

1 Growth, productivity and employment

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1 Growth, productivity and employment

1.0 Introduction and the objectives of the chapter

Three years of low growth

The European economy is currently caught in a slow growth period, with some countries at the brink of a recession. Overall growth in the European Union is about 1.3 % in the past two years and a similar growth rate is expected for the current year (2003). Relative to other slow growth periods, employment proved to be rather robust, increasing at about 0.9 % p.a. and creating 2.6 million jobs in two years. The other side of this picture is a very low increase in labour productivity.

Economic growth continues to be higher in the United States. Real economic growth had been temporarily lower in 2001, since the downturn of the world economy had started here after a decade of high growth. Real growth in 2002 and the current forecasts for 2003 are again higher than in the European Union. In contrast to Europe growth results primarily from an increase in productivity, while employment is stagnant. This reflects on the one hand massive layoffs in the formerly booming ICT sector, and on the other hand the high utilisation of labour in the US. Employment had increased by 20 million or 16.7 % in the 1990s, and employment rate increased from 73.5 % to 75.1 %.

This report investigates the evidence arising during these three difficult years, first by comparing productivity and employment growth in Europe with that in the US, secondly by highlighting country differences in Europe. Comprehensive studies on the EU-US comparisons and on determinants of growth differences are available in past reports and in the international literature and are summarized in Box 1.1. This report focuses on two important issues. The first objective is to compare the European position to that of the US in per capita income, per worker productivity and GDP per hour. To compare the level of these three important indicators on standard of living and efficiency is a demanding task and conflicting figures have been published in the past. The second objective is to investigate which components influenced productivity growth over the past decade in the EU, its member countries and in the US and specifically to which extent the information and communication technology (ICT) contributed to the performance differences.

The role of productivity for competitiveness

- The long term objective of economic policy is to bring about growth in national incomes and to realise full employment. Both goals are combined and set into a wider perspective in studies on the competitiveness of economic regions. Competitiveness is defined as the ability of an economy to raise the standard of living and to achieve or maintain a high level of employment. A more comprehensive notion of competitiveness¹ includes objectives such as investing in education and health, protecting the environment and reducing inequalities and poverty. While non-material objectives tend to become more important, it is evident that without quantitative growth it is difficult to attain social or ecological goals, not to mention achieving the flexibility necessary to adapt to an unstable and unpredictable environment.
- As in the reports for the years 2001 and 2002 we consider the long run productivity as the basic engine of income growth and therefore of competitiveness. In the long run wages follow the trend of labour productivity so as to maintain equilibrium between capital and labour incomes, the so-called sharing of value added. But to a large extent the purchasing power of households is based on salary and income of the self-employed, and household is the major component of domestic demand. To reap the full benefit of efficiency progress, which translates into higher wages, needs to reach full employment so as to increase overall income. Domestic demand depends largely on the evolution of household income. Full employment and greater efficiency are the means to maximise income levels; these are not conflicting objectives, but should be considered as complementary.
- The objective to increase productivity and finally to become the most competitive economic area, has been a central element of the Lisbon strategy for an economic, social and environmental renewal. In the Spring Council of 2003, the European Commission stressed the key role of growth for achieving this ambitious goal, as confirmed by the title: "Choosing to grow: Knowledge, innovation and jobs in a cohesive society". The quantitative target of achieving 3 % growth of the GDP has been

¹ See European Commission (2000, 2001, 2002) for this definition. For an overview on concepts of competitiveness see Aiginger, Landesmann (2002).

set, as well as to increase the employment rate to 67 % by 2005 and 70 % by 2010. Employment has increased already to 66 % in 2001 (against 64.5 % in 1999).

- Apart from global growth, there are three roads to increase the employment rate. These are to limit the numbers of hours worked per person engaged, to increase the share of part-time workers in total employment or to limit wages. A decrease in the numbers of hours worked can coincide with a preference for leisure, but only if people can work more if they want to, otherwise a reduction of working hours should be seen as a constraint. All three strategies are basically defensive strategies, specifically the first two spread employment opportunities out among more workers, the third decreases per capita income with the perspective that output will rise enough to increase total income. In the long run, however, only growth creates new employment, increases labour utilisation and generates income.

The outline of the chapter

- Evidence for growth, productivity and employment in the last two years, hours worked as well as productivity is added to the experience of productivity development in the EU and the US in the 1990s. This is specifically important since many results on productivity acceleration and widening of differences between Europe and the US had been based on a rather short period of the second half of the 1990s.
- Then we assess the difference of per capita income, per worker and per hour productivity between the EU and US, as well as the EU member countries and look whether convergence happened between the EU and USA.
- In the third section we carve out the role of information and communications technology (ICT) for productivity growth and compare the performances in the EU, its member countries and the USA.
- The final section outlines choices and strategies regarding the employment rate and the labour content of growth, as well as discusses to which degree the lower working hours in Europe as compared to the US may partially reflect a higher preference for leisure.

Box 1.1: Recent studies on cross-country differences in economic growth

Author/Institution	Title	Scope	Additional features
Aiginger, K., European Forum at Stanford University, Working Paper 2/2002	The New European Model of the Reformed Welfare State	Analysing performance differences in Europe & determinants	Excellent performance of reformed welfare states with specific innovation policy
Aiginger, K., Landesmann, M., WIFO Working Papers 179/2002	Competitive Economic Performance: The European View	Productivity comparison EU vs. US: determinants on prospect	Impact of differences in industry structure
European Commission, 2003	Choosing to grow: Knowledge, innovation and jobs in a cohesive society	Progress of Lisbon Strategy	Role of knowledge, innovation and jobs
European Commission, European Economy 6/2002	The EU Economy 2002 Review	Macroeconomic Development	Convergence of Accession countries
European Commission, European Economy 71/2000	The EU Economy 2000 Review	Is there a new pattern of growth emerging?	Prospects and challenges for Europe
European Commission, 2002	The competitiveness Report 2002	Productivity growth in services	Human capital, environmental performance
European Commission, 2001	The competitiveness Report 2001	Productivity and innovation	Increasing gap to USA; industry study on biotechnology
European Commission, 2000	The competitiveness Report 2000	Competition in quality	Industry study on service inputs, pharmaceuticals
Gordon, R.J., Northwestern University, 2002	Two Centuries of Economic Growth: Europe Chasing the American Frontier	Performance Europe vs. US in the long and short run	Specific differences in per capita and per hour performance
McMorrow, K., Roeger, W., European Commission, Economic papers no 150, 2001	Potential Output: Measurement Methods	New Economy effect on potential growth	Growth scenarios for the EU and the USA
OECD, 2003	The Sources of Economic Growth in OECD Countries	Econometric evidence and growth determinants	Impact of regulation and public sector human capital
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
Pichelmann, K., Roeger, W., Review of International Economics 2003 (forthcoming)	The EU Growth Strategy and the Impact of Ageing	Impact of ageing on growth and stability pact	Changes in work incentives needed
Van Ark, B., et al., DG ECFIN, 2002	ICT Investments and Growth Accounts for the European Union 1980-2000	Contribution of ICT or growth in EU and US	Structural impact in product and labour markets may limit growth

1.1 The evidence for 2001-2002 and 2003 forecasts

There has been considerable debate among growth economists since the late 1990s over the reality of a lasting rebound in global productivity growth in the USA since 1995 and the so-called emergence of a "new economy" based on production and diffusion of information and communication technologies (ICT). As a collateral effect there are strong questions about the inability of the European Union to profit from the possibilities offered by ICT technology.²

Critics of the "new economy" paradigm insist on the idea that the period of 1995 to 2000 is exceptional. This period saw increased demands for information technology arising from Y2K effects and it is also argued that the Internet and mobile full speed diffusion led to the "dot-com bubble" (see debates in Gordon, 2000, Oliner and Sichel, 2000).

There are also fears that an investment bubble was exacerbated by an exaggerated "new economy" miracle, based on an over-optimistic estimate of progression of growth demand for the ICT products and services. This could have led to massive overinvestment³ and an over-evaluated investment through mergers and acquisitions. Many analysts fear that it may take years to adjust to the burst of the bubble.

It is true that the financial effects of the bubble burst are still having an impact on the stock market all over the world, and even if most specialists agree that it will take many years before we see a significant and lasting rebound there, and there are still questions as to what is going on in the real economy.

1.1.1 *The American productivity increase confirmed*

Most studies of the real output and productivity impacts of information technology were centred on the second half of the nineties and many thought that with the bubble burst the "new economy" effect will disappear in the US, and therefore probably also in the other economies.

Data for the years 2001 and 2002 show that the labour productivity growth remains very strong for the USA. This induces more and more commentators to accept the idea that there is a lasting

² We investigated the impact of ICT in subsection 1.3 of this chapter and later in chapter 2. For papers giving ICT an important role in acceleration of productivity see Van Ark (2000), European Commission (2001), Aiginger, Landesmann (2002), OECD (2001).

³ Cette et Noal, "L'investissement TIC aux Etats-Unis et dans quelques pays européens", Document de travail du CEPII, March 2003.

increase in the USA productivity trend.⁴ But the configuration was very different from the high growth period of 1996/2000. In fact GDP growth in the USA was only 1.3 % for 2001/2002 after a 4 % increase p.a. in the second half of the 1990s (see Table 1.1). Population increased by 0.9 %, thus limiting per capita growth to 0.3 %. GDP per employee on the contrary remained strongly positive with 1.6 % growth, and due to a strong decline in hours worked, there is also a 1.6 % gain in output per hours worked. These evolutions strongly differ from long-term trends, where growth in income was higher than productivity growth (see Table 1.1 and Section 1.4) and employment increased faster than population. However, the main message is that GDP per worker and per hour increased relatively fast as compared to the slow growth of output.

Table 1.1: Productivity gap maintained in 2001-2002

	Growth of real GDP		Growth of GDP per capita		Productivity growth per worker		Employment growth		Productivity growth per hour	
	EU	USA	EU	USA	EU	USA	EU	USA	EU	USA
1990	3.03	1.75	2.43	0.67	1.83	0.50	1.19	1.24	2.06	1.08
1991	1.89	-0.50	1.21	-1.54	2.36	0.41	-0.47	-0.90	3.57	1.04
1992	1.20	3.06	0.98	1.96	2.09	2.39	-0.87	0.66	2.30	2.89
1993	-0.35	2.67	-0.81	1.59	1.20	1.16	-1.53	1.49	1.70	0.29
1994	2.79	4.08	2.44	3.07	2.94	1.71	-0.14	2.33	2.86	1.10
1995	2.46	2.70	2.16	1.75	1.71	1.19	0.74	1.50	1.86	0.39
Growth p.a. 1991-1995	1.59	2.39	1.19	1.35	2.06	1.37	-0.46	1.01	2.46	1.14
1996	1.67	3.61	1.39	2.66	0.97	2.13	0.69	1.45	1.02	2.21
1997	2.59	4.43	2.21	1.58	1.79	2.13	0.78	2.25	1.86	1.58
1998	2.91	4.28	2.68	3.07	0.88	2.77	2.02	1.47	0.94	1.92
1999	2.66	4.11	2.41	2.93	0.89	2.54	1.76	1.54	1.29	2.09
2000	3.45	3.75	3.17	2.63	1.61	2.43	1.81	1.29	2.03	2.05
Growth p.a. 1996-2000	2.66	4.04	2.37	2.57	1.23	2.40	1.41	1.60	1.43	1.97
2001	1.63	0.25	1.36	-0.69	0.29	0.35	1.33	-0.10	1.29	0.38
2002	0.95	2.30	0.71	1.36	0.52	2.81	0.43	-0.50	0.47	2.81
Growth p.a. 2001-2002	1.29	1.27	1.03	0.33	0.40	1.58	0.88	-0.30	0.88	1.59
Accumulated growth 1996-2002	16.95	25.00	14.74	14.30	7.15	16.16	9.15	7.60	9.23	13.78
Growth p.a. 1996-2002	2.26	3.24	1.98	1.93	0.99	2.16	1.26	1.05	1.27	1.86

Source: WIFO and CEPII calculations using data from Groningen Growth and Development Centre.

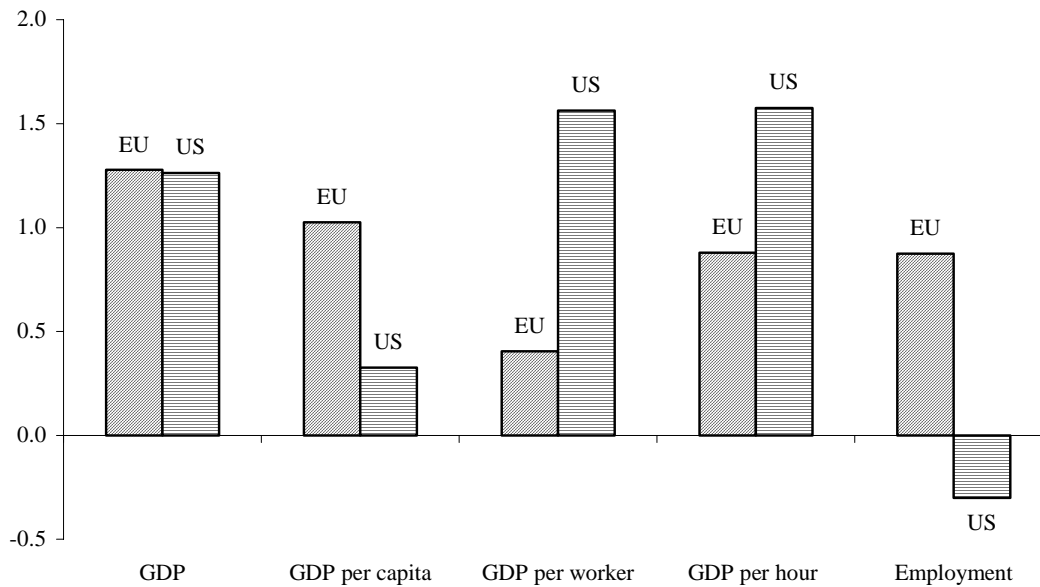
1.1.2 European Union and Japan are, on average, lagging behind.

Economic growth in the European Union was higher than in the US in 2001 and then by about the same in 2002, demonstrating for both years combined a similar growth of 1.3 %. Since European population was near stagnant (+0.3 %), GDP per capita growth amounted to 1 %. Employment expanded despite of the disappointing growth by 0.9 %, the GDP per worker increased therefore only by 0.4 %, more than one percentage point less than in the US. The

⁴ According to BLS last estimate (NEWS, US Department of Labor, BLS, 6 March 2003) US hourly labour productivity in the business sector rebounded in 2002 to 4.8 %, a record surpassing all the past records since the end of WWII (except 6.9 % in 1950) after a 1.1 % increase in year 2001, which was a recession year. This increase for 2002 results from a 2.7 % increase in output and a strong decline in hours worked (2.1 %).

difference is slightly lower for GDP per hour, but again productivity increased stronger in the US (1.6 % vs. 0.9 %). This adds together with the higher growth in other years since 1995 to an accumulated growth difference of nearly 4.5 percentage points.

