share of value added of GDP in business services, but productivity did not rise as fast as in the USA. These results are a first hint that the differences in the USA and Europe in productivity growth come – aside from differences in manufacturing – from the business services sector. While manufacturing is the largest producer of ICT, business services are important users. And in the USA this sector increased productivity by much more than other sectors and faster than in Europe.

[36] Transport and communication make up 6% of GDP in USA and 7% in Europe without any significant change over the two decades.

Figure 4.1

Productivity and productivity growth in broad sectors



Source: WIFO calculations using STAN (OECD).

4.2 Larger share and growth in technology-driven industries in the USA

Industry structure and dynamics can reveal economic forces behind aggregate trends. For this purpose we use three taxonomies, of which each aggregates some of the hundred available 3-digit industries[37] into rather homogenous industry types. The concepts used for making these classifications are based on ideas coming from industrial organization, from trade theory and from technological and evolutionary economics. The technique used to determine which industries belong to a specific group was cluster analysis. For an explanation of the background as well as the technique used see Peneder (2000). These taxonomies were already used in the last Competitiveness Reports of the European Commission (European Commission, 1998, 1999, 2000) to determine differences in competitiveness of European manufacturing according to industry types. In all three taxonomies, there is one class of industries, in which high-income nations are expected to be specialized and in which income elasticity is specifically high. In the taxonomy based on the most intensively used input factor, these are the 'technology-driven industries'. In the taxonomy based on skill requirements it is 'high-skill industry' and in the taxonomy based on the type of external services used this is the group of industries with 'high inputs of information and knowledge-based services'.

Table 4.2

Industrial structures differ and USA leads in three types of 'progressive' industries

	Shares in EU				Shares in USA				Differences in shares EU - USA				Growth p.a.			
													1990/1998		1995/1998	
	1985	1990	1995	1998	1985	1990	1995	1998	1985	1990	1995	1998	EU	USA	EU	USA
According to factor inputs																
Technology driven industries	21.62	21.85	21.41	22.92	26.63	26.46	26.65	30.27	-5.01	-4.61	-5.25	-7.35	2.93	8.59	5.30	15.24
Marketing driven industries	20.38	20.51	20.99	21.11	23.65	24.80	23.92	22.86	-3.27	-4.29	-2.92	-1.75	2.69	5.70	3.11	8.81
Capital intensive industries	16.94	15.65	16.55	14.97	12.81	14.45	14.60	13.50	4.13	1.20	1.95	1.47	1.75	5.87	-0.45	7.61
Labour intensive industries	16.19	16.56	15.51	15.55	13.99	12.80	12.82	12.07	2.20	3.76	2.69	3.48	1.52	6.00	3.01	8.27
Mainstream	24.87	25.43	25.55	25.45	22.93	21.49	22.02	21.31	1.94	3.94	3.53	4.14	2.33	6.67	2.80	9.26
According to human resources																
High skill industries	16.49	16.81	16.10	16.67	19.19	18.27	16.90	18.64	-2.70	-1.46	-0.80	-1.96	2.21	7.05	4.14	14.12
Medium skill/white collar workers	30.69	30.42	31.09	30.86	35.38	37.20	37.73	38.47	-4.68	-6.78	-6.63	-7.60	2.50	7.23	2.67	11.18
Medium skill/blue collar workers	20.50	21.36	21.62	22.53	18.32	17.01	18.12	17.85	2.18	4.36	3.50	4.68	3.00	7.43	4.35	9.92
Low skill industries	32.32	31.40	31.19	29.93	27.11	27.52	27.25	25.04	5.20	3.88	3.93	4.89	1.71	5.53	1.52	7.39
According to external services																
High inputs from knowledge based services	18.61	18.22	18.65	19.23	27.33	27.77	26.89	28.98	-8.72	-9.55	-8.25	-9.76	3.00	7.35	3.98	13.25
Inputs from retail & advertising services	26.96	27.57	27.39	27.92	25.77	26.27	26.37	27.43	1.18	1.30	1.03	0.50	2.48	7.36	3.59	11.92
Inputs from transport services	23.78	24.05	24.82	23.57	22.87	23.39	23.94	21.94	0.92	0.66	0.87	1.63	2.06	5.93	1.18	7.29
Other industries	30.65	30.16	29.15	29.28	24.03	22.57	22.80	21.65	6.62	7.59	6.35	7.63	1.94	6.23	3.08	8.58
Total manufacturing	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00	0.00	0.00	2.32	6.78	2.93	10.46

Source: WIFO calculations using SBS.

[37] The taxonomies aggregate about 100 NACE 3-digit industries (the EU nomenclature) into four or five categories, which are presumed to be homogenous in certain respects (cluster analytic techniques were used here). US data are made comparable to the European nomenclature by EUROSTAT.

The main result is that the USA enjoys a higher share in value added in all these three 'progressive' industries (see Table 4.2). Technology-driven industries make up 30% of nominal value added in the USA in 1998 compared to 23% in Europe. Industries using knowledge services intensively make up 29% in the USA versus 19% in Europe (this is the largest difference). Industries with a large share of skilled workers produce 19% of US value added in manufacturing and 17% in Europe (this is the smallest lead out of the three taxonomies). As far as changes in the industry structure are concerned, industry structure looks very persistent over time for the skill classification and for service inputs. For skill-intensive industries changes in the shorter as well as the longer run[38] are in both regions below one percentage point. In knowledge-based industries Europe is catching up in the long run, but as compared to the lead of the USA not really fast.

The exception is technology-driven industries. Here the USA is able to increase its lead, a difference in percentage points of 4.6% in 1990 is amplified to a difference of 7.4% in 1998. Note that these tendencies use nominal data. Nominal data have some well-known disadvantages (specifically if used for productivity assessment). In our case we consider this as an advantage, since trends are not influenced by differences in price deflation methods (as reported in section 3 using hedonic price adjustments for quality in some countries and not in others).

Since the 'progressive' industries are in general growing faster (the products enjoy a high income elasticity) we can make the usual counterfactual calculation, how different growth rates of aggregate manufacturing would have been if Europe had had the US structure of 1985 together with its 'own' industry specific growth rates. Growth in manufacturing would have been less than one tenth of one per cent higher in Europe, if it had had the higher share of USA in technology-driven, high-skill and knowledge-input-intensive industries. Thus the bigger actual growth differences for total manufacturing do not come from the initial difference in industry structure, but from the fact that technology-driven industries and high-skill industries themselves have grown in the 1990s faster in the USA than in Europe. Structure matters, but only for a small fraction of the actual difference. Demand differences and differences in competitiveness 'explain' the larger part.[39]

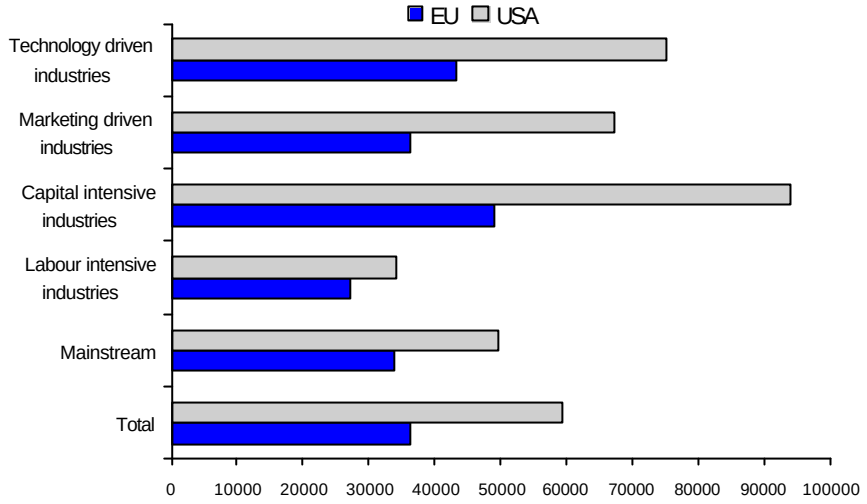
[38] Data are available from 1985 to 1999. Shorter run is defined as in the 1990s, longer run is the full period.

