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NEW FRONTIERS IN EUROPEAN RTD-POLICY – A RESPONSE TO EUROPE´S DISAPPOINTING GROWTH PERFORMANCE?

A REPORT FOR THE „SIX COUNTRIES PROGRAMME ON INNOVATION"

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A REPORT FOR THE ‚SIX COUNTRIES PROGRAMME ON INNOVATION'

Commissioned by the Federal Ministry of Economics and Labour, Six Country Programme

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1 Introduction

In October 2003, 30th and 31st, the 'Six Countries Programme on Innovation' held a Conference titled "Crossing Borders – Venturing into the European Research Area" in Sopron/Ödenburg (Hungary) and Eisenstadt/Kismarton (Austria). This report is based on the background papers prepared for that conference and summarizes the main strands of discussions. Further it takes up recent debates on the developments in Europe with respect to research and technological development especially in the context of the Barcelona/Lisbon targets.

Today, there is an intensifying debate going on about the perceived poor performance regarding economic and technological matters in Europe. Economic growth in Europe during the last years was nothing but disappointing especially if compared to the US which set an impressive record during the "new economy" boom in the mid and late nineties. After the post bubble recession, the US has been able to regain a growth path which is considerable higher than the respective growth prospects in Europe.

In 2000 the European Union responded with the installation of the Lisbon process to set off again a sustained catching up process towards the leading US. A central theme of the Lisbon process is to enhance the scientific and technological competitiveness of the EU. Simultaneously the integration of the new EU member countries into an emerging European Research Area is a tremendous challenge. It is hoped, that an integrated European Research Area may enhance the scientific and technological capability and efficiency and thus enhance the long run growth potential of Europe.

The aim of this report is to give an overview of this debate and to review some results achieved so far. Chapter 2 starts with a discussion of the relative growth performance of Europe versus the US showing that the successful catching up process came to a halt almost abruptly during the 90ies. Since one of the causes of the growth 'miracle' in the US in the 90ies has been the boom of ICT, a short discussion of this investment-led boom follows in chapter 3. As a response the EU started a process to enhance the economic and technological competitiveness (Lisbon process). An overview of the ambitious aims of the Lisbon-process is given in chapter 4. The strategic aim of an integrated European Research Area is discussed in chapter 5 followed by an overview of the achievements of the new member states concerning their transformation of their innovation systems and integration into the institutions of the EU research and technology policy (chapter 6). Chapter 7 gives a summary of the aforementioned congress, organised by Joanneum Research and the Austrian Federal Ministry of Economics and Labour on the theme of European enlargement and technology policy. In chapter 8 some major concluding remarks are presented.

2 „Good Old Europe stalling?“ – Halt or Pause of the European Catching up Process vis a vis the US?

Europe entered the 90ies with great expectations. After the realisation of the internal market a new round of enlargement by a number of rich, high developed countries (Austria and the Nordic states Sweden and Finland) was in preparation. The first steps towards a monetary union were introduced and the economic transformation of the former centralized planning economies in Eastern Europe promised new markets as well as new opportunities for a deeper division of labour within Europe. At the same time, the spirits in the US were almost totally different. Stuck in a severe recession with stagnant incomes and rising unemployment, Paul Krugman (1992) summarized the American situation as "*The Age of Diminished Expectations*".

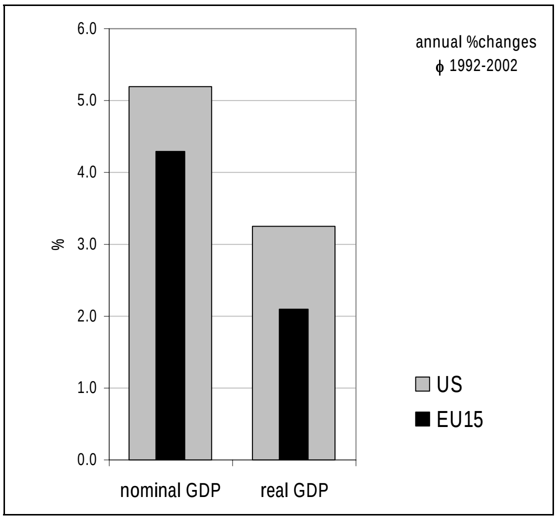
However, during the 90ies the situation changed dramatically. The high expectations in Europe ceased with year after year of disappointing growth and growing unemployment. In the same time in the US, the recession of the early 90ies was replaced by the longest boom in the US post war history. Hence, the debate of a possible Euro-sclerosis stressing severe structural problems of the European economy was resurrected[1].