Figure 1.1: Growth of Output and productivity in the EU and US (2001/2002)

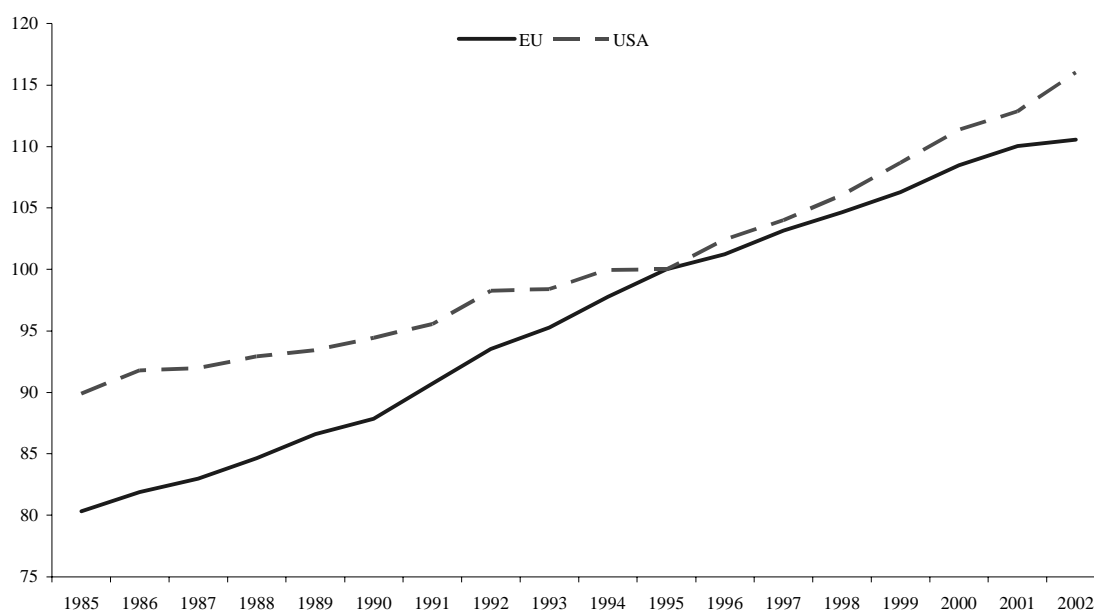


Source: WIFO calculations using data from Groningen Growth and Development Centre.

As in the US, this growth pattern is in contrast vis-à-vis past trends. With a growth of only 1.4 %, the EU should normally have registered a strong decline in employment. In some countries it is believed that being below 2.5 % growth implies that there is an increase in unemployment. Thus there has been a substantial increase in the labour content of growth (see Section 1.4 for further details).

The Japanese economy registered much worse results than either the USA or the EU, showing -0.6 % in GDP growth and -0.5 % in hourly productivity. But this time the adjustment in employment has played in favour of a reduced decline in productivity.

Figure 1.2: Productivity growth (GDP per hour) in the EU and US



Source: WIFO calculations using data from Groningen Growth and Development Centre.

On a country-by-country basis, the European Union countries registered very divergent performances. Only three countries registered GDP growth above 2 % p.a. (2001/2002): Ireland, Greece and Spain. All three are considered as catching up countries, although Ireland enjoys well above average growth after surpassing the EU productivity level (see section 1.2). These three countries are followed by the United Kingdom, Sweden and France with an average growth of about 1½ % within these two years. Among the worst performing economies is first of all the largest EU country, Germany, whose share of the EU's GDP is on average 23 %. The Netherlands, Austria and Luxembourg, Portugal and Italy also shared growth rates near or below 1 %.

Seven countries are, considering their growth rates, creating more employment than average (EU +0.9 %), i.e. Ireland, Italy, Portugal, Spain, the Netherlands, Sweden and Luxembourg. As a consequence their productivity performance is much lower than their growth performance. All other countries tend to improve their relative productivity performance through adjustment in the total hours of work. Consequently Denmark, Germany, Greece, France, the Netherlands, and Finland had a higher increase in productivity per hour than in GDP. Compared to the USA, the EU on current trends is increasing its lag by 0.7 % per year. With the exception of Ireland, Greece, France, and Denmark all EU countries had a lower increase in hourly productivity than the US.

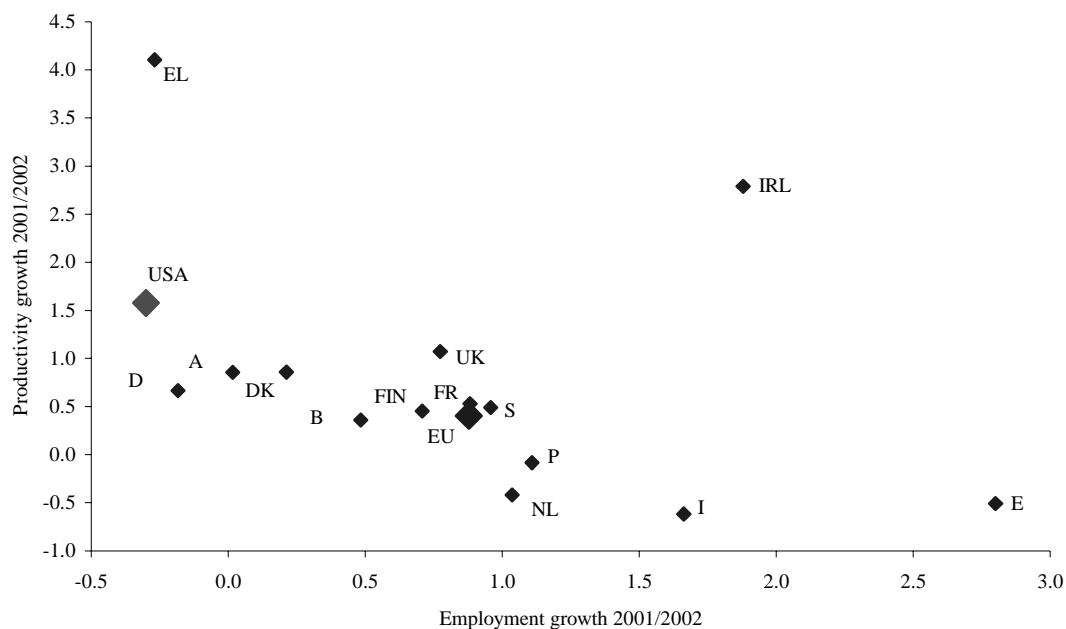
Table 1.2: Country performance in GDP, GDP per capita and productivity 2001/2002

(Average annual increase in percent)

	Growth of real GDP	Growth of GDP per capita	2001/2002		Growth of real GDP	
			Productivity growth per worker	Productivity growth per hour	1991/1995	1996/2000
Belgium	0.85	0.68	0.36	0.43	1.60	2.81
Denmark	1.07	0.76	0.86	1.60	1.97	2.66
Germany	0.48	0.38	0.67	1.18	2.05	1.79
Greece	3.82	3.61	4.10	4.10	1.25	3.42
Spain	2.28	2.10	-0.51	-0.56	1.51	3.80
France	1.42	0.96	0.53	2.41	1.06	2.68
Ireland	4.72	3.55	2.79	3.28	4.70	9.89
Italy	1.04	0.85	-0.62	-0.12	1.27	1.87
Luxembourg	0.99	0.33	-2.02	-1.96	3.93	6.76
Netherlands	0.61	0.06	-0.42	0.87	2.13	3.68
Austria	0.87	0.63	0.85	0.85	2.05	2.57
Portugal	1.03	0.84	-0.08	-0.08	1.70	3.81
Finland	1.16	1.00	0.45	1.25	-0.67	5.05
Sweden	1.45	1.43	0.49	1.18	0.59	2.96
United Kingdom	1.85	1.52	1.07	0.98	1.76	2.83
EU	1.29	1.03	0.40	0.88	1.59	2.66
USA	1.27	0.33	1.58	1.59	2.39	4.04

Source: WIFO calculations using data from Groningen Growth and Development Centre.

Figure 1.3: Productivity and employment growth in the EU and US 2001/2002



Source: WIFO calculations using data from Groningen Growth and Development Centre.

2003 forecasts

During these exceptional days, professional forecasters become more and more pessimistic by the hour due to the troubled international outlook. Therefore it is only guessing to go beyond the actual forecasts published by EUROSTAT, and updated on the 10th of March, 2003. These currently demonstrate again a marginally stronger dynamic in the USA as compared to the EU-15 in both GDP and GDP per employee. It is too soon to tell if the war with Iraq will alter these forecasts, but some of the predictions below seem definitely overly optimistic. For example, the general consensus for the UK is that the 2.5% forecast by the treasury is now looking rather high.

Table 1.3: 2003 Forecasts

	Growth of real GDP	GDP per employee relative to EU
Belgium	2.0	0.1
Denmark	2.1	0.2
Germany	1.4	-0.2
Greece	3.9	1.3
Spain	2.6	-0.4
France	2.0	-0.2
Ireland	4.2	0.8
Italy	1.8	0
Luxembourg	2.0	-1.2
Netherlands	0.9	0
Austria	1.8	-0.4
Portugal	1.2	-0.2
Finland	2.8	0.7
Sweden	2.2	0.6
United Kingdom	2.5	0.3
EU	1.9	0
Japan	1.2	0.3
US	2.3	0.2

Source: CEPII calculations using EUROSTAT.

1.2 Labour productivity: Long-term trends and comparative levels

This section considers relative levels and trends in labour productivity in comparing the EU with the USA and the individual EU-member states against the aggregate EU performance. Two measures of labour productivity are employed, GDP per person employed and GDP per hour worked. Both are contrasted with performance in GDP per capita. The section begins with an examination of relative productivity levels, outlining our baseline-preferred estimate for 2001, the latest year for which reliable data are available, and contrasting this with alternative estimates. This sets out reasons as to why estimates may differ and make the case for the preferred alternative. A decomposition of relative GDP per capita levels is then presented with the focus on the relative importance of labour force participation and the labour leisure trade-off. We then consider growth across time and issues of convergence of productivity in the EU as compared to USA levels.

1.2.1 Productivity in 2001

1.2.1.1 A Comparison of estimates

Table 1.4 shows levels of GDP per capita and labour productivity in the EU are relative to the USA for three alternative estimates, calculations based on OECD data, estimates from the University of Groningen Growth and Development Centre (GGDC) which underlie the results in TCB (2003) and calculations based on EUROSTAT data including the Structural Indicators and AMECO databases. All three estimates demonstrate a consistent position for GDP per capita with levels in the USA nearly 40 % above those in the EU. Discrepancies appear when examining the two labour productivity estimates. All three again suggest a large USA lead in GDP per person employed, but the lead implied using EUROSTAT data is significantly below either OECD or GGDC. Finally OECD data suggest a lower, but still significant USA lead in output per hour worked. The GGDC estimate on this measure is slightly lower than OECD, whereas EUROSTAT suggests the two regions are close to parity.

Understanding these differences requires further examination of the components that make up the underlying estimates – these are shown in the second panel of Table 1.4. OECD estimates suggest a marginally lower level of GDP in the USA relative to the EU than the remaining two measures. All three estimates employ essentially the same population numbers, but there are variations in the two labour input components, chief of these being a considerably higher ratio of USA to EU employment in EUROSTAT than in either OECD or GGDC. There are four main reasons for differences in level estimates, namely the purchasing power parities (PPPs)

employed to convert output in national currency units to a common currency; the definition of employment; the methods used to calculate hours worked and methods to adjust for the informal economy. Details for all four are outlined in the box below. The conclusion of the authors is that OECD and GGDC both use consistent estimates throughout, in particular in matching persons employed with hours per person. The remainder of this section employs GGDC data as these are the estimates that are in the public domain through the GGDC web site.

Table 1.4: Comparison Matrix of Alternative Estimates, Levels 2001, EU = 100

	OECD data	GGDC	EUROSTAT data
GDP per capita	137.2	138.6	138.7
GDP per person employed	123.8	126.7	117.4
GDP per hour worked	108.5	106.6	103.2
Components:			
GDP (USA \$)	103.6	104.5	104.6
Population	75.5	75.4	75.4
Persons employed	83.7	82.5	88.2
Annual average hours worked	113.8	117.7	116.9
Total hours worked	95.5	98.0	103.2

Notes: The OECD estimates are the authors' calculations based on data received from OECD – in particular OECD does not publish a total EU estimate. GGDC does not include Luxembourg in its estimate for the total EU.

Sources: OECD: GDP in 2001 USA\$ and population from National Accounts, vol.1, 2002, OECD, persons employed from Labour Force Surveys, 1981-2001, OECD, Annual average hours worked from Employment Outlook, 2002, OECD; GGDC: GDP in 1999 USA\$ employing Purchasing Power Parities and Real Expenditures 1999 Benchmark year, Edition 2002, OECD, updated to 2001 using growth in constant price GDP from National Accounts, vol.1, 2002, OECD, persons employed from Labour Force Statistics, 2002, OECD, annual average hours worked, various sources including Employment Outlook, 2002, OECD, national statistical offices web-sites e.g. USA Bureau of Labor Statistics (BLS), for most EU countries levels were extrapolated from Angus Maddison (1995), Monitoring the World Economy, 1820-1992, OECD – see GGDC web site <http://www.eco.rug.nl/ggdc/homeggdc.html> for more detail. GGDC does not include Luxembourg in its estimate for the total EU; SI: Eurostat Structural Indicators for relative levels of GDP per capita, per person employed and per hour worked, component sources from AMECO database.

Box 1.2: Relative levels of GDP and labour input: why do they differ?

There are three primary reasons for differences in estimates of levels, namely the purchasing power parities (PPPs) employed to convert output in national currency units to a common currency; the definition of employment; the methods used to calculate hours worked.

PPPs: At present there are three sets of PPPs that can be used to convert GDP to a common currency, the 'rolling' or 'current price' estimates of OECD and EUROSTAT for 2001 and the fixed base estimates for 1999 preferred by the GGDC. In the 'rolling' estimates OECD employs national deflators through three year full PPP benchmarks, whereas EUROSTAT makes use of annual survey information. Crucially in both estimates the USA does not participate in the annual surveys so that comparisons between EU countries and the USA make use of national USA deflators. As indicated in Table 1.2.1 the choice of which of the three variants to use makes very little difference to the relative levels of GDP.

Employment: jobs versus persons: There are currently two employment measures published in official statistics; number of persons and jobs, and the difference between the two being the number of persons with two or more jobs. Multiple jobs, accounting for about 8 % of the total, are much more prevalent in the USA than in the EU. The USA national accounts produced by the Bureau of Economic Analysis (BEA) counts jobs, whereas BLS figures refer to persons. Employment in EU countries' national accounts tends to be a job based measure, but labour force survey estimates refer to persons. It is not clear a-priori which of these two concepts is best in measuring per worker labour productivity. For the USA EUROSTAT appears to use jobs (BEA source) whereas both OECD and GGDC use persons. Of utmost importance is that the hours estimates employed are consistent with the employment concept. Hours per person will by definition be higher than hours per job. Both OECD and GGDC use hours per person for the USA based on data supplied by BLS. In the case of the USA, EUROSTAT also appears to be using hours per person, which is not consistent with their use of jobs for employment. BEA publishes hours, but these exclude the self-employed. O'Mahony and DeBoer (2002) calculate a BEA based hours figure adjusting for longer hours for self employed; their estimate is about 8 % lower than the BLS persons figure. An inconsistency in the USA data underlying the Structural Indicators is likely to account for much of the difference between the EUROSTAT and OECD/GGDC picture of the USA lead in GDP per hour worked.