[39] There is however an important line of research arguing that traditional shift and share analysis does not reveal the importance of 'progressive' industries, since sophisticated industries usually supply spillovers to other industries. Peneder (2002) demonstrates this empirically to be important for Europe in a panel analysis where spillovers are significant while shift and share analysis does not reveal a 'structural effect'.

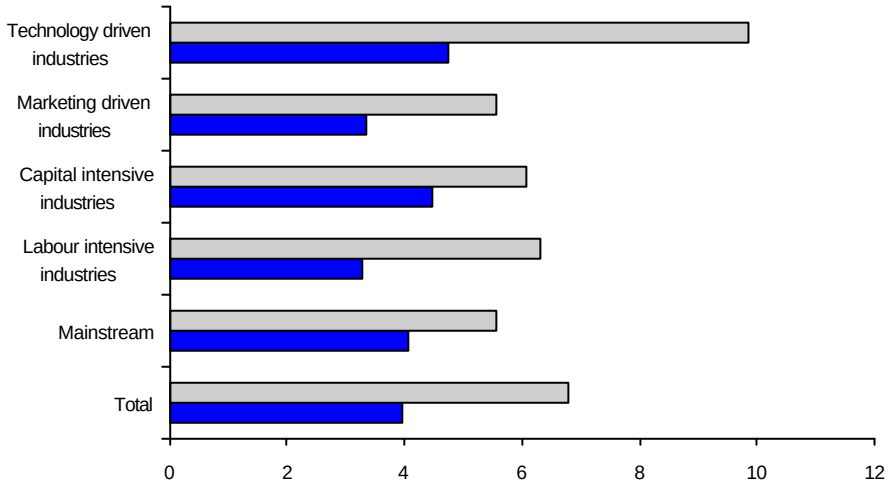
Figure 4.2

Productivity and productivity growth in industry types

Value added per employee 1990 (ECU)



Productivity increase (p.a.) 1990/1998



Source: WIFO calculations using SBS.

4.3 Higher productivity and stronger acceleration in the USA

To compare the level of productivity has been shown to be a difficult task for the aggregate economy. It is even more difficult for the 'meso level' of industries and sectors, since the statistical concept used for calculating value added for industries are different.

The productivity difference between Europe and the USA is higher in technology-driven industries than in total manufacturing. In 1990 value added per employee was 73% larger in the technology-driven industries, and if we 'normalize' this by comparing productivity premium in this sector relative to the overall lead we get a 'productivity advantage' of 10% in the sense that the US productivity advantage in the technology driven sectors is by this margin higher than for total manufacturing.

From 1990 to 1998 productivity increased in the US technology-driven industries by 9.9% p.a. (see Figure 4.2). This increase is significantly faster than in overall manufacturing and much larger than in Europe. These two findings strongly support the view that technology and differences in technological progress in these industries are factors influencing growth. If it had been demand in general or prudent fiscal and monetary policy this would not explain the reported differences.

4.4 Productivity differences in ICT-producing and using sectors

Since there are weaknesses in the data it is important to show that the results are replicated in other studies using different data and methodology. Stiroh (2001) shows that productivity increase is significantly larger in ICT-intensive industries and that there is a strong correlation between ICT capital accumulation and labour productivity.

We can replicate these tendencies for our data set. The share of ICT-producing industries[40] had been rather similar in Europe and the US in 1985: 6.37% in the EU versus 8.35% in the USA, this difference increased to 4.6 percentage points in 1995 and to 7.39 points in 1998 (see Table 4.3). The shares of the ICT-using industries are roughly the same in both regions, and the difference remains approximately constant.

Looking at production change the overwhelming dynamic of the ICT-producing sector in the USA can be demonstrated. Production increased by 9.3% in the first half of the 1990s and by 19.7% in the period 1995 and 1998 as compared to meagre 0.9% and 3.6% p.a. in Europe. And productivity growth was 18.2% in nominal terms and 18.6% in real terms for the last period in the USA. Productivity in the ICT-producing sector accelerated in Europe too, but the growth rates were 5.1% in nominal and 8.1% in real terms.

[40] For defining industries as ICT-producing and ICT-using we follow the classification of Van Ark (2000), but do not allow an industry to be in both sectors to guarantee the adding up property. ICT-producing industries are office, accounting and computing machinery; insulated wire and cable; radio, television and communication equipment; medical appl. & measurement instruments. ICT-using sectors are publishing; chemicals and chemical products; electrical machinery, medical, precision and optical instruments.

Table 4.3

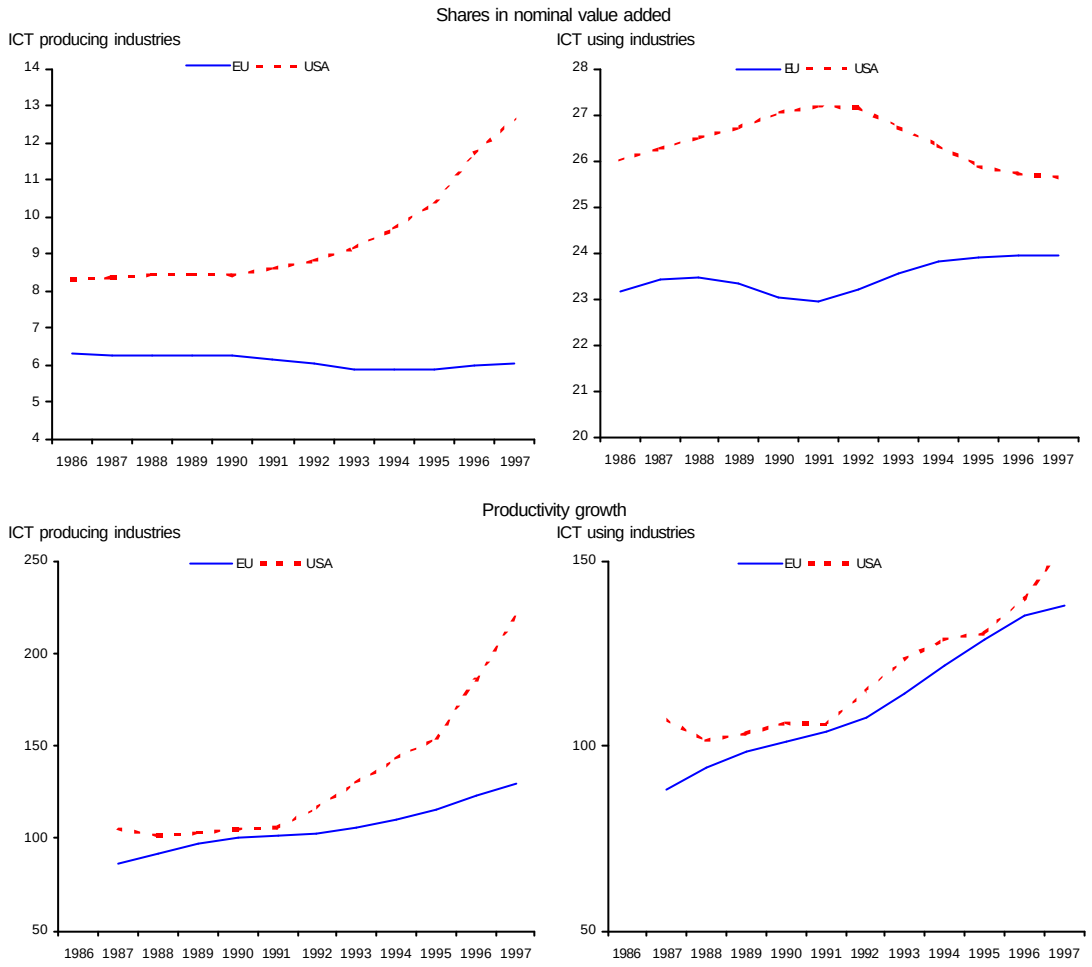
Contribution of ICT-producing and using industries to productivity growth