2.1. SOME REMARKS ON EUROPE'S DISAPPOINTING GROWTH PERFORMANCE

Why did the US, a country already in the lead in terms of GDP per capita, appear to find a new gear in the 90's that allowed it to forge further ahead of some major EU economies? Figure 1 shows average economic growth rates between 1992 and 2002 for the US and for the European Union in its 1995-manifestation.[2] At +2.10 %, Europe's average annual growth rate of real GDP is appreciably (more than a third) smaller than the US-rate of +3.25 % (in nominal terms, the gap is relatively smaller). Although the two numbers are not strictly comparable due to somewhat differing accounting practices[3], this difference cannot be simply set aside as a statistical blip.

[1] See e.g. „*"Der kranke Mann Europas"* (Sinn 2003), *„Ist Deutschland noch zu retten*?" in the case of Germany, or *„La France qui tombe"* (Baverez 2003) bzw. *„Le desarroi Francais*" (Duhamel 2003) in the case of France.
[2] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
[3] For example, in the European Union, firms' purchases of software are counted as business expenditures, thereby reducing GDP. On the other hand, in the US, they are counted as GDP-neutral investment

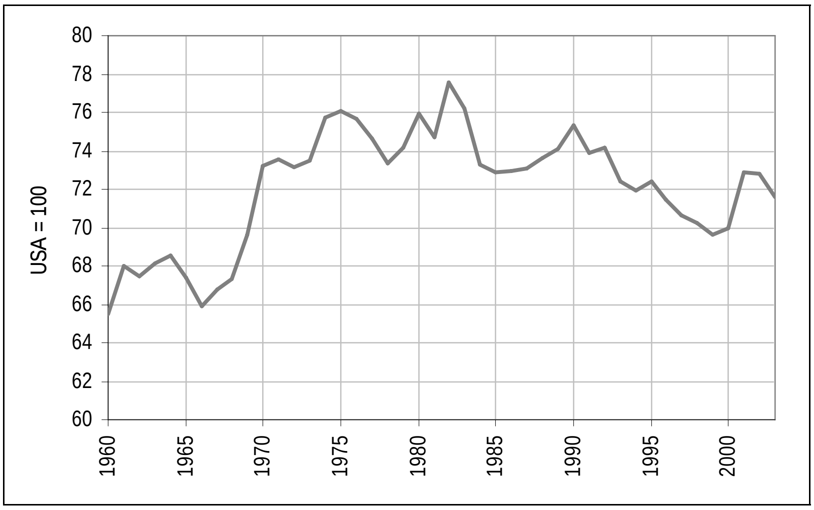
Figure 1: GDP growth EU and US, ϕ 1992-2002



Source: AMECO data base; own calculations

Figure 2 shows the development of European GDP relative to the US in the long term. After a phase of very rapid catching-up in the early post-war period, convergence at the level of GDP per capita came to an end at the beginning of the 70’s and has remained unchanged since at around 73 % of the US level (see Figure 2). This fact suggests a Europe stuck at a substantially lower standard of living than the US and, moreover, unable to catch up further. Thus even if income per person is growing at almost the same pace as in the US, Europeans are still stuck with much lower living standards than Americans.

Figure 2: GDP per capita at PPP (US=100)



Source: AMECO data base; own calculations

GDP per capita can be decomposed into two factors, which are needed to explain divergent growth patterns: labour productivity and labour utilisation. Hence,

Trend growth of GDP per capita	=	Trend growth in labour productivity	+	Change in labour utilisation

Although the links between welfare, economic output and productivity are complex in practice and theory, conceptually the idea is simple. If productivity increases, with other things remaining equal, aggregate economic welfare increases. As Paul Krugman (1992) once put it, productivity is not everything, but in the long run it is almost everything. Thus, productivity is the engine that drives rising living standards. Labour utilisation (employment rates combined with hours worked) is the other important factor in accounting for differences in the GDP per capita levels. These two factors are interrelated insofar as unemployed people of working age generally have lower education levels, and thus lower potential productivity than those who are employed. The following **Fehler! Verweisquelle konnte nicht gefunden werden.** shows the development of the two factors over time and in relation to the US.