Annual average hours worked: Direct versus component methods: The direct method employs survey evidence on the actual number of hours worked for persons surveyed. If the survey is undertaken with high frequency, this method should yield an accurate estimate. The component method starts with usual weekly hours worked and deducts for hours paid, but not worked due to holidays, sick leave, strikes etc. and adds in any additional hours due to overtime. The component method frequently draws information from a large number of, and possibly inconsistent, sources whereas the direct method is based on a single source, i.e. a survey. In practice, surveys are often carried out quarterly so that they may miss some time lost due to holidays. A further complication is that surveys may be based on persons or enterprises with the results not always consistent. In the estimates in Table 1.2.1 OECD hours are direct estimates based on EU labour force surveys, but with some downward adjustments and data from employer surveys from BLS for the USA. GGDC generally employs the component method, but their US hours are from the same source as OECD. Again it is unclear which is the better definition, but as the labour force surveys, at least in the EU, are being standardised this is likely to be the most reliable measure in the future.

The informal economy: The estimates also vary in respect of adjustments for the informal economy. Arguably most service sector jobs, regardless of how low paid, are picked up in USA official statistics, but there is some doubt whether similar jobs in the 'informal economy' are in fact measured in European countries. Although there is international agreement that the 'informal economy' should be measured, in practice national statistical offices vary in the methods they employ to deal with this problem and there are questions on whether GDP and employment adjustments are consistent with each other. None of the three estimates in Table 1.2.1. adequately deal with this issue. However although all three include adjustments to official Italian GDP measures, it is only GGDC that includes a corresponding adjustment to employment.

1.2.1.2 Productivity levels in the EU, 2001

Table 1.5 demonstrates relative levels of GDP per capita, GDP per person and GDP per hour for all 15 member states. With the exception of Luxembourg all EU member states in 2001 had levels of GDP per capita significantly below that of the USA. However within the EU there is much variation so that the countries with the highest levels (Denmark, Ireland, and the Netherlands) enjoy average standards of living some 70 % above those in the poorest nations (Greece, Portugal). There is less variation in levels of GDP per capita among the countries with the highest population (Germany, France, the United Kingdom and Italy) although Spain as a large country falls well behind this group.

Examination of GDP per person employed shows a somewhat different picture although again the US leads all EU member states bar Luxembourg. There remains a large gap between the highest and lowest per person productivity countries, but the identification of the leaders changes. In this case the highest productivity countries include some of the larger countries, i.e. France and Italy. Finally the GDP per hour worked figures demonstrate many EU member states reaching productivity levels above or close to USA levels, namely Austria, Belgium, Germany, France, Ireland, Italy, Luxembourg, and the Netherlands. The EU member states with the lowest per capita incomes (Greece, Portugal and Spain) remain those with the lowest levels of per hour labour productivity.

Table 1.5: Productivity levels 2001, EU member states and USA, EU = 100

	GDP per capita	GDP per person employed	GDP per hour worked
Belgium	106	119	122
Denmark	118	101	108
Germany	105	102	110
Greece	67	79	65
Spain	83	91	79
France	102	109	117
Ireland	123	119	113
Italy	103	110	108
Luxembourg	185	127	122
Netherlands	113	99	114
Austria	109	103	107
Portugal	73	64	58
Finland	102	97	96
Sweden	101	90	89
United Kingdom	101	93	89
EU	100	100	100
USA	138	127	107

Note using gross national product rather than GDP for Ireland would imply that that country was close to the EU average for the measures in the Table above. The difference is due to transfer pricing with the gap between NNP and GDP large and increasing over time in Ireland. Hence output is inflated by the difference between these two measures of aggregate activity; the gaps between GDP and GNP are small for remaining countries.

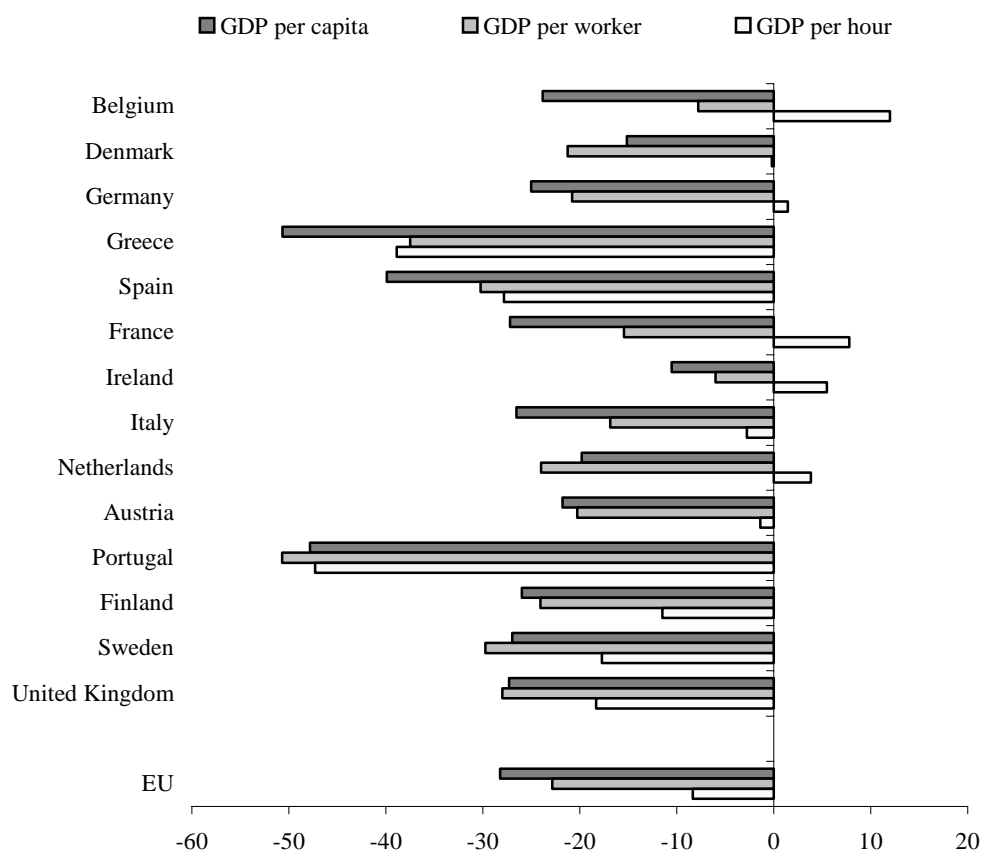
Source: GGDC: GDP in 1999 USA\$ employing Purchasing Power Parities and Real Expenditures 1999 Benchmark year, *Edition 2002, OECD*, updated to 2001 using growth in constant price GDP from *National Accounts, vol.1, 2002, OECD*, persons employed from *Labour Force Statistics, 2002, OECD*, annual average hours worked, various sources including *Employment Outlook, 2002, OECD*, national statistical offices web-sites e.g. USA Bureau of Labor Statistics (BLS), for most EU countries levels were extrapolated from Angus Maddison (1995), *Monitoring the World Economy, 1820-1992, OECD* – see GGDC web site <http://www.eco.rug.nl/ggdc/homeggdc.html> for more detail. GGDC does not include Luxembourg in its estimate for the total EU.

Underlying differences in labour productivity are a marked difference in the relative position of countries depending on the sector being compared. Thus the USA continues to enjoy a significant lead relative to all EU countries in manufacturing, but its lead is less pronounced in services. Thus in 1999, value added per person in the USA was nearly 60 % higher than in the EU, whereas the American lead in the much larger market service sector was only about 20 % (O'Mahony, 2002).⁵

The difference between relative levels of GDP per capita and GDP per person employed is due both to rates of labour force participation and unemployment. Differences between GDP per person and GDP per hour worked stem from the extent of part-time work, the length of the standard work week and days paid, but not worked per year, this primarily due to annual holiday leave. Cross-country differences in some of these components are illustrated in Table 1.6.

⁵ Market services comprise of transport, communications, distributive trades, financial and business services and private personal services.

Figure 1.4: Differences to the US: from per capita to per hour



Source: WIFO calculations using Groningen Growth & Development Centre.

The first column of this table shows the ratio of the working age population (aged 16-64) to the total. There is little variation across countries or regions in this ratio, in particular in the EU relative to the USA. As we move along the columns in the Table more variation appears. Column two shows the relative participation rate i.e. the labour force over the working age population. Participation is much higher in the US than in the total EU and higher than in the most of the EU member states. However, Denmark and Sweden have higher participation rates than the USA and a number of countries, namely the Netherlands, Finland and the United Kingdom have rates at or near those of the USA. The unemployment rate in the EU is considerably higher than in the USA, although the variation across EU member states is very high. Of the large population countries, France, Italy, Germany and Spain all show unemployment rates above the EU and significantly greater than in the USA. The United Kingdom is the only large country with an unemployment rate similar to that achieved in the USA. Luxembourg, the Netherlands, Austria, Ireland and Portugal all perform better than the

USA in respect of unemployment. The final column shows relative annual hours worked. Workers on average work for longer periods per year in the USA than in the EU – only Spain and Greece have annual average working hours at or above USA levels. Dutch and German workers have the shortest hours followed by Denmark, France, Belgium and Austria. The United Kingdom has a working hours pattern more similar to the USA than to other large EU member states.

Table 1.6: Labour and hours ratios, EU member states and USA, EU = 1

	Working age population/ total population	Labour force/ working age population	Unemployment rate	Annual average hours worked
Belgium	0.98	0.95	1.33	0.98
Denmark	1.00	1.15	0.62	0.94
Germany	1.01	1.04	1.07	0.93
Greece	1.01	0.87	1.41	1.22
Spain	1.02	0.93	1.45	1.15
France	0.97	1.00	1.18	0.93
Ireland	1.01	0.99	0.47	1.06
Italy	1.01	0.88	1.30	1.02
Luxembourg	1.00	1.38	0.22	1.04
Netherlands	1.02	1.08	0.35	0.87
Austria	1.01	1.03	0.47	0.96
Portugal	1.02	1.09	0.53	1.02
Finland	1.00	1.08	1.23	1.11
Sweden	0.97	1.11	0.66	1.01
United Kingdom	0.98	1.07	0.62	1.05
EU	1.00	1.00	1.00	1.00
USA	0.99	1.08	0.61	1.19

Sources: OECD: GDP in 2001 USA\$ and population from *National Accounts, vol.1, 2002*, OECD, persons employed from Labour Force Surveys, 1981-2001, OECD, Annual average hours worked from *Employment Outlook, 2002*, OECD.

In summary, across the EU there is a general tendency for a greater amount of non-working time than in the USA either through lower participation, higher unemployment or shorter hours. Only two countries, the United Kingdom and Portugal show a similar pattern to the USA in all three measures. This in turn may reflect a preference for the EU population to take some of their high standards of living in the form of greater leisure, but could also reflect the institutional environment that may constrain persons from working their desired amount. Thus labour market regulations that effectively restrict part-time working or serve to raise unemployment, norms on holidays and the standard working week, cultural factors that constrain the participation of certain groups, e.g. married women, may all act to ensure sub-optimality of working patterns. These issues are discussed further in Section 1.4.

1.2.2. *Productivity Growth*

Productivity levels at a point in time are the result of a dynamic pattern of economic growth which in turn is due to a large number of factors such as investment in physical and human capital, resources devoted to innovative activities and the institutional and regulatory environment facing producing units. This section considers the dynamics in standards of living and labour productivity with underlying causes of these differences discussed in subsequent sections.

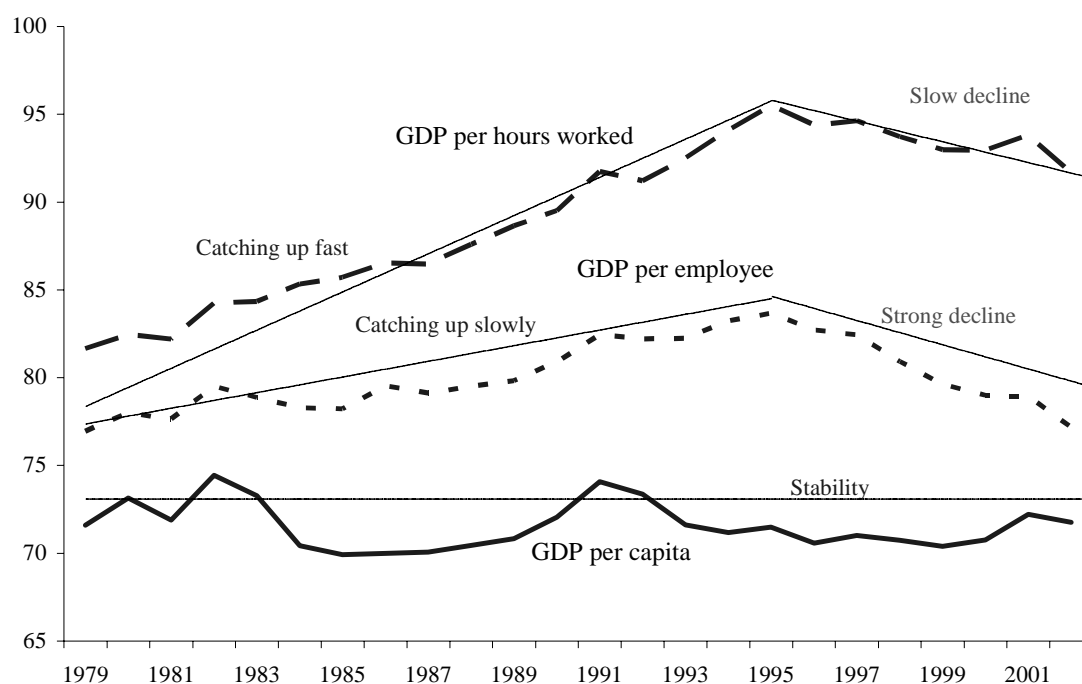
Figure 1.5 shows the time pattern of changes in GDP per capita, contrasting the total EU with the USA for the period 1979 to 2002. In terms of GDP per capita the EU position demonstrates almost no change relative to the USA up to the year 2002. In contrast the graphs of both GDP per person engaged and GDP per hour show respectively slow convergence (GDP per employee) and rapid convergence (GDP per hour worked) of EU levels to the USA up to the mid 1990s, thereafter hourly productivity decline slowly and GDP per employee decline more rapidly. The pre 1990s convergence was stronger in terms of GDP per hour than GDP per person employed consistent with the notion that the EU population decreased their time spent working, whether voluntarily or involuntarily.⁶ The period from the mid 1990s was one of enhanced output growth in the USA, most likely due to an impact from information technology (see the discussion in section 1.3).

Table 1.7. shows growth rates of GDP per hour for the EU, all individual EU member states and the USA, contrasting with the early 1990s with the period since then. The total EU and the majority of EU member states experienced a slowdown in growth in output per hour across the two time periods in contrast to the acceleration in productivity growth in the USA.