	EU				USA			
Nominal value added	*1985*	*1990*	*1995*	*1998*	*1985*	*1990*	*1995*	*1998*
Share of ICT-producing industries	6.37	6.21	5.90	6.02	8.35	8.47	10.53	13.41
Share of ICT-using industries	22.91	22.87	23.82	23.81	25.70	27.08	25.82	25.57
Share of other industries	70.72	70.91	70.28	70.16	65.95	64.45	63.65	61.02
		1985/	*1990/*	*1995/*		*1985/*	*1990/*	*1995/*
Production growth		*1990*	*1995*	*1998*		*1990*	*1995*	*1998*
ICT-producing industries		5.59	0.89	3.64		0.80	9.28	19.73
ICT-using industries		6.07	2.78	2.92		1.57	3.65	10.10
Other industries		6.17	1.77	2.87		0.05	4.37	8.92
Total		6.11	1.95	2.93		0.51	4.64	10.46
Productivity growth								
ICT-producing industries		4.91	3.01	5.09		2.54	8.73	18.23
ICT-using industries		5.24	5.55	2.29		1.17	4.71	9.73
Other industries		6.10	4.46	2.83		-0.16	4.39	8.75
Total		5.86	4.63	2.85		0.41	4.83	10.15
Production growth (real)								
ICT-producing industries		2.89	0.10	660		-1.65	8.29	20.12
ICT-using industries		3.20	0.50	265		-1.62	0.92	9.26
Other industries		2.35	-0.67	2.98		-2.94	2.69	8.75
Total		2.57	-0.35	3.12		-2.47	2.72	10.19
Productivity growth (real)								
ICT-producing industries		2.24	2.21	8.10		0.05	7.74	18.61
ICT-using industries		2.38	3.21	2.02		-2.01	1.95	8.90
Other industries		2.29	1.96	2.94		-3.14	2.71	8.58
Total		2.34	2.26	3.05		-2.57	2.90	9.88
Contribution to productivity growth								
ICT-producing industries		0.31	0.19	0.30		0.24	0.72	1.87
ICT-using industries		1.21	1.25	0.59		0.27	1.22	2.52
Other industries		4.35	3.19	1.96		-0.01	3.03	5.48
Total		5.86	4.63	2.85		0.41	4.83	10.15
Contribution to productivity growth (real)								
ICT-producing industries		0.28	0.19	0.30		0.00	0.61	1.90
ICT-using industries		1.17	1.22	0.59		-0.58	0.49	2.30
Other industries		4.47	3.20	1.95		-1.98	1.91	5.35
Total		5.86	4.63	2.85		-2.57	2.90	9.88
Contribution to productivity growth (Domar weights nominal)								
ICT-producing industries		0.25	0.17	0.27		0.20	0.58	1.61
ICT-using industries		1.04	1.10	0.47		0.29	0.98	2.05
Other industries		4.67	3.24	2.25		0.71	3.27	6.11
Total		5.86	4.63	2.85		0.41	4.83	10.15

Source: WIFO calculations using SBS and a modified classification of ICT-producing or ICT-using industries by van Ark.

Figure 4.3

ICT-producing and using industries

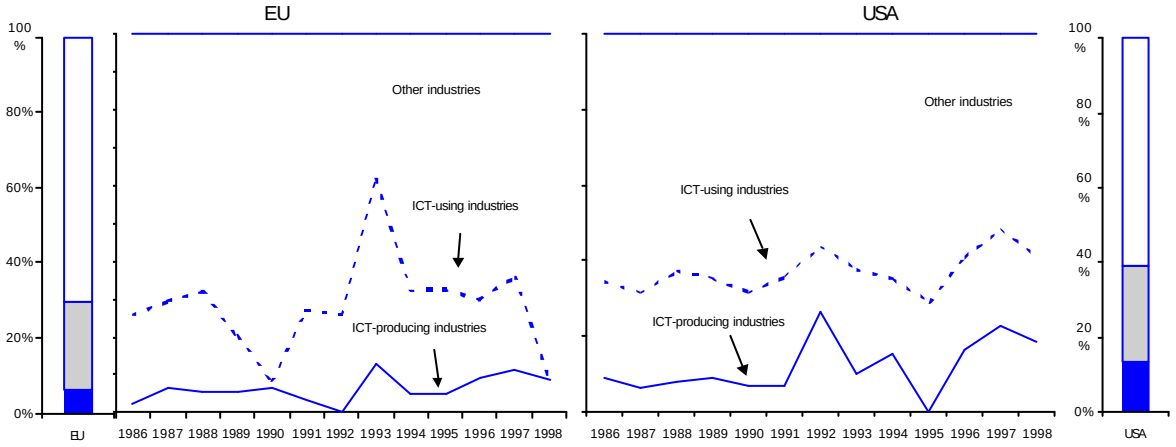


Source: WIFO calculations using SBS and a modified classification of ICT-producing or ICT-using industries by van Ark.

Figure 4.4

Contribution of ICT industries to productivity growth in EU and USA

(as compared to share in value added, extreme left block and extreme right block)



Source: WIFO calculations using SBS and a modified classification of ICT-producing or ICT-using industries by van Ark.

In the ICT-using industries productivity accelerated in the US too, but increased 'only' with one-digit rates. The development in productivity growth in the ICT-using industries is more similar between the US and the EU (see also van Ark, 2000).

If we calculate the contributions of these three industry types to the overall productivity increase, we find that the small ICT-producing sector (less than 10% of value added in 1990) contributed 0.6 to 0.7 percentage points to the productivity increase of total manufacturing in the USA. The much larger ICT-using sector did first contribute less. In the last years it surpassed the ICT-producing sector, and now is contributing 2.3 to 2.5 percentage points. The other industries which amount to 64.4% of value added contribute about 54% to productivity growth. In Europe the ICT-producing sector increased its contribution from 0.2 to 0.3 percentage points, no acceleration is seen yet in the contribution of the ICT-using sectors, and the other industries contribute proportionally to their share in production.

4.5 Quality upgrading in existing structures

There is evidence that Europe and the USA are specializing in different segments of industries, which can only partly be delineated by the high-tech industries as defined by research input or ICT characteristics. This is shown for example in the good performance of Europe in the mainstream or engineering industries, which have a higher share of manufacturing output and where output is growing faster in Europe. Secondly, it can be shown that Europe specializes in higher price segments of industries and thirdly in industries in which quality is defining the competitive edge. These trends correlate with the stylized fact that Europe excels in the medium and lower segments of the qualification spectrum (while the USA leads in the top segment). It is also consistent with a lower mobility of plants and firms, which is encouraged and supported by regional or national policy priorities in order to guarantee employment in existing firms and locations. Divestitures are discouraged, because the economic or social costs of change are considered to be high in Europe. See evidence on a slower 'speed of change' in Aiginger (2001).

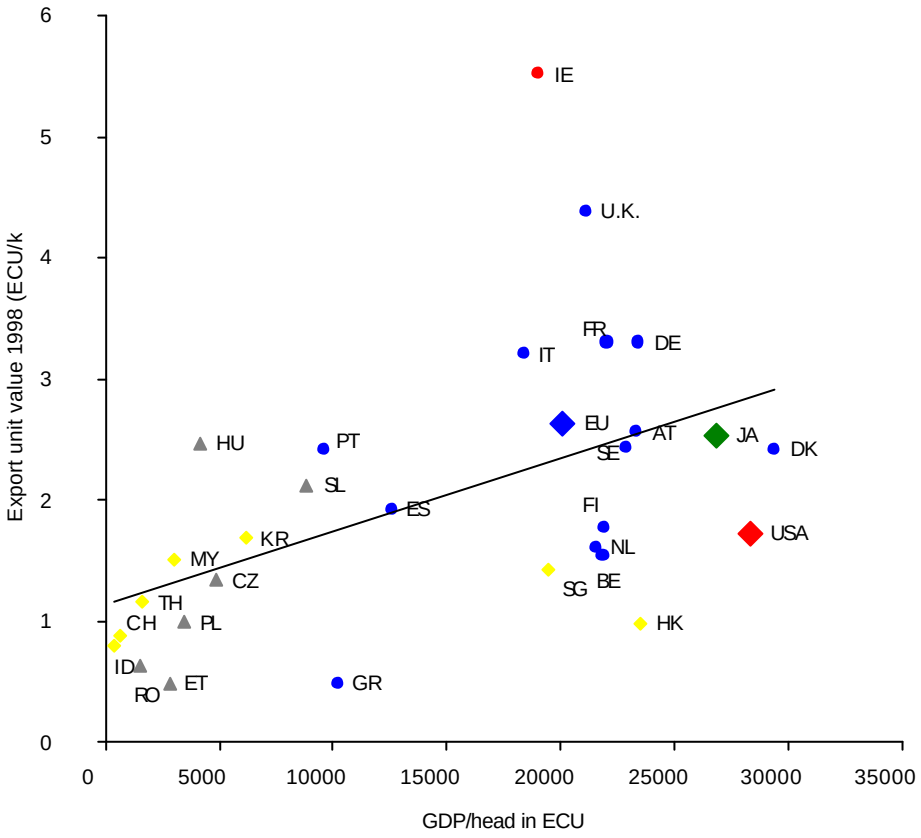
Several attempts have been made to estimate quality upgrading, specifically if quality is defined in a broad sense, including demand specificity, after sales services, design, etc., thus incorporating non-technical elements (see Jansen and Landesmann, 1999, Landesmann and Burgstaller, 1998). We report three attempts to assess the quality position of countries: the first estimates the position of export industries in the price spectrum ('quality segments'), the second assesses the position of countries in price- respectively quality-sensitive industries ('revealed quality elasticity') and the third is a comprehensive approach by using unit values of exported goods ('unit value approach').