A few EU countries did achieve labour productivity growth rates higher in absolute values than those achieved by the USA in the later period. But these tended to be either countries that were a long way behind the USA (Greece and Portugal) or nations with a large share of high technology production (Finland and Ireland). EU member states that had converged on the USA by the mid 1990s demonstrated a deteriorating relative position thereafter, although Belgium and Austria are the exception to this rule.

⁶ Similar stages of convergence have been analysed in Aiginger, Landesmann (2002).

Figure 1.5: *Catching up in GDP per capita, productivity per worker and per hour in the EU (US=100)*



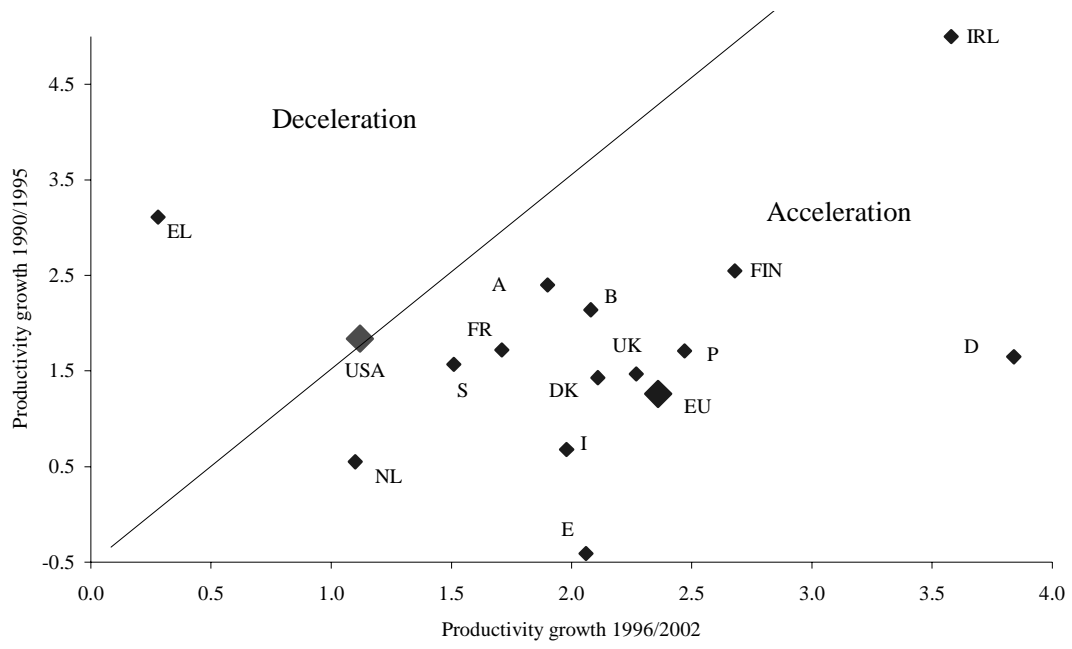
Source: NIESR calculations using data from Groningen Growth and Development Centre.

Table 1.7: *Growth in Output per hour, 1990-1995 and 1996-2002*

	1990-1995 % per annum	1996-2002 % per annum
Belgium	2.08	2.14
Denmark	2.11	1.43
Germany	3.84	1.65
Greece	0.28	3.11
Spain	2.06	-0.41
France	1.51	1.57
Ireland	3.58	5.00
Italy	1.98	0.68
Luxembourg	1.77	2.04
Netherlands	1.10	0.55
Austria	1.90	2.40
Portugal	2.47	1.71
Finland	2.68	2.55
Sweden	1.71	1.72
United Kingdom	2.27	1.47
EU	2.36	1.26
USA	1.12	1.84

Source: GGDC: GDP in 1999 USA\$ employing *Purchasing Power Parities and Real Expenditures 1999 Benchmark year, Edition 2002*, OECD, updated to 2001 using growth in constant price GDP from *National Accounts, vol.1, 2002*, OECD, persons employed from *Labour Force Statistics, 2002*, OECD, annual average hours worked, various sources including *Employment Outlook, 2002*, OECD, national statistical offices web-sites e.g. USA Bureau of Labor Statistics (BLS), for most EU countries levels were extrapolated from Angus Maddison (1995), *Monitoring the World Economy, 1820-1992*, OECD - see GGDC web site invalid link! for more detail. GGDC does not include Luxembourg in its estimate for the total EU.

Figure 1.6: Productivity (GDP per hour) acceleration in EU and US



Source: WIFO calculations using data from Groningen Growth and Development Centre.

1.3 The contribution of ICT to productivity growth

Productivity growth has been shown to be higher and accelerating in the US, but low and decelerating in the second half of the 1990s for the EU. These tendencies have been extended to the most recent years, in which growth of output and productivity was higher in the US. There are important differences across member countries of the EU. Some are enjoying acceleration and productivity rates similar to the US. We investigate in this section both the differences between the US and the EU, as well as the differences across European countries by the growth accounting technique. This technique investigates which part of the productivity increase (defined as GDP per hour) is contributed to the input of capital, and which is left unexplained and assumed to be the result of technical progress (called total factor productivity, multi-factor productivity or Solow residual) or even "the measure of our ignorance". The approach is based on the Solow model of economic growth and the methodology has been developed by Jorgenson and Griliches (1967). Our specific emphasis is to assess the impact of information and communication technology on growth. The data additionally allow us to distinguish between the impact of ICT on capital formation, as well as on the technical progress. In Box 1.3 we demonstrate a more detailed view of our methodology.

The ICT revolution has two major effects. On the demand side, new products and new services experience two-digit growth. The growth accounting approach calculates the share of investment into this new technology and estimates its impact on growth. More specifically it calculates that part of capital deepening which is due to ICT investment. Demand by firms, as well as consumer demand was spurred by steep declines in prices that were again the engine for a renewed growth with low inflation. Decreasing prices gave incentives for ICT-users to use these and the profit from large productivity gains, although the extent of these gains is still subject to considerable debate. Low inflation in turn facilitates an ease in monetary policy and so contributes to lowering the rate of interest, thus giving rise to a kind of virtuous circle. On the production side the ICT producing sectors contribute to high and steeply rising productivity.⁷

⁷ The contribution of the ICT sectors to the increase in total factor productivity is the second part of the "ICT contribution" to the increase in labour productivity (see Table 1.8).

Box 1.3: The analysis framework

The accounting method methodology applied here is the one of Jorgenson and Griliches (1967) whose objective consists in tracing how the quality of inputs evolves with the scope of enhancing the possible substitution schemes between factors of production. Assuming a Translog production function rather than the more usual Cobb-Douglas allows the interaction of different effects to be evidenced as a breakdown of these effects at the first-order till the n -order can be implemented. Moreover, the discrete-time Tornqvist index is an exact index number if it is applied to the Translog function (Hulten, 2000). But some assumptions relating to these production functions may appear strong and deviations from them may bias results, namely the residual of the function. By assuming that production inputs are properly compensated against the services they render, they must be interpreted with caution.

The value added production function is given by:

$$Y_t = F(K_t, L_t, T) \quad (1)$$

where K_t are capital services, L_t are labour services and T total factor productivity.

Inputs' shares of value added are equal to the elasticities of production to these factors, under the assumptions that returns to scale are constant and product and factors markets are assumed to be perfectly competitive.

Under these conditions, equation (2) can be transformed as follows:

$$\Delta \ln Y = \bar{v}_{K,t} \Delta \ln K_t + \bar{v}_{L,t} \Delta \ln L_t + \Delta \ln A_t \quad (3)$$

where $\underline{\Delta}$ is the first difference operator,

$\bar{v}_{K,t}$ is the average share of capital in domestic income, and $\bar{v}_{L,t}$ is the average share of labour in income. Constant returns implies that

$$\bar{v}_{K,t} + \bar{v}_{L,t} = 1,$$

The contribution of each factor of production to growth is determined from equation (3) and is given by the input growth rate in volume (including the evolution of quality of this factor of production) weighted by its return share in value added.

By rearranging equation (3), the contribution of factors of production to growth of the average hourly labour productivity can be expressed in the form:

$$\Delta \ln y_t = \bar{v}_{K,t} \Delta \ln k_t + \bar{v}_{L,t} (\Delta \ln L_t - \Delta \ln H_t) + \Delta \ln A_t \quad (4)$$

with:

$$y_t = \frac{Y_t}{H_t} ; k_t = \frac{K_t}{H_t}$$

where H represents the volume of hours worked.

Growth of average hourly labour productivity then stems from:

- * The "capital deepening", or substitution of capital for labour, arising from capital accumulation,
- * The improvement of the labour quality defined as the difference between the rate of growth of the weighted labour input and hours worked,
- * Growth of total factor productivity.

Capital services

The construction of capital services involves that the efficiency of each type of asset is taken into account.

In that respect, each type of asset i at time t can perfectly be substituted for another asset i at time $t-1$. Actually, it is assumed that data on investment at constant prices allow for differences in the performance of the various assets. It means that price series used to deflate the investment series at current prices reflect the efficiency of assets. For some assets like computers and some parts of communications equipment, hedonic prices are used (for instance in the US and France). The asset price is regressed upon a set of related qualitative characteristics in order to retain quality and construct a constant quality price index. Roughly, it consists in extrapolating series backwards in order to get the missing prices for new equipment or forward for older equipment.

1.3.2 Comparing US and EU performance

As reported, productivity has accelerated in the US, but decelerated in the European Union. The EU had a high productivity increase per hour in the first half of the 1990s, but is lagging the US in the second. This result is summarised in Table 1.8 for the purpose to learn which factors contributed to these trends. More specifically the table gives a summary of the contributions of capital deepening and TFP to hourly labour productivity growth, contrasting the 1990-1995 period with 1995-2000. As discussed earlier in Section 1.2 there are significant differences comparing these two periods with a one percentage point decline in EU labour productivity growth between the first part of 1990s and the second part, and a rise by a little more than one point in the USA.

- The deceleration in the EU is almost equally explained by a decline in the two non-ICT components: the contribution of investment to growth declines first in investment in non-ICT equipment (-0.65 in other non-residential capital) and secondly in a decline in TFP in non-ICT producing sectors (-0.55). The first conclusion is that if we look at the EU performance separately, it is not in the ICT-linked economy that the decline is

coming. In fact ICT contributes positively between the two periods by an increase of 0.18 points in its contribution to productivity.

- The acceleration of 1.02 points in US hourly labour productivity comes from ICT capital investment by 0.35 points (0.07 in other kinds of investment), 0.17 from TFP growth originates in ICT producing sectors. Another 0.43 stems from TFP gains in non-ICT producing sectors⁸. Overall, about half the labour productivity acceleration is explained in the US by an increased contribution of ICT, with the other half coming from the non-ICT economy.
- The total ICT-linked impact differential between the US and EU is 0.54 % in the second half of the 1990s. This is more than two-thirds of the productivity differential.
- If we go into further details we find that the contribution of ICT investment to increased productivity in the US results from a increase of several kinds of ICT equipment: 0.38 in computers, 0.11 in communications equipment, and 0.26 in software. This differs from 0.22 %, 0.07 % or 0.11 % in the EU.
- The growth rates of real capital formation and the capital services of ICT have been as rapidly in EU as in the US.
- The intensity of investments were quite different, with the share of US investment in GDP surpassing EU by half to two-thirds throughout the period of 1981-2000.

Summing up the contribution of ICT to productivity in EU is around half the contribution in the US in the second half of the 1990s (0.61 % vs. 1.15 %). The larger part of the total difference (-0.54 %) comes from lower ICT investment (-0.23 %), the smaller one (-0.20 %) from lower growth in total factor productivity (in ICT-producing sectors).

⁸ See William Nordhaus, "Productivity growth and the new economy", found that there has been considerable acceleration of productivity in non-ICT sectors between one-third to fifty percentage points of the increase that occurred outside the ICT sectors.

*Table 1.8.: Contributions to growth in average hourly labour productivity
(in percentage points)*

	1991-1995			1996-2000		
	EU	US	EU-US difference	EU	US	EU-US difference
Growth of hourly labour productivity (a)	2.45	1.19	1.26	1.43	2.21	-0.78
Contributions from:						
Capital deepening (b), of which from	1.34	0.58	0.75	0.80	1.00	-0.20
ICT capital	0.28	0.40	-0.11	0.40	0.75	-0.34
of which:						
Office and computer equipment	0.13	0.19	-0.07	0.22	0.38	-0.16
Communication equipment	0.06	0.04	0.03	0.07	0.11	-0.04
Software	0.09	0.16	-0.07	0.11	0.26	-0.14
Other non-residential capital	1.05	0.19	0.86	0.40	0.25	0.15
Contributions from :						
Total factor productivity (c) of which from	1.12	0.61	0.51	0.62	1.21	-0.58
Production of ICT, excluding software	0.14	0.23	-0.08	0.20	0.40	-0.20
Office and computer equipment	0.09	0.10	0.00	0.13	0.16	-0.03
Semiconductors	0.03	0.11	-0.08	0.07	0.24	-0.17
Communication equipment	0.01	0.02	-0.01	0.00	0.00	0.00
Other producers	0.97	0.38	0.59	0.42	0.81	-0.39
Total ICT contribution (d)	0.43	0.62	-0.20	0.61	1.15	-0.54

(a) GDP per hour worked in total economy, GDP excluding imputed and actual rents

(b) Capital service per hour worked

(c) Including changes in the quality of labour

(d) Equals contribution of ICT capital and ICT production

Source: Van Ark et al. (2003)

1.3.3 Individual performances: winners

For some EU member states, namely Belgium, Greece and Luxembourg, there are up to now no appropriate data available for an analysis of contributions to growth using the decomposition in Table 1.8. Here we compare two periods, 1991-1995 as compared to 1996-2000 between two peaks of economic activity⁹.

Comparing individual performance, we can distinguish two groups of countries, one with a rather high productivity growth in the first period and showing higher or no change in productivity growth in the later period.¹⁰ Table 1.9 shows the decomposition of labour productivity growth for these countries.

⁹ Estimates for the year 2001 will be possible by the end of April 2003 but, although it is interesting as such, may not add to the analysis, as 2001 was a recession year.

¹⁰ The results in Section 1.2 suggest Belgium and Greece would have been members of that group.

Table 1.9: Country with acceleration in productivity growth (GDP per hour)

(Growth rate of 1996-2000, less 1991-1995)

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity
Finland	+0.10	-1.06	+1.95	+1.0
Ireland	+0.47	+0.50	+1.31	+2.28
Austria	+0.16	+0.03	+1.21	+1.37
France	+0.11	-0.78	+0.64	-0.03
Sweden	-0.25	-0.11	-0.04	+0.10

Source: Van Ark et al. (2003).

The contribution of ICT investment is significant, but not a major cause of acceleration of labour productivity growth in most. It ranges from an acceleration of 0.47 percentage points for Ireland to only 0.10 for Finland.¹¹ The more important contribution to increased productivity lies in four of the five countries in the acceleration of the Total Factor Productivity. The exception is Sweden; here again the effect had been large already in the first half of the 1990s. The non-ICT investment contribution is rather negative (-1.06 for Finland) or slightly positive (+0.03 for Austria). In other words these countries have made major gains in productive efficiency. For more comprehensive evaluation of economic performance including ICT, research input and human capital see Box 1.3 or Box 1.4.

1.3.4 Group of countries with deceleration in labour productivity

A similar decomposition is shown in Table 1.10 for countries that experienced a decline in labour productivity growth across the two time periods. Three of the largest European Union members registered a strong decline (larger than 1 %) in labour productivity: Germany, Italy and United Kingdom. They have three different stories to tell. In Germany the decline was for the most part due to a decline in non-ICT investment. During the early 1990s, Germany registered a construction boom as a consequence of German reunification. The end of the boom and the difficulties encountered in the catching-up process of the Eastern Länder are among the major explanations of the German decline.

¹¹ However, here the contribution of ICT investment had been high in the first part of the 1990s.

Table 1.10: Countries with a deceleration in hourly labour productivity

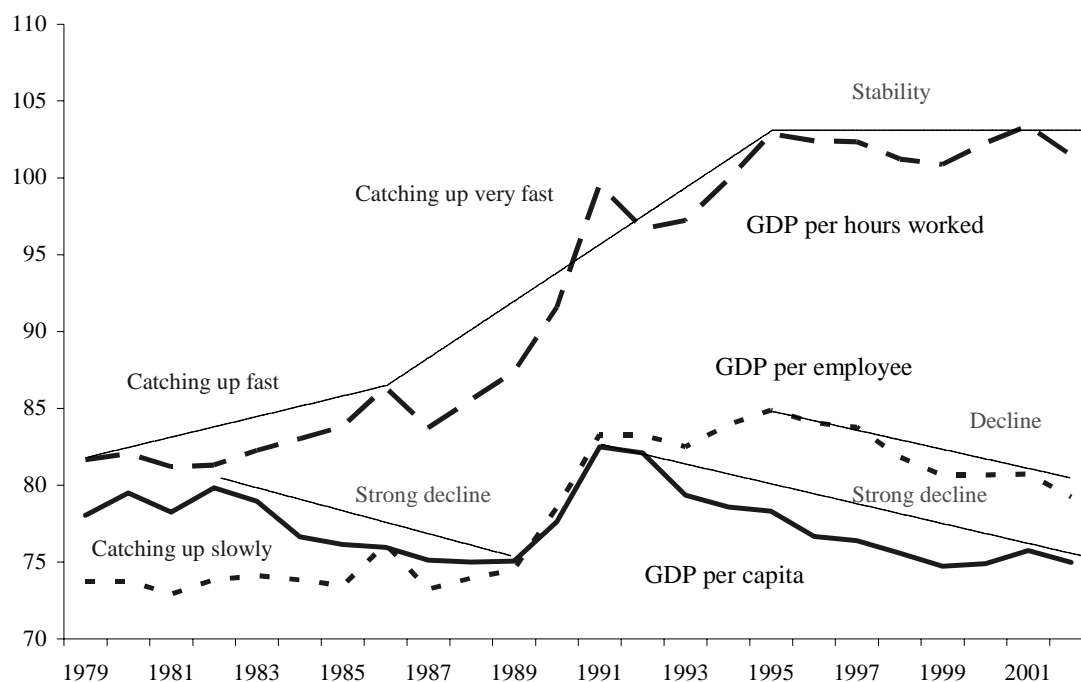
(Growth rate of 1996-2000, less 1991-1995)

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity
Netherlands	+0.15	-0.65	-0.22	-0.62
Denmark	+0.16	+0.01	-0.89	-0.71
United Kingdom	+0.29	-0.26	-0.92	-0.89
Portugal	+0.02	-0.61	-0.44	-1.03
Germany	+0.04	-0.70	-0.45	-1.15
Italy	+0.09	-0.60	-1.37	-1.87
Spain	-0.03	-0.92	-1.12	-2.07

Source: Van Ark (2003).

Looking at Figure 1.7 we see that reunification has been a major statistical and economic problem. Statistically, before 1991 the national income accounting in the Democratic Republic was based on the concept of the measure of the net material product with administrative price valuations. Economically we have two different regions, one with high market standard and high efficiency notably as far as productivity is concerned, the other with very high social standards and a very employment ratio, but very low productivity.

Figure 1.7: Germany GDP per capita, per employed person and per hours worked (US=100)



Source: CEPII calculations using data from Groningen Growth and Development Centre.

As a consequence average income per capita compared to the USA level is almost stagnant or even declining over the period 1980-2002. We have two periods of strong decline: from 1983 to 1989 and from 1993 to 2002, with a strong rise in between. On the contrary there has been a strong increase in hourly productivity, which means that without a strong increase in GDP per employee there has been a reduction in hours worked. The duration of work was larger in the Eastern part of Germany so it was the result of a harmonisation of the two parts of the country on the regulations in use in the Western part. Since 1995 GDP per hour has been stable as compared to the USA.

Of great concern for the whole group, other than the United Kingdom, is the very low contribution of ICT investment. For Italy the major cause (about two-thirds) of the decline in productivity is due to the deceleration of TFP. It has also a very low contribution from ICT investment.

The UK case is to some extent a paradox. The UK invests heavily in ICT. The level of its contribution (0.50) during the 1995-2000 period is large by the standards of other countries. It even increases its ICT contribution more than the US between the two periods. Nevertheless the overall productive picture is rather negative due to a strong decline in the contribution of TFP (-0.92). This was largely concentrated in manufacturing and most likely stems from large and sustained appreciation of Sterling in the mid to late 1990s (see O'Mahony and Robinson, 2003, for a discussion of the UK manufacturing productivity slowdown).

The Netherlands' case shows, contrary to the other countries with decelerating productivity, only a small decline in TFP (-0.22). The major cause of decline is from non-ICT investment. We will also see in the next section that the Netherlands are very active in promoting employment that can be detrimental to hourly labour productivity, but not so much to the global efficiency measured by TFP. For Spain and Portugal have almost no contribution from ICT investment and they registered a large decline both in non-ICT investments and TFP, Spain having the worst results in both cases.

As a conclusion we can say that ICT investment plays a major role in the USA productivity revival. It plays also an important role, but not as much as in the USA, in the European countries that experienced relatively favourable productivity performance. The contribution of ICT tends to be small in the countries that registered a decline in productivity growth; the insufficient investment in this technology seems to be one of the reasons for the disappointing performance of several European economies. Moreover, it seems that the general or macro-

economic conditions prevailing in many EU Member States explain the low level of non-ICT investment, the low rate of growth and in the end the low rate of productivity change.

Box 1.4: In search of the best performing European countries

Some European countries came close to the US in growth of output and productivity, some in employment rates and employment growth; but none in all four dimensions. An exception is Ireland, which experienced extremely successful catching up, surpassing the EU average in GDP/capita (though not in NNP/capita). Relatively successful in boosting output and productivity are Sweden and Finland, they enjoy high and accelerating labour productivity (see Table 1.9) whereas the Netherlands increased employment partly on a part-time basis, and enjoys a medium growth position among EU countries (see Section 1.4).

Even among these relatively successful countries, the performance looks rather different across indicators (Aiginger, 2002). Finland enjoyed productivity increases, specifically in the manufacturing and technology sectors. Unemployment is still rather high, and the productivity acceleration happened in the first part of 1990s. Sweden also has high productivity growth in manufacturing, but low increases in employment and after several devaluations now a low per capita GDP. Government expenditure shares and taxes decreased in relation to GDP, but are still high. Good performance in the very last years is impressive as it happened despite a crisis in its largest firms and the general downturn in the ICT industries.

The Netherlands excel in employment creation and in eliminating a high unemployment rate. It encouraged part-time work, focused on research, and enjoyed high employment, low unemployment rates, and employment growth. But a rather large part of employment potential shifted into disabled schemes. As shown above the Netherlands had low increases in per worker productivity, although starting from high levels (see section 1.4).

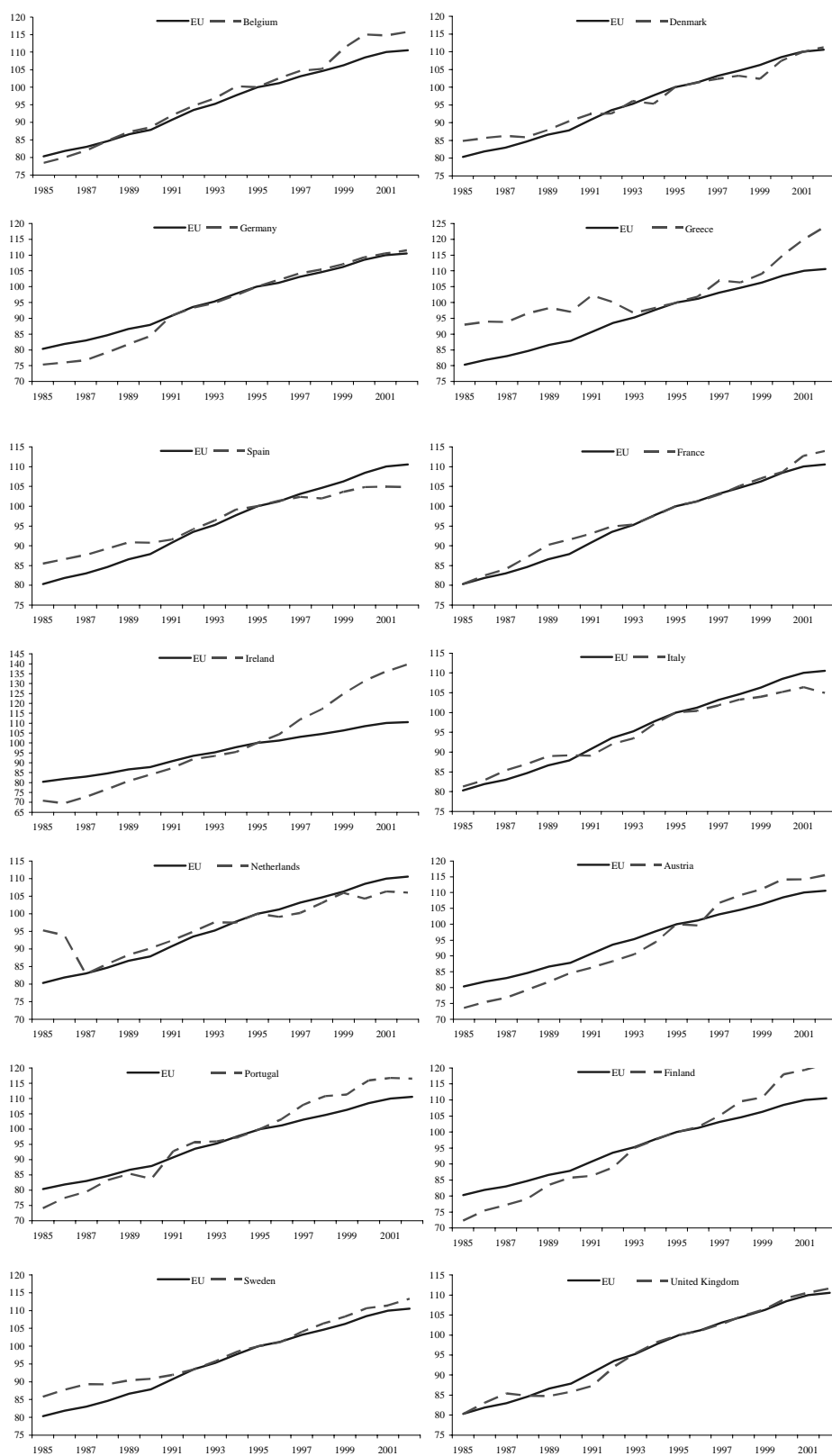
If we look for common elements, we refer first to the structural characteristics of these countries. All of them are small open economies, they belong to the group of Northern type Welfare States with high costs and taxes. Policy can be characterised as tripartite decision-making by government, trade unions and employers' representatives. All four are countries with a consistent long run consensus, and rated as countries with the highest "trust" or "social capital" (see Temple, 2000, rankings by Knack, Keefer, 1997).

The common elements in the policy strategies pursued by these countries are the following:

- * The most important strategy element was to increase the long-term growth path. All these countries invested in research, education and in the production or diffusion of ICT. Finland and the Netherlands increased their research expenditures dramatically, even in a period where total government expenditures were reduced. Sweden reinforced the production and diffusion of telecommunications to become the leader in most ratings for the information society. On average these four countries increased R&D in relation to GDP from 1.6 % (1981) to 2.4 % (1995) and finally to 2.8 %, as compared to 1.9 % for the total EU area. Sweden and Finland are leading in expenditures on education, and Finland is leading in the PISA ranking on quality of education. The Netherlands is above the EU average in secondary and tertiary educated people as a percent of the labour force.
- * The second pillar of the reform was to bring costs and productivity in balance again. Additionally, all countries tried to reduce the corporate tax rate, which itself had been below personal income tax.
- * The third strategy element has been to improve the incentive structure. Workers in these countries have a high probability re-employment and assistance if they look for a new job. Policies increasing the flexibility of firms, while retaining security for people are labelled as flexicurity (flexibility plus security).

Aiginger (2002) claims that the most important of these elements was the first, namely the active investment into future growth. This is well in line with the Lisbon strategy. The other two pillars were the short run (or necessary) conditions to solve a major problem in competitiveness or in market breakdown. The third active pillar enforced growth and allowed the other strategies to hold in the long run. Without it, each discretionary cut in wages and in spending would have proven too small, as had been the US budget cuts in the 1980s and those of the large European countries. Passive strategies tend to decrease demand and to start a vicious circle, unless an active element (or some lucky external shocks) push up growth.

Figure 1.8: Productivity growth (GDP per hour) in EU countries



Source: CEPII calculations using data from Groningen Growth and Development Centre.