Quality segments

Aiginger (2000a) shows that exports of the European Union are placed to 51.3% in the highest quality segment of the industries, while only 18% fall into the lowest price or quality segment (see Table 4.5). Ten years before the share of exports in the high quality segment had been only 46.8%, that of the low quality segment 19.7%. The quality segments were delineated with the use of import prices of the EU disaggregated into 30 countries of origin. The lower bound of the highest tercile defined the 'border' for the highest quality segment. Unfortunately similar numbers do not exist for the USA.

Figure 4.5

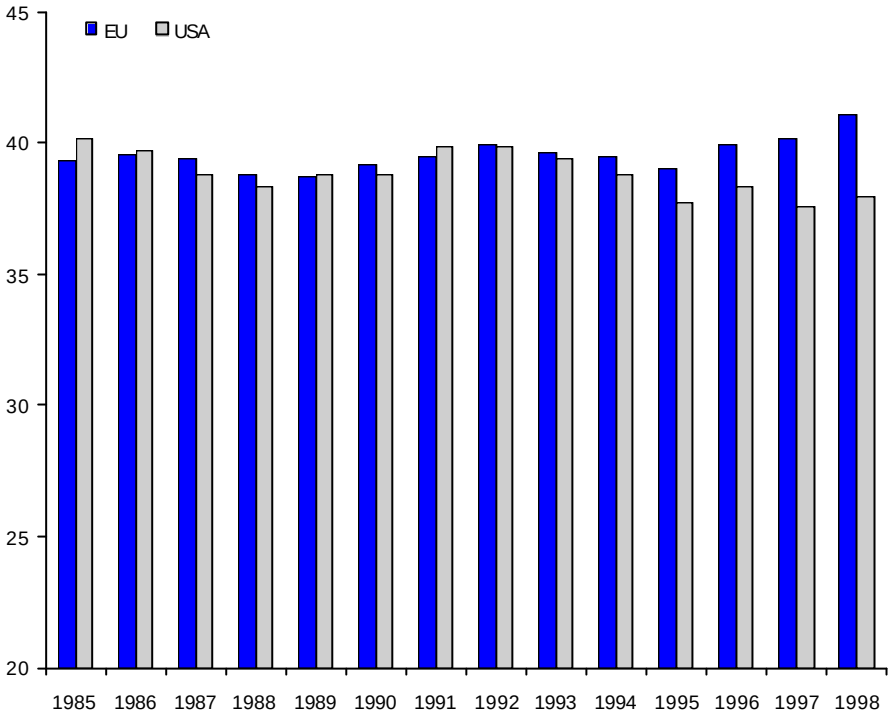
Unit value and GDP per head



Source: WIFO calculations using SBS and COMEXT.

Figure 4.6

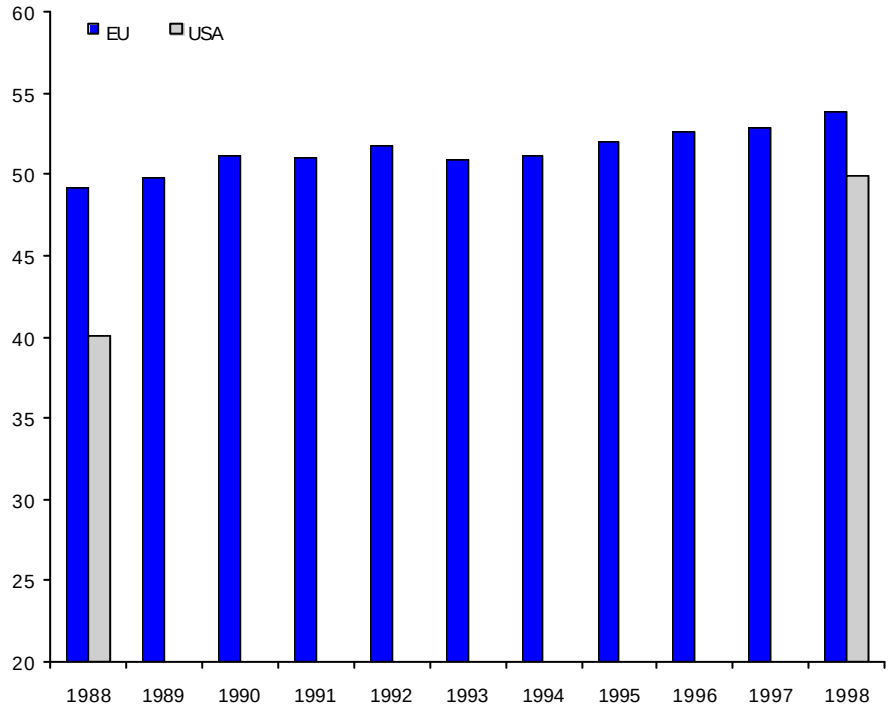
Share of quality-intensive industries in value added in Europe and in the USA



Source: WIFO calculations using SBS.

Figure 4.7

Share of quality-intensive industries in exports in Europe and in the USA



Source: WIFO calculations using COMEXT.

Revealed Quality Elasticity (RQE)

A second indicator on the quality of products can be derived by calculating the shares of value added in industries in which prices are defining the competitive edge and in those in which quality is defining the competitive edge. This is done by a technique using the price relation and the quantity relation in bilateral exports to get a qualitative information about the price elasticity (Aiginger, 1997, 2001). If prices and quantities have the opposite sign prices are important for defining the competitive edge (demand is price elastic) and the competitive outcome is (at best) partly determined by quality. If countries can export despite of a higher unit value, the exports have to be qualitatively superior (in some widely defined way). According to this measure Europe is producing 41% of its value added in manufacturing in the segment in which quality is important (high RQE industries), the USA only 38% (see Table 4.6). Europe is increasing its share of quality elastic industries, for the USA it is decreasing. This is consistent with Europe having a relatively expensive labour force (including taxes and social security payments) and its trend of increasing unit labour costs on the one hand and the increasing presence of low cost countries specifically in the nearby transition countries. Europe has to make use of its qualified labour force to upgrade quality within industries and to shift into industries in which prices do not alone define the competitive edge. Since Europe does not invest enough into research and is not

Table 4.4

Europe exports high quality products

	Exports				Imports			
	High	**Medium**	**Low**	**Balance** High-low	**High**	**Medium**	**Low**	**Balance** High-low
1988	46.8	33.7	19.7	27.1	44.5	35.2	20.5	23.9
1998	51.3	30.7	18.0	33.3	45.8	32.1	22.1	23.7

Remark: Share of exports and imports in quality segments of individual industries (Aiginger, 2000a).

Source: WIFO calculations using COMEXT.

Table 4.5

Share of quality-intensive industries in value added

	Shares in EU			**Shares in USA**		**Differences in shares** EU - USA		**Growth p. a.** 1990/ 1998	
	1988	1990	1998	1988	1998	1988	1998	EU	USA
Value added	38.76	39.20	41.10	38.33	37.97	0.43	3.13	2.89	6.50
Exports	49.24	51.13	53.89	40.06	49.91	9.18	3.98	9.57	27.09
Imports	35.57	37.84	41.02	33.46	47.65	2.11	-6.64	9.62	26.70
Trade balance[1)]	41.17	35.50	40.80	-34.19	-31.79				

Note: 1) Trade balance of the sector of quality-intensive industries (see Aiginger, 2000a) in % of total trade ((exports + imports) / 2).

Source: WIFO calculations using SBS.

dominating in radical breakthroughs, its main specific advantage lies in industries in which quality upgrades and small innovations are important, without gaining a share in the very highest tech industries (due to insufficient effort in research, ICT and top-quality tertiary education).

Table 4.6

Unit values of the EU exports and quality premium according to trade partners

	Export unit value			Import unit value			Relative unit value	
	1988	1998	% change	1988	1998	% change	1988	1998
EU extra trade	1.738	2.250	29.5	1.037	1.715	65.5	1.676	1.312
EU intra trade	1.274	1.452	14.0	1.268	1.360	7.3	1.004	1.067
EU vs. US4	1.757	3.096	76.2	1.697	3.503	106.4	1.035	0.884
EU vs. Japan	4.842	6.131	26.6	10.268	12.125	18.1	0.472	0.506
EU vs. non-USA	1.733	2.089	20.6	0.950	1.495	57.3	1.823	1.397
EU vs. non-triad	1.668	2.011	20.6	0.800	1.304	63.0	2.084	1.542

Source: WIFO calculations using COMEXT.

Unit value approach

Last but not least the unit value of exports gives a rough but rather comprehensive information about quality. The unit value of European exports (EU extra trade) is 2.25 ECU, this is higher than the unit value of US exports which is about 1.8 ECU. The data set reports exports to all countries in the world.[41]

In the bilateral trade between Europe and the USA the unit value of US exports is higher and increasing faster. US exports to Europe have a unit value of 3.5 ECU/ton in 1998, for the reverse flow from Europe to USA the unit value is 3.1 ECU/ton. This balance is produced by the technology-driven industries: in US bilateral exports the unit value of technology-driven industries is 70% higher than that of European exports to the USA and this sector is responsible for more than 50% of European imports from the USA. Ten years ago this sector had not dominated the picture and European exports had a slightly higher unit value due to high quality in labour-intensive and marketing-intensive industries and in price-intensive industries in general.

The difference between results for total exports (higher quality of European exports) and for the bilateral exports reveals a certain bifurcation in US exports. While US unit values with Europe are extraordinarily high (3.5 ECU/ton), its unit value with the non-European countries is rather low (1.5 ECU/ton for non-European and 1.3 ECU/ton to non-triad countries). On the other side Europe's non-US exports have a rather high unit value

[41] A shortcoming of this data set is that not all industries report export quantities (in tons). In this respect the COMEXT database is preferable, which reports quantities in tons for all products.

(2.1 ECU/ton non-US, 2.0 ECU/ton non-triad exports of the EU). In other words, Europe enjoys a considerable quality premium in its total exports (30% to all countries), which is not created vis-à-vis the USA. Here it has a quality penalty (since export prices are less than import prices) of 10%. This penalty amounts to 40% for technology-driven industries.

4.6 Regional differences

It is a well-known fact that US manufacturing is regionally more concentrated. This had even been the basis of a prediction that Europe would follow the USA in this respect, shifting resources from the periphery to the core.[42] Empirical studies are difficult since the size of the regions makes comparisons difficult. If we compare states for the USA and NUTS1 regions for Europe there is a slight tendency towards higher regional concentration of industries in the USA. In neither the USA nor Europe regional concentration is increasing, if anything it is decreasing and the USA follows the European trend towards deconcentration. The main difference between Europe and the USA is that the differences in productivity between the highest industrialized regions and the less industrialized ones (the periphery) is larger in Europe. This is the mirror image of lower mobility of labour and firms. However, integration leads to catching up of peripheral countries in Europe (Ireland, Portugal, Spain, to a lesser extent Greece, not the southern part of Italy and other intra-country backward regions).

4.7 Centres of excellence in Europe: towards a 'New European model'?

We already stressed in the macroeconomic explanations that a few European countries could match US growth of output and productivity and did excel in the growth drivers. This excellence has its counterpart in the industrial structure as shown by the taxonomies and the quality indicators. Sweden and Finland have shares of knowledge-intensive and technology-driven industries similar to those of the USA, Ireland has a large share of technology-driven industries as well as ICT industries and are among the best performing countries for twelve out of 16 indicators on quality. These three countries are leading in growth drivers, have above average growth rates in output and productivity and have industry structures with a high share of income elastic industries (see Figure 4.2 for their position in growth drivers). It would be interesting to analyse why Sweden and Finland – and with some qualifications – Netherlands and Denmark invested into the 'growth drivers' while many other countries did not. And whether a 'new European model' is coming up, not defined by welfare and comprehensive social coverage only, but by investment into and fast diffusion of new technologies. As a tentative start to such a discussion, let us enumerate what these countries share: all of them are small countries, geographically in the north of Europe, economies open to world trade, policy is to some degree consensual,

[42] For the facts see Kim (1997), for the prediction Krugman (1991), for evidence Aiginger and Leitner (2002).

with an egalitarian touch in incomes policy, all had a specific, determined and inclusive approach to make use of the information technology. None is a low cost country, all have rather high taxes and did face serious problems at some time in the early 1990s (afraid of losing markets or competitiveness). This is a parallel to the US fear in the early 1990s to lose competitiveness to Japan.

4.8 Structural differences indicate the importance of technological forces, but partly also strategies are different

Summing up, the industry evidence supports that there are deeply routed differences in structure and dynamics between the Europe and the USA, which will to some degree persist in the new decade. The share in value added of many industries with high-income elasticity are larger in the USA, and specifically the technology-driven industries and the knowledge-based industries did grow faster in the USA in the 1990s. Productivity growth was very different in the individual sectors with a much higher increase in technology-driven industries and in business services in the USA. In both groups, productivity increased in Europe too, but especially in these sectors significantly less than in the USA. Thus disaggregation strongly supports the view that technology is behind the acceleration of productivity in the USA and that differences in the performance of technology-driven industries can explain a significant part of the performance differences between Europe and the USA. The impact of ICT-producing industries on productivity is significantly higher, and the impact of ICT on productivity seems to have spread to ICT-using industries.

However, a picture focusing on the technology forces alone and on high-tech industries may understate Europe's performance. Europe enjoys an advantage in industries in which price competition is mitigated since vertical product differentiation and incremental innovations are defining the competitive edge. The whole trade surplus of Europe is generated by a quality premium, defined as the ability to sell products at a higher price supported by quality. This quality premium exists in trade with the non-triad countries. Upgrading quality is very important for Europe, specifically for high wage countries which could not compete with low cost countries since wages are high even relative to productivity. And wage dispersion in manufacturing in a specific region is less than in the USA. The USA on the contrary sells technology-intensive goods to Europe, but also low-price goods to the non-triad countries, thus covering a broad spectrum of price-intensive industries. These differences existed at the start of the 1990s, but became more distinct throughout the 1990s. The analysis of the industry structure supports those early shifts in demand to ICT and life sciences, but also the high level of research and the excellence of US education in the top segment – and in the growth drivers in general – which are basic forces behind the productivity acceleration in the USA. This does not preclude that cyclical effects or policy priorities (in favour of reducing unemployment or budget deficits or curbing

inflation) had contributed also to the productivity differences. However industry evidence indicates that technology is the major factor explaining the US performance in the 1990s.