1.4 Productivity, employment and growth: what are the options for the EU?

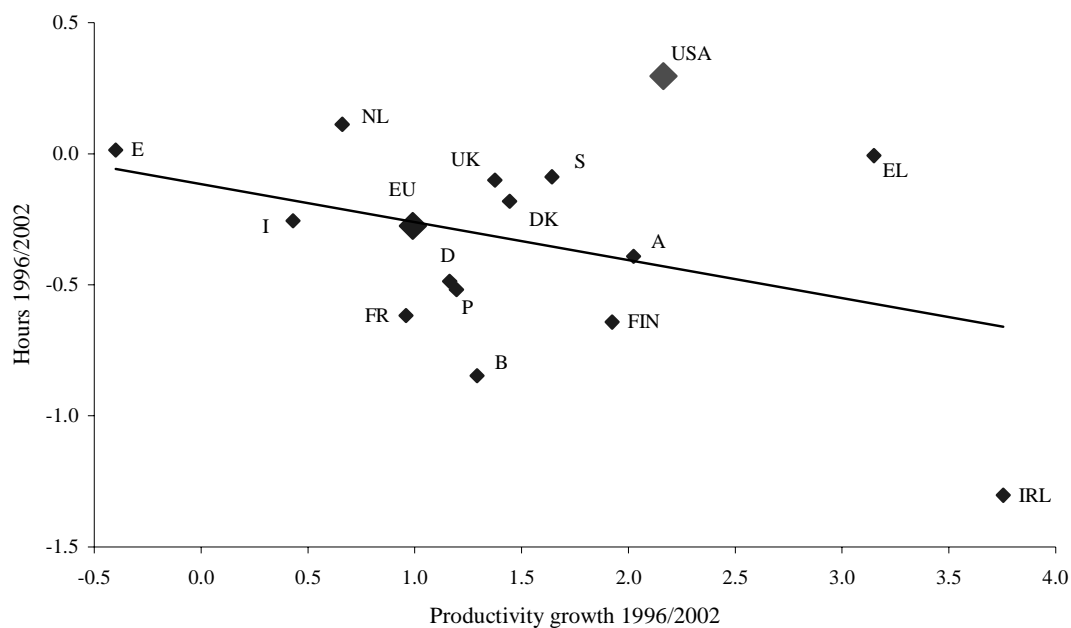
1.4.1 Long run trends in employment and working time

Globalisation, as well as integration did not eliminate some fundamental differences between the US and Europe, nor between EU member countries themselves. The large and persistent difference of about 40 % in per capita income is one difference strikingly stable over decades. This is a remarkable difference in living standards, even if we take into account that productivity differences between the US and Europe are much smaller. The difference in productivity between the leading and the lagging EU member countries of about 2 : 1 is another persistent feature, even if we take into account that Greece and Portugal enjoyed a productivity growth slightly higher than in the EU average in the 1990s. Additionally, employment rates differ widely across countries, as does the number of hours worked per employee. The overall picture is that there are some signs of slow convergence driven by technological development, as for example by ICT, which has impacted all economies. But there seems to be also underlying differences in institutions and even in preferences, which prevent faster convergence. Differences in institutions and preferences on the other hand open and suggest options for countries how to react to new opportunities and to cope with upcoming challenges.

Productivity and working hours are not simply related. Higher productivity allows producing the same output in fewer hours, these results either in a reduction of the number of workers or in a reducing of the working hours. Increasing productivity in the long run lowers the price of products and pushes up demand and international competitiveness, thus increasing output and employment. Reducing working hours may lead to increasing productivity or increasing prices, depending on the response of wages and on price elasticity. Figure 1.9 demonstrates this relationship for the last seven years. The US increased productivity per hour slightly more than the EU in 1996 to 2002, nevertheless the number of hours per worker increased also by 0.3 % p.a. Hours worked (per person) decreased in Europe by 0.3 % p.a.. Two extreme European countries are Ireland and Spain. Ireland achieved its high growth with less working hours. In Spain working hours are constant, but per hour productivity declined.

The Netherlands continued to increase total working hours resulting in low growth of productivity, however starting from a high level. Greece enjoyed stable working hours with catching up in productivity. Decreasing working hours and low productivity growth was experienced in Italy.

Figure 1.9: Productivity dynamics (GDP per hour) and change in labour input

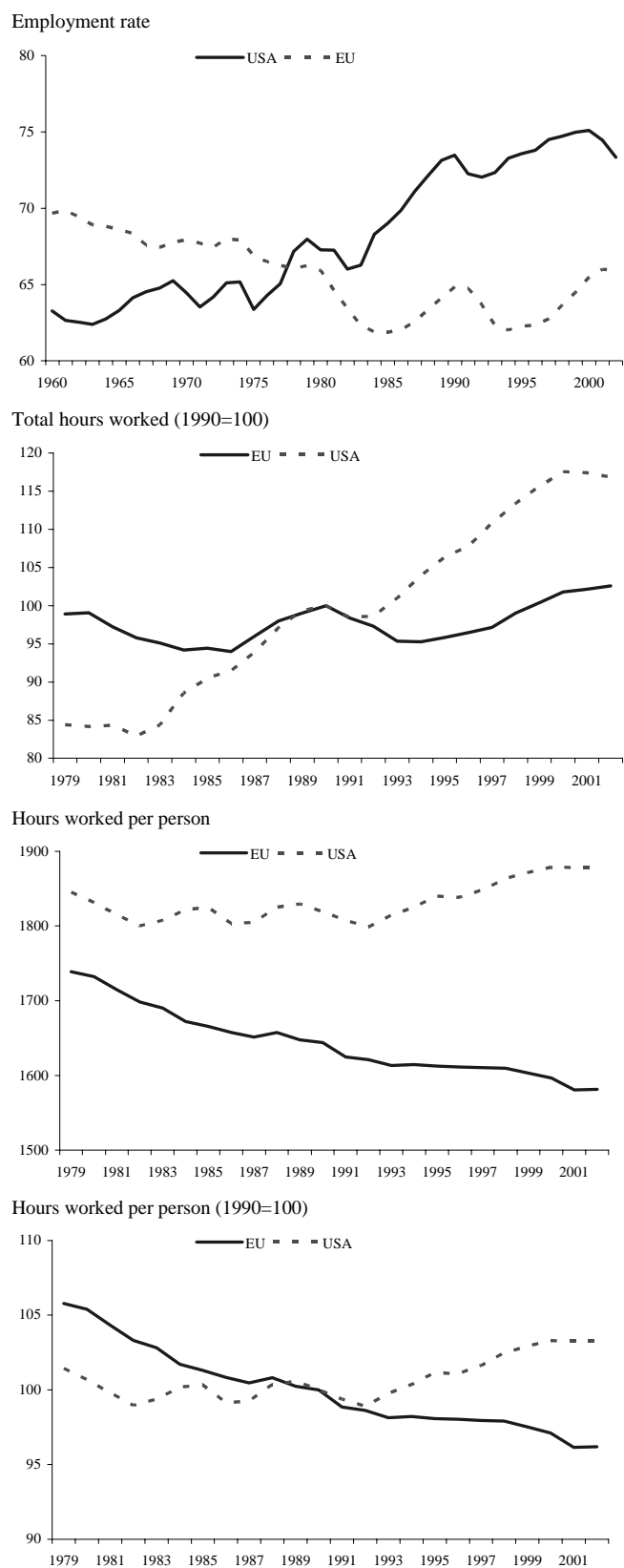


: WIFO calculations using data from Groningen Growth and Development Centre.

As to the long-term relation of working time and employment, working time is decreasing and employment rates are increasing. Since 1870 there has been a decrease in working hours from an annual average of 3,000 hours to less than 2,000 hours in the US and to around 1,500 for EU countries¹². In the 1990s the reduction of working hours did decelerate, in some countries there is even a reversal of trends with an increase in the annual average duration of work (USA and Sweden). Other countries like the Netherlands still registered a decline due to an increasing number of part-time jobs. Within Europe there are differences between 1,921 hours per worker in Greece and 1,376 hours per worker in the Netherlands.

¹² Following Maddison (2001).

Figure 1.10: Employment and working hours in the long run



Source: CEPII calculations using data from Groningen Growth and Development Centre.

Employment data reveal that the relation of workers to total population remained surprisingly constant in Europe between 1870 and 1995, at about 44 %. On contrast, the share of working population in the US increased from 36.6 % (1870) to 41.0 % in 1973 and then again to 49.1 % in 1998. A secular rise in labour participation is to be expected due to the higher participation of women in the work process. Additional years spent for education, increasing life expectancy and incentives towards early retirement are working against this secular trend. Relating employment to working age population (instead of total population) underlines these trends and highlights the differences between the US and Europe. The employment rate in Europe was 66 % in 2002, practically the same as in 1975. In the US employment rate increased from 66 % in 1978 to 73 % in 2002. Thus the US, who used to have a lower employment rate, surpassed Europe in 1978 and obtained a 12 percentage point higher rate in 1997. In most recent years Europe has increased its employment share, narrowing the difference to seven points. Increasing the employment share to 67 % by 2005 and to 70 % by 2010 has been declared as a European target in the Lisbon strategy.

1.4.2 The labour content of growth

Higher employment rates can increase economic growth if there is sufficient demand and if output reacts strongly on additional labour supply. If we take growth as given (or influenced by an exogenous set of determinants) for a moment, we can investigate, how much employment is needed for a given growth. This relation is called employment elasticity of output. This is the rate of change in employment for each 1 % change in output.

Labour intensity of growth has been higher in the US than in Europe for the past two decades. For each point of output increase, labour increased by 0.47 % in the US and by 0.27 % in Europe. However over time the labour intensity of growth is decreasing in the US, reflecting the fuller utilization of the labour market. Unemployment decreased from 7.1 % in 1980 to 5.9 % (2002). In Europe employment intensity had been low in the 1980s; it became negative in the first half of the 1990s, implying that the growth in output was not even high enough to stabilize employment. In the second half of the 1990s, employment elasticity rose to 0.58 %, clearly surpassing the US. This increase of employment elasticity of output is to some degree the mirror image of the deceleration of macroeconomic productivity. But it is not the whole story insofar as fast growing countries can boost productivity and employment at the same time (see Ireland, Finland, Sweden).

Table 1.11: Employment elasticity to GDP growth

	1979/2002	1979/1989	1990/1995	1996/2002	2001/2002
USA	0.47	0.57	0.42	0.31	-0.22
EU	0.27	0.25	-0.29	0.58	0.45
Belgium	0.17	0.01	-0.04	0.41	-0.29
Denmark	0.26	0.38	-0.28	0.33	0.13
Germany	0.02	0.23	-0.44	0.23	-1.26
Greece	0.35	0.58	0.45	0.06	0.06
Spain	0.47	0.13	-0.43	1.13	1.06
France	0.26	0.09	-0.11	0.60	-0.10
Ireland	0.34	-0.15	0.44	0.55	0.28
Italy	0.29	0.23	-0.44	0.75	5.63
Luxembourg	0.56	0.33	0.65	0.77	0.43
Netherlands	0.94	1.22	0.83	0.77	3.99
Austria	0.41	0.44	0.88	0.14	-0.72
Portugal	0.40	0.41	-0.66	0.62	1.50
Finland	0.08	0.25	5.23	0.47	0.00
Sweden	0.08	0.35	-3.64	0.43	0.00
United Kingdom	0.25	0.25	-0.29	0.46	0.33

Source: CEPII using data from Groningen Growth and Development Centre

1.4.3 Recent national experiences with regard to employment

The first half of the 1990s output growth was too low to create employment. In the second half growth accelerated, but this alone does not explain the better employment performance of the EU. What has also changed was the employment content of growth. This tendency was confirmed in most recent years where growth far less than in the first half of the 1990s, was accompanied by rising employment. The United Kingdom, the Netherlands and France are countries that emphasized employment creation in response to high unemployment rates.

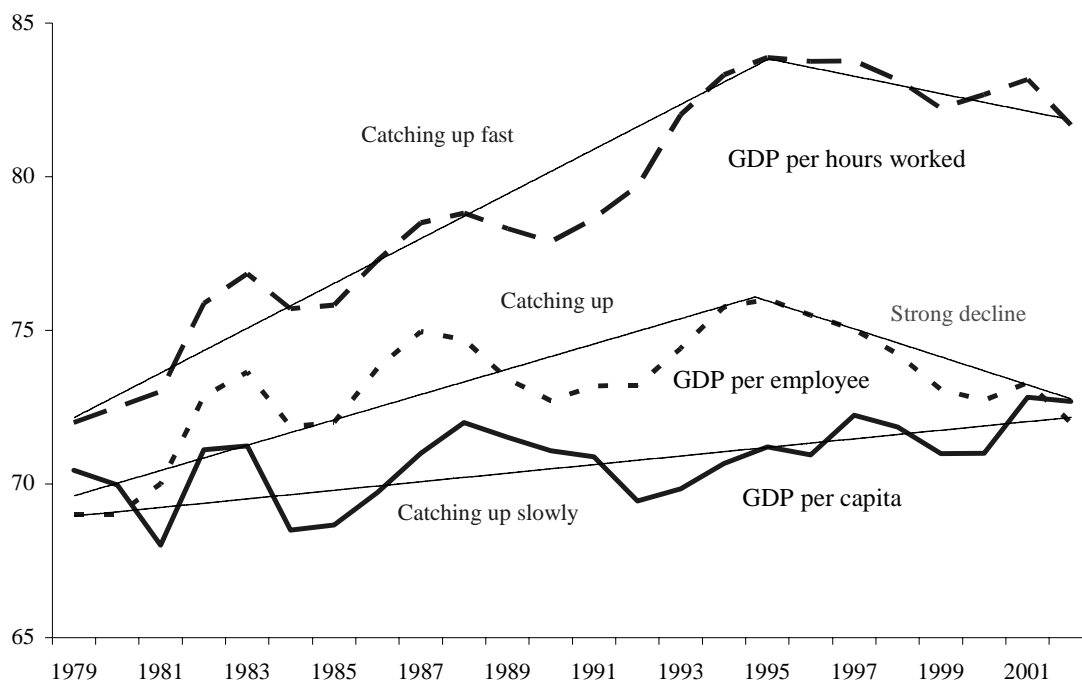
United Kingdom's productivity level leads versus Europe. It has stabilised its situation as far as GDP per capita is concerned and improved its productivity performance relative to the total EU while at the same time increasing the employment rate.

United Kingdom

United Kingdom was the only large European country failing to converge to US productivity levels in the long run and has lost its early per capita income lead to European countries. This relative economic decline in GDP per capita has stopped, at GDP per capita now equal to the average of the EU. It reduced its lag to the US in hourly productivity in the first half of the 1990s, and did not lose much in the second half. However per hour productivity is now 17 % lower than in the EU average (see Table 1.5). Since the employment rate is 7 % higher than on

EU average, the UK is the example of a high employment/low productivity country. High investment in ICT helped to prevent a further decline in the relative position and to boost investment in the service sector.¹³

Figure 1.11: UK GDP per Capita, per employed person and per hours worked (US=100)



Source: CEPII and NIESR calculations using data from Groningen Growth and Development Centre.

Netherlands¹⁴

Netherlands succeeded in reducing its unemployment keeping a rather generous welfare system and favouring part-time work.

In 1982, the Dutch rate of unemployment stood at close to 11 %, it has declined since then to 2.1 % in the year 2001. Hourly productivity had been 45% above the EU average in the early

¹³ If we go into some details we see that the UK was able to increase its number of independent workers between 1980 and 1990 by 1,500,000 and its non-specified workers by 500,000 but were later (2001) reduced by 600,000. In the 1990s unemployment trended downwards to rates not seen since the mid 1970s, reaching a level of just over 1 million persons in 1999. Recent research suggests a wide range of factors have contributed to this decline. These include moderate wage growth in the 1990s, the decline in trade union power, more flexible labour markets and changes to the benefit administration system (Riley and Young, 2001 Riley, R. and Young, G. (2001), "The Macroeconomic Impact of the New Deal for Young People", National Institute of Economic and Social Research Discussion paper No. 184, August.

1980s and is now only 14 % higher. During the same period GDP per capita remained at 15 % above the EU average level. These evolutions are clearly the result of long-term economic policy to increase employment while maintaining a high standard of living of its population. In fact we must add that the number of working age population was growing faster than in average EU and the ratio of employed persons to the working age population was comparable to the British levels. One of the major reasons for the success was the very rapid development of part-time jobs. Adopting international standards, the level of part-time employment is twice the average level in OECD countries.¹⁵ The policy choice in Netherlands was to increase the employment rate by encouraging part-time work, the productivity lead per worker was lost, but productivity per hour remained well above average, as did per capita income. ICT had an important role in increasing output (see Aiginger, 2003).

France

France, one of the most regulated countries, tried to impose shorter working hours and reducing the cost of employing low wage earners

Up to the mid 1990s there has been for 25 years an almost constant increase in unemployment: from less than three percent in the late 1960s towards 12.7 % in 1996. The productivity per hour increased rather fast, the increase of 3 % per year during 1979-1989 was 0.5 % higher than the GDP growth rate. Together with a population increase of 0.5 % per year unemployment went up, specifically for young and less qualified people and older workers. The activity rate of people aged between 15 and 24 was 29.9 % in France in the year 2001; compare to 61.1 % in the United Kingdom and 73.6 % in the Netherlands. Wages were higher than in the Netherlands, though productivity was lower. The spread was due to the exceptional rise in social security charges during the first half of the 1980s. In the Netherlands authorities have cut public spending especially the salary of government employees and the size of the social benefits.

¹⁴ Sébastien (2000).

¹⁵ What is more if we compare the 1990/1995 period with the 1996/2002 period we see that the GDP growth rate increase by 0.4 while hourly productivity rate decreases by 1.2 percentage points, this is not the usual relation à la Kaldor-Verdoorn where it is assumed that when the rate of economic growth increases there are scale economy effects and so productivity increases. Among the factors that explain this exceptional evolution is a mix of long term commitment of the policies, decentralised negotiations with the social partners, including wage restraint, currency adjustment at the beginning (1982) to correct for overvaluation. There is probably room left to go on with the process as there is still a low rate of employment for aged women, possibility to offer full-time jobs for those willing to do so, reduce number of disabled people and to bring them back into the labour force.

*Table 1.12: Increasing the labour content of growth
France: (1987-1999)*

Three years cumulated, thousands

	1987-1989	1997-1999	Difference
Non farm employment (salaries) : natural evolution	649	603	-46
+ Part time effect	40	50	10
+ Reducing working hours	0	67	67
+ Social contribution alleviation	0	106	106
+ Special measures	24	6	-18
= Real evolution (total above)	713	832	119
+ Self employment	11	27	16
+ Farm job	-172	-50	122
+ Non market jobs (helped)	-56	98	154
(Special young employment)	(-)	(170)	(170)
+ Non market jobs	243	164	-79
Total civil employment	739	1071	332

Source: DARES.

The situation was characterised by high productivity per hour and low employment (or an implicit "preference for unemployment"). This came to an end in the mid-1990s when the government undertook several measures notably in reducing the legal duration of work and in lowering the indirect cost on low wages. Several studies demonstrate that a one percent decrease in the labour cost of low wage earners raises the employment by one per cent¹⁶. In 2001 France is in per capita GDP 2 % above the EU average, having a high productivity per worker of 9 % and per hour even of 17 %.

1.4.4 The trade off between working hours and per capita income

Per capita income is about 40 % higher in the US than in the EU, much larger than the productivity difference. We have shown in section 2 that this is not due to different age structure. The smaller share of the difference comes from the lower employment rate and the larger part from lower working hours per worker. In the historical perspectives these differences have evolved relatively late, since Europe had longer working hours per person and higher employment rates than the US not too long ago. Reduction in the working time had been a policy goal of trade unions and enjoyed rather broad support in ruling political parties in Europe. Reducing the employment rate of course was never a goal, but a partially accepted consequence of longer education, early retirement and disability schemes.¹⁷

¹⁶ L'Horty (2000).

¹⁷ Special issue of "Economie Internationale", OECD (2000).

Differences in labour participation, as well as differences in working hours per year can come both from the supply side, as well as from the demand side. People might be willing to work a longer part of their life, but do not find adequate employment and stay out of the labour market (discouraged workers). Along the same line people working less hours may either be driven by the demand for leisure, family responsibilities, cultural interest or accept part-time work as a substitute for insufficient full-time employment opportunities. The institutional settings of labour relations and working arrangements, as well as cultural background and tradition play a large role, as well as the educational system, the steepness of wage schemes with experience and tenure and institutions for child rearing.

In the long run the reduction of working time in Europe was a result of negotiated contracts or laws, which introduced maximal working hours and longer holidays for full-time workers. In more recent years it is the consequence of the increase in part-time work, and flexible work contracts. A further reduction of working time in Japan and France were legal decisions, while reduction in working time in Germany and the Netherlands was the result of intensive discussions with the trade unions. In Sweden, working time increased due to increasing working hours for the part-time workers, in the US due to increasing overtime hours.

Part-time work is now the main source of the increase in labour participation and job creation in Europe. Part-time jobs are nevertheless considered widely¹⁸ as low quality jobs: wages are lower, as are possibilities to benefit from professional retraining are lower, it is often difficult to change from a part-time work to a full-time work. These factors indicate that part-time work is not always voluntary. Table 1-4-3 shows that a large majority of workers would choose to work more, if possible (on average between 62 % or 56 % for the years 1985 and 1994). Only between 31 % and 38 % of the respondents would choose to work less and have reduced incomes. But these data also show that between 1985 and 1994 the opinions seems to shift in favour of more leisure (except for the poorer countries such as Spain and Greece, but not for Portugal).

Nevertheless it seems that a majority of women working part-time are voluntarily doing so and are more satisfied than full-time workers, and more women want to have access to part-

¹⁸ There is however also a segment of high qualified part-time jobs.

timework¹⁹. It seems that the quality of life and the possibility to have time for their children is to some extent acceptable at the price of a reduced income. And increasingly both partners of a family want some kind of reduction of working time during specific phases of their life cycle. Several countries try to distribute part-time jobs more equally between male and female workers, encouraging male workers to take part in the maternal/paternal leave or to share the reduction in working time. If part-time work became more of a one choice out of several possibilities or even a kind of "normality" and if it would not be confined to lower paid jobs, career opportunities and income expectations would not suffer after short part-time periods.

There are some indicators that lead us to believe that there are differences in preferences between the US and Europe. There is no strong popular support, if any, in the US to shorten working weeks or to increase holidays, while in Europe trade unions had for a long time strong support in their negotiations for longer holidays and shorter working hours. If trade unions or labour councils have accepted shorter working hours in exchange for lower wage increases or if employees accept an absolute wage cut in times of competitive pressure, this implicitly reveals a maintained preference for leisure (the price of additional leisure is revealed to be above zero). Evidence for more leisure is also revealed if workers voluntarily agree to switch from full-time contracts to part-time contracts, and if trade unions negotiated the right for reduction of work time for full-time employees (dependent on firm size and restricted by imminent demands of firms, see the legal possibility to switch to part-time in the Netherlands, Visser, 2002)²⁰.

On the other hand there is evidence, that the lower employment rate is not always voluntary. First and foremost the high unemployment rates in several countries clearly indicate an involuntary shortage in labour demand. The popularity of long-term contracts and labour clauses, which restrict dismissals, also indicate labour shortage. A third indicator is that some proportion of part-time employees would prefer full-time work (see Table 1.13). Institutional settings giving part-time employees a priority in switching to full-time jobs (at the cost of outsiders), again indicate unsatisfied demand for full-time jobs.²¹

¹⁹ Effective demand is of course contingent on the set of alternatives and circumstances, in the case of female workers labour demand depends additionally on absolute wage, on gender differences in wages, on wage, institutions for child rearing and distribution of family obligations across gender lines.

²⁰ Visser (2000) calls the Netherlands "the first part-time economy in the world" and the current status as "one-and-a-half earner model". He describes how reluctant trade unions and representative of women right organisations had first seen part-time work and then changed there attitude:

²¹ Gordon raises the question whether "...Italian men who retire early or housewives sitting at home...doing this because they chose to, or because the economy or society do not provide sufficiently rewarding jobs for them" and

Table 1.13: Effective working hours and leisure /income trade off, European Union, 1985 et 1994a

	% salaries who prefer :						Average annual hours worked by salaries		
	Work more			Work less			1985	1994	Ratio 1994/1985
	1985	1994	Ratio 1994/1985	1985	1994	Ratio 1994/1985			
Belgium	58	48	0.83	36	40	1.11	1 643	1 603	0.98
Denmark	38	32	0.84	51	66	1.29	1 586	1 568	0.99
Germany	56	54	0.96	30	34	1.13	1 674	1 590	0.95
Greece	68	84	1.24	26	14	0.54	1 803	1 803	1.00
Spain	64	70	1.09	31	24	0.77	...	1 741	...
France	62	53	0.85	34	40	1.18	1 696	1 670	0.99
Ireland	78	59	0.76	19	37	1.95	1 815	1 747	0.96
Italy	55	54	0.98	39	39	1.00	1 710	1 682	0.98
Netherlands	46	43	0.93	47	52	1.11	1 654	1 447	0.87
Portugal	82	58	0.71	11	35	3.18	1 871b	1 847	0.99
United	77	62	0.81	19	32	1.68	1 684	1 683	1.00
Unweighted Average	62	56	0.90	31	38	1.20	1 696	1 671	0.99
...	Non-available.								
(a)	Data are only for those who make a choice.								
(b)	1986.								

Sources: CEPII calculations using Commission européenne (1986,1995a) and EUROSTAT.

1.4.5 Reducing the total cost of low wage earners

Many countries have started to reduce the cost of low wage earners; there are three main reasons that can explain the high unemployment rate of low skilled workers. First the information revolution tended to be technologically biased in favour of qualified workers, second industries intensive in low qualified work such as clothing, toys, small electronic devices etc. are dramatically reducing their production capacity in favour of newly

answers with the wild guess, that one third of the difference represents voluntary chosen leisure and two thirds represent lack of employment opportunities. The consequence is that a welfare corrected efficiency of Europe in relation to US in 2000 is "neither 77 % nor 93 %, but something closer to 85 %". His perspective is the very long development, and he describes that Europe lost its per capita gain vs. the US in the second half of the 10th century and "has not caught up after 130 years of falling behind the American frontier". Gordon (2002, pp. 10ff).

industrialised countries, thirdly the total cost of labour may be too high even in domestic sectors (such as personal services, restoration and hotel, retail trade, etc.) sectors. So the two solutions are to invest in education so as to reduce the number of non-qualified workers entering the market, with the other solution being to reduce the cost of hiring low qualified people. Some countries have been very active in that direction as can be seen in the Table 1.14.

Table 1.14: Total tax wedge in % of low wage

	1996	1997	1998	1999	2000	2001	Change
Belgium	50.5	49.5	51.1	51	49.9	49.1	-1.4
Denmark	41.3	41.7	40.4	41.3	41.2	41.1	-0.2
Germany	46.5	47.7	47.5	47	46.5	45.4	-1.1
Greece	34.9	35	35.1	34.3	34.3	34.3	-0.6
Spain	34.4	34.8	35.1	32.6	32.8	33.3	-1.1
France	44.3	41.6	42.5	40.3	39.6	38.4	-5.9
Ireland	26.5	24.9	23.4	21.5	18.1	17.3	-9.2
Italy	48.3	48.8	44.4	44.1	43.3	42.9	-5.4
Luxembourg	29.1	29.7	28.9	29.5	30.4	28.8	-0.3
Netherlands	39.3	38.8	39.2	40.2	40.6	36.8	-2.5
Austria	41	41.1	41.5	41.6	40.1	39.9	-1.1
Portugal	30.6	30.8	30.7	30.2	30.4	29.6	-1
Finland	44.4	44.2	44	42.6	42.4	40.9	-3.5
Sweden	48.6	49.2	49.3	48.7	47.9	47	-1.6
United-Kingdom	26.8	28.4	28.5	25.8	25.3	24.8	-2
EU	40.6	40.8	40.3	39.1	38.6	37.8	-2.8
Japan	18.4	19.4	17.7	23.1	23.1	23.2	4.8
USA	29.2	29.2	29.1	29.2	29	27.7	-1.5

Source: EUROSTAT 2003.

Ireland although having one of the lowest tax burden reduced the cost tax wedge²² by 9 %, second came France (5.9 %) as already mentioned, Italy (-5.4 %), Finland (-3.5 %), the Netherlands(-2.5 %), United Kingdom (-2.0 %), etc.

The issue of reducing the employer's social security contribution has been discussed at length²³ in a recent study. It concludes that a reduction in employer's social security contribution can only have significant employment effects if they effectively reduce labour costs. The reason being that the government has to finance the loss of contribution, it can do it through an increase in value added tax or an environmental tax, which lowers the positive effect of the

²² Tax wedge is the difference between labour cost for the firm and net income for the employee.

²³ Burggraeve, Du Caju (2003).

reduction of the tax on low wages. But if these measures are accompanied by wage moderation then a net positive effect will be given.

Another aspect of the reduction of low qualified labour cost is that it will increase the number of low qualified people employed and therefore it will reduce the gains in productivity because of the growth of low productivity sectors such as retailing, restoration etc²⁴. So once again a relative decrease in productivity is not the problem.

1.4.6 Conclusions

There are large differences in productivity, income, and working hours in developed economies and even within the European Union. And there are choices between higher income and less working hours, which are driven partly by preferences partly by policy restraints as to cope with unemployment. Facilitating part-time work has successfully been used to make labour more flexible and to increase the employment rate. Part-time work is for some people even preferred to full-time work, for others it is involuntary and limits earnings and upward mobility. Reducing the labour costs of low qualified workers, or limiting wage increases are other strategies to increase employment and the employment content of growth. Raising incomes can finally be achieved only by techniques that increase the long-term growth potential of an economy. This is done by removing growth barriers and investing in the future i.e. innovation, education and diffusion of new technologies. Each European country is facing a unique combination of structural constraints; some countries seem to be on track to increase productivity and employment.

The Lisbon strategy sets the goals for the EU of becoming the most competitive economy, to increase the employment rate up to 70 % by 2010 and to boost real GDP growth up to 3 % per year. This strategy implicitly limits the scope for policies to substitute leisure for income and to focus on defensive strategies. An employment target underlines that part of the current low employment rate is involuntary; and it furthermore assumes that increasing labour supply will result in higher output, and not in higher unemployment nor in lower working hours. Becoming the most competitive economy implies a strategy to reduce existing barriers to growth and to encourage activities that increase the long-term growth path, like research, human capital and diffusion of new technologies.

²⁴ Carnot, Quinet (2000).

1.5 Summary and conclusions

The European Union is currently experiencing a slow growth period, with three years of about 1 % growth per year, and several countries on the brink of recession. Relative to other slow growth periods, employment is surprisingly robust. 2.6 million jobs have been added in 2001 and 2002 together, and in 2003 employment is again expected to rise. A large share of the new jobs are part-time, with hours per worker decreasing by ½ %. The other side of the ability to create jobs in a slow growth period is the low increase in productivity. In the past two years productivity per worker increased by half a percentage point, and per hour productivity consequently by 0.9 % p.a.