5 Prospects for the current decade

In sections 3 and 4 we have argued that Europe still shows considerable gaps over a wide range of 'growth drivers' which determine the relative competitive performance amongst advanced economies. We have also argued that the relevance of such growth drivers is of particular importance in periods in which aggregate productivity growth is significantly affected by the generation, introduction and diffusion of a new 'general purpose technology'(GPT). It is in such periods – using a Schumpeterian approach – when 'above normal' profits (or rents) can be obtained by the innovators and when a technology lead can be further built up through a cumulative process of early diffusion of the new technologies, the demand for further secondary innovations, the sunk cost and learning advantages of the early entrants in the new technological fields and the reinforcing support of an adjusting institutional and behavioural environment. The 1990s had all these typical Schumpeterian characteristics in which the effects of the widespread introduction of information technology (as the relevant GPT) could be observed. The general assessment is that the first decade of the 21st century will continue to witness the aggregate and structural effects of the introduction of this by now maturing 'new technology', as well as the impact of another GPT i.e. biotechnology. Hence differences in 'supply side growth drivers' will continue to affect relative performance.

Shift of importance from ICT production to ICT use

However, as a new technology matures and growth effects stem mainly from application and diffusion and less from innovation, it is likely that the mix of factors which determine overall growth performance will change. Evidence has accumulated over the past few years that (i) the aggregate productivity enhancing effects of ICT can increasingly be seen in ICT-using activities and not just the ICT-producing industries (see Jorgenson and Stiroh, 2000a and b, Daveri, 2000, Bailey and Lawrence, 2001) and (ii) that European economies lag less in the area of ICT use than in the presence/share of ICT-producing activities (see van Ark, 2000). Hence the European deficit in ICT production/innovation might have somewhat less weight in determining overall productivity performance in the current decade than in the second half on the 1990s. Of course, in bio-technology the story of the second half of the 1990s might repeat itself, although experts emphasize differences in the likely industrial and growth impact of this technology compared to ICT.

Evidence for some catching-up in growth drivers

Furthermore, some of the 'growth drivers' measure stocks (per resident or in percent of GDP) and if there are some long-run satiation levels in such stocks, then the gaps not only

measure a competitive disadvantage at a point in time but also the 'scope for catching-up'. And indeed, as was pointed out in section 3, we could observe (see Tables 3.5 and 3.6) a closure in some of these stock measures (TLC and ICT expenditure in % of GDP, PCs per resident, internet users, etc.) between the EU and the US over the 1990s. With a reduction of such gaps in stocks we should in turn expect a reduction in the ability to generate differential productivity growth.

Dynamics of industrial specialization remains unfavourable

Section 4 has pointed out that the dynamics of industrial specialization over the 1990s shifted further in favour of the US in terms of the relative representation in overall value added of technology-driven industries, high-skill industries and of industries with high inputs from knowledge-based services. Furthermore, the US managed to maintain the gap in those knowledge-based service industries. In terms of export structure, there is evidence that the European countries have reduced the gaps in the representation of such industries in their overall exports although significant gaps remain. However, the role of US multinationals in European exports could not be separately identified in this analysis. The picture which emerges here is that underlying 'endowments' (to be interpreted in a wide sense and definitely not statically) do point in the direction of the US keeping a comparative advantage in high-tech, high-skill, high-knowledge-input activities. There is, however, a solid performance of European producers in terms of being able to consistently export in the high-quality product spectrum of many industries, notably mainstream or engineering industries; additionally there have been inroads in technology driven industries and products, such as mobile telecom appliances, smart cards, aircraft and spacecraft, etc.

What about the macro environment?

It was pointed out that the macroeconomic developments in Europe in the latter half of the 1990s were characterized by a 'double dip' pressure on a restrictive use of both fiscal and monetary policies: first, a major effort had to be exerted (especially by some countries) to achieve the Maastricht criteria and thus qualify for EMU entry and then (the 'second dip') there was further pressure to 'traverse' towards a long-term fiscal stance (within the –3% band) as required by the Stability and Growth Pact. Furthermore, there was the early period of monetary policy making by the new centralized European monetary authority which required a much more cautious behaviour than the US Fed. Apart from the importance of reputation-building in the initial phase there is also the more enduring issue that the ECB (differently from the Fed) is faced with a situation – in spite of the Stability Pact – of a much less co-ordinated use of fiscal policy in the euro area; this might require a more restrictive compensatory stance by the ECB.

The impact of all the above factors look like diminishing over the longer-term: Once the traverse towards the new fiscal deficit band has been achieved by the main countries (here

Germany, of course, is a major laggard) this should no longer exert the same degree of restrictive pressure. Further, the mechanisms of fiscal policy coordination will get strengthened and, once reputation building by the ECB shows up to be successful, this factor alone will no longer put it at a disadvantage. There are, of course, other reasons why the conduct of fiscal and monetary policy is likely to remain different between the US and Europe, but this cannot be dealt with in detail in this paper.

The macro environment remains, however, one of the most difficult to judge in terms of relative performance between the US and Europe: One of the important issues is whether the macro features accompanying the boom in the late 1990s in the US were/are sustainable. This issue is still hotly debated and no consensus has emerged on the issue of the low savings rate, the sustainability of a large current account deficit, whether the investment and consumption booms were guided by unsustainable wealth effects and profit (capital gain) expectations etc. Furthermore, the issue of and on what level a new productivity trend path has been established has important implications for NAIRU and hence long-run employment (unemployment) rates. These issues have not been relevant in the EU in the 1990s, but could become relevant in the current decade if indeed it enters a period of strengthened diffusion of new technologies similar to the US experience over the 1990s. Furthermore, although capital market, social security and labour market reforms in the EU have been slow it is expected that they will affect savings, investment, and labour market behaviour and thus growth in the longer-term (see Bains et al., 2002).

What about European Integration effects?

One of the disappointing features of the past decade in the European Union was the meagre harvest – at least in terms of additional growth – from the Single Market programme initiated in 1992 (see the evaluation studies reported in European Economy, 1998). The evidence collected indicates that the impact of the Single Market regime is much more protracted than originally envisaged. With hindsight this is not surprising as a new regime requires adjustment, generates institutional and behavioural resistances which have to be overcome, requires the building up of experience and political weight behind new policy institutions (such as European competition policy), etc.

As the experiences of liberalization in general indicate, everything which goes beyond pure trade and capital account liberalization, does not proceed in a 'big bang' fashion. Most of the liberalization measures, be it the manifold measures to reduce or abolish market entry barriers, the liberalization of capital markets, of public tenders, measures designed to improve labour mobility, etc. require a whole host of complementary institutional reforms, strengthening of enforcement powers (such as of the various EU directorates or of new regulatory authorities), the development of recognition and harmonization procedures (of degrees, pensions and other social security entitlements, etc.) and, very importantly, behavioural changes by the main actors (enterprises, local authorities, households) which

actually utilize the new opportunities. Only over considerable periods of time do such liberalization programmes thus lead to the expected gains in allocative efficiency and hence to the expected growth dividend.

Hence we expect the gains of the Single Market programme and, similarly, the gains from a unified currency zone to continue to be reaped over the current decade and this can be expected to show up in the (static and dynamic) economies of scale, scope and variety effects which were originally outlined in the *Costs of Non-Europe* and the *One Europe, One Money* studies. This is the more the case, as regime changes often produce the adjustment costs early on in their implementation while the benefits emerge with a longer lag. We expect something similar to occur with EU Enlargement (see below).

The prospects of further institutional and policy reforms in Europe

In many ways, the reform experiences of the 1980s and 1990s in the US and the UK (i.e. of the 'Anglo-Saxon model') are shaping the reform policy discourse in Europe; this is true at the regional, national and the EU level. It also refers to both positive and negative experiences or perceived experiences associated with that model (amongst the latter are considered the distributional effects or the effects of badly designed regulatory mechanisms or privatization programmes, see e.g. UK railways). In sizable areas of structural reforms, continental European countries are still early in the process of implementing such reforms (e.g. privatization of public utilities) or are still developing and evaluating adjusted versions of such reforms. These are core issues in the debate about reform processes at the EU and national levels in Europe which cannot be dealt with satisfactorily in this paper. It suffices to say that the expected dividends from such structural reforms, if they are implemented, are still to come and could, together with the further reaping of the benefits from the Single Market, have complementary and hence multiplicative effects.

There is a further area in which the experiences of the 1990s have initiated an incentive to speed up reforms in Europe. There is now a much stronger emphasis of adjusting the *European innovation system* (again at the regional, national and European level) which – if our and many others' analysis is correct – played an important role in explaining the different growth experiences of the US and Europe in the 1990s and also explains a good deal of the variation of experiences within Europe. There are major reforms underway in the European R&D system (university reforms, industry-university links, capital market reforms to support venture capital, public policies towards R&D etc.) and this has moved high up on the reform agenda in those countries in which it has not already been important in the past (such as Finland, Sweden, Denmark, Netherlands, Ireland).

Crucial are of course reforms of labour markets (including policies towards immigration) and social security systems which are core elements in the rhetoric of the European reform

agenda, although it is much less clear in which detailed direction or at what speed such reforms will actually proceed in many of the European countries.

Will EU Enlargement make a difference?

Similar to the other integration processes discussed above, East-West European integration has been a gradual process and there will not be a dramatic regime shift (at least at the economic level) as a result of the accession of the first group of Central and Eastern European (CEE) economies. In many ways, the major steps towards integration of the 'two halves of Europe' over product and capital markets have already taken place over the last decade (see the degree of trade integration, the importance of FDI stocks in the economies of many of the first round accession countries, the presence of foreign banks, etc.; for details on the structural impact of the East-West European integration process see Landesmann, 2000 and 2002). Furthermore, in many of the outstanding sensitive areas (such as labour mobility, the takeover of the most costly areas of the *acquis communautaire*), transitory arrangements have been or will be adopted (including the participation in the main transfer payments programmes, CAP and Structural Funds) so that the impact will again be gradual. Finally, the economic weight of the CEE candidate countries (their combined GDP is roughly that of the Netherlands) is small to have a major impact on the European economy as a whole in purely macroeconomic terms.

We believe nonetheless that East-West European integration together with the steps towards market integration in the EU has important implications for corporate strategies and activities by European companies: the newly integrated economic zone in which these companies operate has become much more diverse in income, productivity and wage levels, as well as in the structural characteristics of the available labour forces, infrastructure and spending patterns. We also expect, in contrast to a simple homogenous convergence model, that growth experiences amongst the accession countries and also amongst the economies that are initially left out but are still highly integrated with the EU economy (such as the Balkans and Russia) will be very diverse (see also the past experiences of the cohesion countries, such as Ireland on the one hand and Greece on the other). Hence we expect this heterogeneity to shape corporate activity in Europe in the decade to come. Evidence suggests that the development of production networks and of stages of production fragmentation, which was typical for US companies operations globally for some time, is increasingly becoming a feature of European corporate strategy (see e.g. Baldone et al., 2001). This in turn has implications for the European production system as a much more diverse pattern of comparative and locational advantages can be exploited.

Will competitive performance matter more or less?

We shall finish with a last provocative point. The European economy (especially with the integration of up to 13 new member countries over the next decade or so) will be a relatively closed economic zone. It will be less affected by international exchange rate fluctuations, its monetary stability will depend almost exclusively on the conduct of its own monetary policy and EU (coordinated or centralized) fiscal and monetary policy as well as EU labour market institutions will shape (through their impact on interest rates and wage rates) the evolution of demand and savings behaviour. To which extent will a somewhat detrimental competitive performance of the European economy also over the medium-run impose external pressures for adjustment? In our view, the answer is: to a much lesser degree than was the case in the fragmented, but open European economy of the 1970s, 80s and 90s. This does not mean that the factors discussed in the previous sections which determine the growth processes in advanced economies will be any less relevant and that the systemic comparisons with the US and other successful economies worldwide would not be important for policy formulation. It simply means that the traditional measures of international competitiveness, such as market share developments (in non-EU trade), currents accounts, (non-EU) capital in- and outflows are likely to play less of a role in putting pressure to react through policy adjustments and institutional reform. Thus, for individual countries and regions within the EU, the relevant comparisons will be mostly with other EU countries and regions and less with large international competitors such as the US. The concern with US-EU competitive rivalry will continue to be important for the policy-makers at the EU level, but might be much less felt at the level of individual countries; the focus of national policy-makers (and the general EU public) will more likely shift towards intra-EU rivalry.

6 Summary

1. This paper defines competitive economic performance as the ability of an economy to raise incomes per head and employment (level 1 competitiveness). In contrast to other definitions of this pervasive and controversial term of competitiveness, our definition (i) downgrades the importance of external balances, (ii) rejects to equate competitiveness with a low cost position, and (iii) is open to complementary considerations including the starting position and assessing the issue of sustainability (level 2 competitiveness). Systemic evaluations of the effectiveness of different competitive systems and welfare considerations cannot be excluded completely, but are in general beyond the scope of this paper.

2. Seen from this definition, Europe's performance in the 1990s and specifically in the second half of this decade was disappointing. Real growth of the economy (and specifically of manufacturing) and employment growth were lower in Europe than in the US. Productivity growth accelerated in the US (productivity rebound), but not in Europe. The secular productivity catching-up of Europe towards the productivity leader US stopped in the 1990s. Hence the distance between the US and in Europe increased in the second half of the 1990s (forging ahead of the leader). Europe's share in world trade decreased, the share of US exports increased. The trade balance however was in general positive for Europe, and over the 1990s (increasingly) negative for the US.

3. The extent of the productivity rebound and of the new phase of forging ahead of the USA depends on the choice of indicators (for output, inputs, productivity) and on several technicalities (quality adjustments of output and inputs), but the evidence looks convincing. The surprising US performance is more distinct for labour productivity than for total factor productivity, for manufacturing than for the total economy, for production per worker than per hour. However, the two main tendencies (rebound plus forging ahead) survive the use of many different sets of indicators, many methods of adjustments and can be seen on different levels of aggregation.

4. If we put the 1990s in the long-run perspective, we can see three distinct periods for the relation of productivity of Europe vs. US. In per capita income (at PPP) Europe catches up continuously from 1960 to the mid-1970s, after which there is a period over which the gap approximately stays constant up to 1993, and finally the period from 1993/94 in which GDP per capita diverges again. For GDP per worker, there are two periods: catching up to the 1990s and then divergence, the catching up period shows convergence first at a greater and then at a smaller speed, as would be expected from a ‘catching-up with the leader’ model.

5. The most striking difference in the long run is the sharp increase in the employment ratio in the US, in contrast to its slight decrease in Europe. The employment rate, which had been lower in the US in the 1960s, crossed the European rate in 1978. The new gap in favour of the US increased specifically between 1983 and 1993 from 4 to 10 percentage points. A large part of the divergent behaviour between GDP per capita and GDP per employee over this period was due to the much better utilization record of the potential labour force in the US. It was only after this extreme jump, that US productivity started to soar.

6. Explaining the development from the perspective of the new growth (convergence/divergence) literature, it looks as if Europe was on a path of 'conditional convergence' in per capita GDP up to the early 1990s, followed by a period of divergence. 'Conditional' rather than 'absolute' convergence stems from systemic differences between 'leader' and 'follower' which prevents the latter from reaching the same GDP per capita level even in the very long-run. This can be due to a long-run differential in the effectiveness of use of one or more inputs (such as the lower degree of labour utilization in Europe) or to a maintained differential in the quality of inputs used or to a sustained differential in the capacity to innovate which yields a 'rent' component to the leader's income. We argue that all the above factors played a role in the US vs. Europe performance but with changing weights over different sub-periods. The weights can change either because the differentials themselves change in terms of systemic features or because in certain (external) circumstances one or the other factor is more decisive (such as the 'rent' component in periods when economies experience the impact of the introduction of a new 'general purpose technology' (GPT)). The same approach can be used to explain temporary (rather than long-run) periods of 'forging ahead' as was witnessed in the latter half of the 1990s.

7. Returning to the pre-divergence period, it seems to be evident that US economic policy in the 1980s attempted to increase employment even at the cost of lower medium incomes (see the decline in real terms of the minimum wage, the higher spread in incomes, conditioning of unemployment benefits on work; recall however the income tax credit). At the same time Europe tried to decrease unemployment by discouraging people to work or by keeping them in government jobs (early retirement schemes, employment in state owned or public utilities, increase in public employment or in defensive job training schemes). These explanations have no easy place in growth theories, but management of labour supply and the labour supply elasticity may be part of the set of factors on which convergence is conditioned. Alternatively, these may be factors influencing the transition path between equilibria.