US productivity growth maintains a positive differential with Europe in a slow growth period

Growth in the US had been lower than Europe's in 2001, but higher in 2002, therefore on average about the same as European growth. It is higher in 2003 and predictions for the next year are higher as well. This development is remarkable since US growth had been higher in the last decade (by more than 1 % p.a.) and since the downturn had started after a ten year period of prosperity, in which overinvestment in ICT (or the "new economy" in general) and a collapsing bubble in the US-stock prices are among the causes for the downturn. Specifically productivity per worker is increasing in the US even during the slow growth period by 1.6 % p.a. (per worker and per hour). This adds to the experience from the second half of the 1990s, in which productivity had accelerated in the US and decelerated in Europe. The difference in output accumulates now for the seven years since 1995 to 8 %. The difference in productivity growth amounts to 9 % per worker and 4.5 % per hour.

Out of the EU member countries, Ireland, Greece and Spain had considerably higher growth in the most recent years. Specifically low is the German growth. In the second half of the 1990s growth had accelerated to 2.7 %, and growth acceleration occurred in all member countries except Germany. However, only Finland, Ireland and Luxembourg had growth rates higher than the US. Ireland, Greece, Finland, Austria, Belgium, Portugal, and Luxembourg surpassed US gains also in productivity (per hour) in the period from 1995 to 2002.

ICT contribution to productivity half a percentage point higher per year

The annual average contribution of ICT to productivity growth in the 1990s is calculated to be 0.8 % in the US and 0.5 % in Europe. It accelerated from 0.4 % in the first half of the 1990s to

0.6 % in the second. However, the contribution of ICT to productivity growth increased even faster in the US, namely from 0.6 % to 1.1 %. This demonstrates a difference of 0.5 % p.a. in ICT impact on the growth of labour productivity per hour in the second half of the 1990s. Out of the total increase in labour productivity (per hour) 43 % in Europe and 52 % in the US can be attributed to ICT. Out of the productivity acceleration in the US, about two-thirds are ICT-related. The ICT contribution consists of two components. Firstly, ICT enforces capital deepening (this part is measured by the investments in ICT). Secondly, ICT contributes to higher total factor productivity (measured as productivity increase – after taking investment and labour input into account - in the ICT producing sectors). In Europe, as well as in the US, the first is the larger component. The contribution of ICT investment in the acceleration of labour productivity is largest in Ireland and Sweden; the smallest contribution to acceleration is seen in Portugal, Germany and Italy (with no contribution to the acceleration in Spain).

Catching up in productivity stopped or reversed

The insufficient productivity growth in Europe over the last decade is important since it stopped or reversed a decade long catching-up process in European productivity. The extent of the absolute difference in productivity is assessed in depth in this report, specifically since different assessments had been published in the past, including data in which the EU had a higher per-hour productivity than the US. The best estimate for the current difference in per capita income between the US and Europe is about 40 %, with a corresponding difference in per-worker output of 27 %, and a difference in per-hour productivity of 7 %. Previous estimates or data, which show Europe as leading in per-hour productivity, have not used consistent data for output per worker and hours per worker.

Large difference in income, small but significant in per hour productivity

The largest component determining the strikingly large income difference (GDP/capita at purchasing power parity) is the higher rate of labour utilisation in the US compared with Europe. The second component is the shorter working hours per person. Differences in age structure do not play a decisive role. As far as convergence is concerned there is surprisingly low convergence in per-capita income, and the difference of about 40 % is stable over decades. Production per worker did converge over the past decades slowly but steadily. This convergence stopped in the 1990s and the US increased its lead in the seven most recent years. Cyclical stability, as well as higher investment or higher efficiency in growth drivers like research, education and the rapid diffusion of new technologies seem to have reinforced the

leading US position. Employment rates have been increasing in the US over more than two decades. The US overtook Europe in this indicator in 1978. The US then gained a 12 % higher employment rate in 1997, a difference which has now decreased to 8 percentage points, as the EU is approaching its employment rate target of 67 % by 2005 (the employment rate in 2002 is 66 %).

Differences in European countries as to productivity levels, change and overall performance

For productivity per hour Europe was catching up fast up by 1995. Several European countries seem to have reached the US level in the beginning of the 1990s. The EU on average was lagging in 2001 by 7% and this lag had increased in the second half of the 1990s. Countries with considerably higher productivity per hour are Belgium, Luxembourg, France, Ireland and the Netherlands; Germany, Italy, Denmark and Austria are slightly above or approximately even with the US. Out of these countries Belgium and Austria increased productivity per hour stronger than the US in the second half of the 1990s.

Performance across European countries differed in the 1990s. The only country that increased productivity and employment faster than the US was Ireland. It surpassed the EU average in GDP per head and per hour, but is still below average in Net National Product and in wages per head. Out of the countries catching up, Greece and Portugal enjoy above-average growth. Among the countries with medium or high income, the performance of Sweden, Finland, the Netherlands and Denmark can be considered as especially successful (in terms of macro-economic performance), despite high wages and comprehensive welfare systems. The strategy of these countries - aside from fiscal prudence and reforming of institutions - has been to enforce education, research and the diffusion of new technologies, being the main elements of the Lisbon strategy. However, even within this group there are different strategies and unsolved policy issues: the Netherlands enforce part-time work, Sweden and Finland enjoyed the ICT revolution, with the latter still having a rather high unemployment rate, and Denmark enjoys high productivity and excels in the use of ICT. Out of the larger countries, only for the United Kingdom has the contribution of ICT to productivity growth been large. The United Kingdom overcame decades of below-average productivity growth. The productivity level in the United Kingdom is lower, and employment is higher than in the European average. France did spread employment by reducing working hours; it has a high level of productivity, but only slightly above average per capita income. Germany did not close its gap in high-technology sectors, as

restrictive macro-economic policy and insufficient structural reforms, all together resulted in the lowest growth rate of the member countries.

There are many choices; the final target is higher growth and employment

There are remarkably large and persistent differences in productivity, income, and working hours between the EU and US and even within the European Union itself. They may partly reflect choices between higher income and more leisure. For the other part, they reflect constraints in labour supply or are the consequence of policies to cope with competitiveness on the firm level or with unemployment on the national level. Facilitating part-time work has successfully been used to make labour more flexible and to increase the employment rate. Part-time work is for some people even preferred to full-time work, for others it is involuntary and limits earnings and upward mobility. Reducing the labour costs of low qualified workers, or limiting wage increases are other strategies to increase employment and the employment content of growth. Raising incomes can finally be achieved only by techniques that increase the long-term growth potential of an economy. This is done by removing growth barriers and investing in the future i.e. innovation, education and diffusion of new technologies. Each European country is facing a unique combination of structural constraints; some countries seem to be on track to increase productivity and employment.

The Lisbon strategy sets the goal of becoming the most competitive economy, to increase the employment rate to 70 % and to boost real GDP growth up to 3 % per year. This strategy limits – at first glance - the scope for policies to substitute leisure for income and to focus on defensive strategies. At the second glance, it is an attempt to embark on an autonomous growth path with higher GDP and productivity growth and thus creating room for manoeuvre. Becoming the most competitive economy implies reducing existing barriers to growth and encouraging activities that increase the long-term growth path, such as research, education and diffusion of new technologies. A precondition for this approach - as demonstrated by some of the smaller countries in the European Union – is to foster innovation in all policy areas thus retaining flexibility for policies in a changing environment.

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Appendix 1: The role of human capital

A specific emphasis is given in recent years to estimating the importance of human capital for growth. This comes first from the importance of human capital in recent models of growth, secondly from better data available for cross-country comparisons and thirdly from the central role human capital has for other growth determinants (research as well as ICT diffusion or biotechnology needs qualified workers). For a broad survey of the literature on growth and education including labour economics and social capital see Temple (2000). DSTI 2003 enumerates nine indicators on human capital available for at least 18 countries in a rather comparable way. OECD (2003) presents the latest and most comprehensive estimates of the effect of human capital on productivity growth.

Evidence of the effect of education on growth comes from four

sources: labour economics, growth accounting, growth regressions, and estimates on externalities. Labour economics estimate the effect by regressing wages on an indicator on education, usually the years of schooling, work experience and other variables. The coefficients on educational attainment find that wages increase between 5 % and 15 % per year spent at school (Temple, 2000, p. 9). The results are relatively robust, but there are objections that education might not increase productivity, but be valued only as a signal for innate abilities. Growth accounting divides output growth into components explained by input growth and a residual reflecting efficiency and technology changes. Input is divided into quantity and quality, where quality of labour is measured by the change in employment at each level of schooling. The latter should be evaluated by their marginal productivity, which is proxied by the mean income associated with each schooling level. This approach usually leads to about one half a percentage point explained by labour quality, or if we relate it to growth of productivity of about one tenth to one fifth of productivity growth. See Jorgenson, Gollop, Fraumeni (1987) for a rather historic study, Jorgenson and Yip (1999) for a more recent evaluation, Englander and Gurney (1994) for a survey and Temple (2000) for a comprehensive overview. OECD (2003) is the most recent evidence. Growth regressions finally add a human capital variable into a production function. This is an important step from asserting the importance of inputs by their presence, towards explanation with a certain degree of confidence into the causality. The seminal study of Mankiw, Romer and Weil (1992) presented results that if human capital investment (in percentage of GDP) increases by one tenth, output per worker will increase by 6 %, with stronger boosts in education resulting in even higher (implausible) surges in productivity. Other studies use shares of secondary and tertiary workers in GDP (Gemell,

1996), which are nearer to output indicators of the education system, but still do not include differences in the quality of education across countries. Hanushek and Kim (1995) overcame this by taking international tests of cognitive skills in mathematics and science. Over the time the evidence on the importance of human capital has improved, brought about by better econometrics, as well as better data.

DSTI (2003) gives an overview of nine indicators on educational levels available for a broad range of countries. Four indicators refer to educational attainment, measuring the highest level of education completed by an adult as defined by the International Standard Classification of Education (ISCED). The *percentage of the labour force with tertiary education* in 2001 was highest in Canada, Ireland, and the United States, followed by a group of countries composed of Finland, Japan, Sweden, Belgium and Australia. The *ratio of science, engineering and health PhDs per population aged 25 to 34 years* in 1999 was highest in Switzerland, Sweden, Germany, Finland, the United Kingdom and France. A related indicator, the *ratio of PhDs in all fields per population aged 25 to 34 years* in 1999, was also highest in Switzerland, Sweden, Germany and Finland. The *average years of education in the population* in 2000 were highest in Australia, Sweden, the United Kingdom, Belgium and Finland. This indicator is related to the expected years of schooling under current conditions, excluding for children under the age of five.

The stock of labour force skills is measured here by three indicators. The *number of researches per 10,000 labour force* in 1999 was highest in Finland, Iceland, Sweden, the United States and Norway. Overall, approximately 3.2 million researchers are engaged in R&D activities in the OECD area. The *percentage of labour force in high-skilled jobs* in 2001 was highest in the United States, Belgium, Finland and the Netherlands, followed by Sweden, Switzerland, Luxembourg, Canada, The United Kingdom, Denmark and Iceland. Data are taken from the European Community Labour Force Survey (CLFS) for the European countries and from national labour force surveys for the United States and Canada. The *percentage of high-skilled jobs filled by persons with tertiary education* in 2001 was highest in Greece, Spain, Belgium, Norway, Canada, the United States, and the United Kingdom.

Measures of training and life-long learning are published in the annual publication *Education at a Glance*. The two selected indicators show: the *participation rates in continuous education and training* were highest in Denmark, Finland, Sweden, the United States, Norway, New Zealand and the United Kingdom. Continuing education and training activities include courses, private lessons, correspondence courses, workshops, on-the-job training, apprenticeship

training, arts, crafts, recreation courses and any other organised and sustained education. The *adult share of formal educational enrolments* in 1998 was by far highest in Australia, followed by the United Kingdom, Sweden and New Zealand. This indicator describes how the formal education system accommodates the learning needs of adults.

These indicators show a rather mixed picture. Also it is important to distinguish between the flow of persons out of education and the stock of qualified persons in the workforce. Thus the UK performs relatively well in flow indicators, given recent expansion of the education system in that country, but remains in a poor relative position using stock measures. At best we can conclude that the evidence is clear of a positive impact of human capital on growth, but considerable research is still needed before we can identify which countries have a significant skill shortfall which could act as a break on productivity growth.

Appendix 2.1: Countries with high and accelerating growth in labour productivity

Growth rate of 1995-2000, less 1995-1995

Growth contribution in percentage points 1990-1995

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Finland	0.23	0.84	1.23	2.29	0.19
Ireland	0.21	0.43	2.96	3.61	0.07
Austria	0.21	1.03	0.44	1.69	0.48
France	0.21	1.11	0.06	1.38	3.5
Sweden	0.25	0.61	1.00	1.86	0.25

Growth contribution in percentage points 1995-2000

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Finland	0.33	-0.22	3.18	3.29	0.10
Ireland	0.68	0.93	4.27	5.88	0.16
Austria	0.37	1.06	1.63	3.06	0.23
France	0.32	0.33	0.70	1.35	0.46
Sweden	0.50	0.50	0.96	1.96	0.52

Acceleration in growth contribution

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Finland	+0.10	-1.06	+1.95	+1.00	-0.08
Ireland	+0.47	+0.50	+1.31	+2.28	+0.09
Austria	+0.16	+0.03	+1.21	+1.37	-0.25
France	+0.11	-0.78	+0.64	-0.03	-3.04
Sweden	+0.25	-0.11	-0.04	+0.10	+0.27

Source : Van Ark (2003).

Appendix 2.2: Countries with deceleration in productivity per hour

Growth rate of 2000-1995, less 1995-1990

Growth contribution in percentage points 1990-1995

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Netherlands	0.30	0.30	0.43	1.03	0.70
Denmark	0.25	0.70	1.61	2.55	0.16
United Kingdom	0.36	0.88	1.41	2.65	0.26
Portugal	0.28	1.88	1.36	3.52	0.21
Germany	0.33	1.18	1.36	2.87	0.24
Italy	0.29	1.09	1.62	3.00	0.18
Spain	0.20	1.11	0.98	2.29	0.20

Growth contribution in percentage points 1995-2000

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Netherlands	0.55	-0.35	0.21	0.41	2.62
Denmark	0.41	0.71	0.72	1.84	0.57
United Kingdom	0.65	0.62	0.49	1.76	1.33
Portugal	0.30	1.27	0.92	2.49	0.33
Germany	0.37	0.48	0.91	1.76	0.41
Italy	0.38	0.49	0.25	1.13	1.52
Spain	0.17	0.19	-0.14	0.22	-1.21

Acceleration in growth contribution

	ICT investment	Non ICT investment	Total factor productivity	Labour productivity	ICT share in total factor productivity
Netherlands	+0.15	-0.65	-0.22	-0.62	+1.92
Denmark	+0.16	+0.01	-0.89	-0.71	+0.41
United Kingdom	+0.29	-0.26	-0.92	-0.89	+1.07
Portugal	+0.02	-0.61	-0.44	-1.03	+0.12
Germany	+0.04	-0.70	-0.45	-1.15	+0.16
Italy	+0.09	-0.60	-1.37	-1.87	+1.34
Spain	-0.03	-0.92	-1.12	-2.07	-1.42

Source : Van Ark (2003).