8. Also in the 1980s important features diverged between the US and Europe. The dollar, which may have been overvalued in the late 1970s, was devalued from 1.39 to 0.76 relative to a European basket between 1980 and 1985. Thus a low-cost strategy was pursued (a road to competitiveness which is usually considered not as advisable for leading economies) and it was stimulating profits. This made the US attractive for foreign capital and, though the trade balance could not be improved in the long run, it insulated the US economy to some extent from the economic importance and the perils of current account deficits. Amongst other important policies, airlines, the truck industry, and telecom were deregulated in the 1980s, tax incentives for investment and research were intensified.

9. The different performance of the EU and the US in the 1990s does not seem to be too surprising, if we look back at the situation with the benefit of hindsight: in all the expenditures, which are usually declared by new growth theory to be the determinants of long-run productivity and output growth, the US was leading at the beginning of the 1990s. Measuring human capital by education expenditures or by performance indicators, measuring research by input or output, and measuring the investment into the new general purpose technology ICT, all indicators revealed the US to be leading at the beginning of the 1990s relative to Europe.

10. What seems to be surprising is that this perspective had not been the dominant view at that time. Recall that this was the time in which the US was most anxious to lose competitiveness primarily vis-à-vis Japan. The reason for not yet realizing the US lead versus Europe may have been an underestimation of the importance of ICT (recall the famous Solow statement that computers were seen everywhere but not in the productivity statistics) and that the higher expenditures of the US in education and research had been facts for a long time – without a striking consequence for relative productivity growth. Two explanations are possible: one is that the contribution to productivity of these inputs increased, via new tendering schemes, more civilian research, perfecting benchmarking for schools; the other is that the impact of the specific (already established) US system of innovation increased as a new general purpose technology entered the phase of economic rewards. The upshot of today's evaluation is that ICT has increased productivity by one per cent per year in the US in the 1990s as compared to half a percentage point in Europe. The maintained lead of the US in education expenditures and in research may have led to differences in the available 'knowledge' stocks which facilitated a faster rate of innovation and the more rapid diffusion of this new general purpose technology.

11. In assessing the reasons for the productivity rebound and forging ahead of the leader in the 1990s, we emphasize the importance of 'growth drivers'. The US were leading quantitatively in expenditures on R&D and education and worked hard to increase the efficiency of expenditures in these areas. The importance of these two determinants of long-run growth of developed countries probably increased in this decade due to the upcoming new general-purpose technology (ICT). Apart from the usual growth accounting calculations we test the importance of ICT by going into disaggregated statistics for the US and Europe. If prudent demand management or absence of a cyclical crisis by chance had been the reason for higher growth, the productivity acceleration should be spread across the different industries. The available industry data show however extremely strong increases in productivity first in ICT producing industries, then in ICT using industries and finally in ICT using services. And the level and increase of productivity is definitely stronger in the US than in Europe in ICT

producing industries and in ICT using services. This evidence points at the importance of supply side forces in general and ICT specifically.

12. Another piece of evidence is that growth of output and productivity had been very different in the individual European countries, and that these differences were related to differences in the 'growth drivers'. A few European countries matched the US performance in growth of output in manufacturing and in productivity. These countries, notably Sweden, Finland, but also Denmark and the Netherlands, put great emphasis on information technology, either in production or in use or both. All these European Centres of Excellence are small countries, centred in the North of Europe, economies open to world trade and competition. Economic policy is to a large degree consensual with an egalitarian touch in incomes and gender policy (they all have high labour force participation rates). All countries had a specific, determined and inclusive approach with explicit goals in technology policy, none is a low cost country, all have rather high taxes for consumers and partly on environmental use, and all did face serious problems at some time at the beginning of the 1990s (with fear of losing competitiveness). It will become interesting to speculate about a New European Model, combining technology mindedness with social inclusiveness.

13. We claim that technology and investment into intangibles is the main explanation for the productivity rebound and forging ahead of the US. But these factors are not the whole story. Restructuring had already reduced the share of labour-intensive industries in manufacturing and increased the share of technology and marketing driven industries at the beginning of the 1980s. The low cost strategy, and the lower dollar had already boosted profits and made American stocks very attractive at the beginning of the 1990s. These higher profit expectations became further validated and persistent as the new technology enabled existing firms to reap Schumpeterian rents and new technology based firms to enter. Monetary policy had got reputation for stability; fiscal policy struggled to do the same, it needed two discretionary attempts to balance the budget, an attempt which was finally successful as growth proved high, and cycle free. This enabled a relatively expansionary monetary policy and later an anti-cyclical fiscal policy, policies which American economists had earlier criticized as inefficient or harmful. Europe had first to get a reputation for monetary responsibility (and tried this at all costs specifically dominated by the German Central Bank) and then to fulfil the Maastricht criteria. And Europe was distracted by the high unemployment, the opening of the borders to transition countries, and internal programmes. Several of the policies started will be stimulating in the long run, but imply costs in the short run (liberalization and privatization of network industries), others were rather defensive (early retirement schemes). Investment in growth drivers stagnated, specifically for large countries.

14. In assessing the development in the next decade, there are pros and cons that the US lead may persist in growth of output and productivity. Let us first summarize the arguments for another decade of superior US competitiveness in the sense of increasing output, productivity and employment faster than Europe's:

- The investments into the growth drivers are still very different. Investment in research and education and expenditures of ICT are by one third larger in the US. For the next general-purpose technology – biotech – the relative position is more difficult to measure, but the consensus is that the US is leading again. US firms are strong players world wide and there is an excellent firm segment in new technology-oriented ventures.
- The monetary and fiscal authorities have a reputation of stability and a handling of macroeconomic policy sensitive to the requirements of the business cycle. The US economy continues to attract foreign investments.
- The US innovation system of high level universities, university industry links, venture capital finance and efficiency and mobility of researchers is still superior to European and Japanese alternatives.

On the other hand, there are arguments that

- Europe has narrowed the difference for at least some of the growth drivers;
- that the European innovation systems – albeit different – are becoming more efficient and open;
- that European countries will evolve towards more fiscal policy co-ordination and that the European Monetary Union has gained credibility;
- European countries are in the process of reforming their welfare state and some of the features of the labour market; capital markets are gaining in depth and are becoming more risk prone, and taxes at least for business have been reduced;
- the integration benefits from the Single Market, the Monetary Union and of European Enlargement may in the upcoming decade become more visible;

On the other side of the coin, it is still too early to judge whether we are going to witness the beginning of a new sustained growth phase in the US and whether the high deficits in the current account and the low savings rate may become a problem for the US. This could be the case if profits do not recover sufficiently and stock market volatility and corporate governance problems deter external investors. Furthermore, the sustainability of domestic spending on consumption and consequently of investment is in doubt given the degree that they are based on profit expectations and stock market performance (on these issues see Baily, 2002).

15. Finally we addressed the issue of whether international competition will continue to exert the same pressure in the EU over the next decade: On the one hand, due to European integration efforts – EMU but also the integration of up to 13 new members over the next decade or so – the EU as an entity will be a relatively closed economic zone. Compared to the experiences of individual EU member states over the past decades, exchange rate fluctuations will be much less important than was the case before EMU. Monetary stability will depend almost exclusively on the conduct of EMU monetary policy bar major external shocks such as a rise in the price of oil. EU (coordinated, harmonized or centralized) fiscal and monetary policies will shape the determinants of the main components of demand and of savings behavior. Hence the traditional measures of international competitiveness, such as market share developments (in non-EU trade), currents accounts, (non-EU) capital in- and outflows are likely to play less of a role in putting pressure to react through policy adjustments and institutional reform. Thus, for individual countries and regions within the EU, the relevant comparisons will be with other EU countries and regions and less with large international competitors such as the US. The concern with US-EU competitive rivalry will continue to be important for the policy-makers at the EU level, but might be much less felt at the level of individual countries. This does not mean that the determinants of the EU growth process – and here particularly that of the most advanced countries and regions – will change from the ones outlined in this paper, but that the focus by national policy-makers (and the general EU public) will more likely shift towards intra-EU rivalry. Whether this leads to more or less systemic convergence with the US is an open question.

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