Table 1: GDP per capita, GDP per hour worked and hours worked

	GDP per capita		GDP per hour worked		Hours worked per capita	
	1970	2000	1970	2000	1970	2000
United States	100	100	100	100	100	100
EU-15	71	70	65	91	101	77

Source: AMECO data base; own calculations

The gap, measured as GDP per capita, between the EU-15 and the US has remained roughly constant, as has been mentioned above. The next two columns however show that labour productivity, measured by GDP per hour worked, has increased much faster in Europe than in the US, from 65 % of the US in 1970 to roughly 91 % in 2000. These data are quite impressive, showing that over the period of 30 years Europe has almost caught up with US levels of output per hour. Nevertheless, Europe still remains significantly behind in output per capita. How could Europe be so productive yet so "poor"?

The last two columns, which show the hours worked per capita offer the answer: the relative hours worked per capita have decreased in roughly the same proportion as the relative EU-15 labour productivity has increased.

In other words, the decline in the number of hours worked per head of population in Europe compared to the US has compensated for the rise in relative labour productivity per hours. Hence, despite having high productivity growth rates since 1970 (the higher growth rate of labour productivity ended in the mid 1990's and has been slower than in the US since then) the lower employment rates and shorter average working hours per employee help to explain the bulk of the income gap with the US, whose labour utilisation was considerable higher.

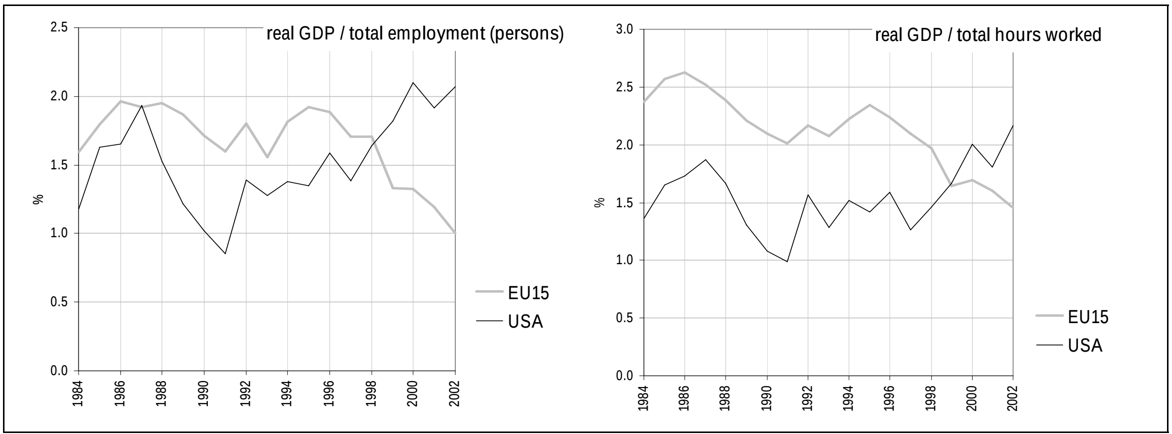
2.2. LABOUR PRODUCTIVITY: THE RECENT DEVELOPMENT

While European private sector productivity is no longer gaining ground and labour input is still shrinking, the strong performance of the US has reflected both productivity and employment growth over recent years. Productivity growth, especially, accelerated markedly over the second half of the 90's, and as of late has begun to accelerate even more rapidly.

However, as was mentioned before, history tells us another story. Statistics suggest that the average annual growth rate in labour productivity in the last two decades was higher in Europe than in the US. In the period 1979-1998 the GDP per working hour grew at an annually rate of 2.3 % in the EU compared with 1.5 % in the US. In that light, the economic performance of the EU in general does not look so bad, as until the second half of the 90's the EU productivity appeared to grow at a higher rate than the US.

But the end of the 90's marked a new trend in the labour productivity in Europe in comparison with the US: in 1999-02 the labour productivity in the EU shows an average growth rate of 1.6 % (vs. 1.9 % in the US).

Figure 3: Annual growth in total productivity, 1979-2002 (5-year moving average)



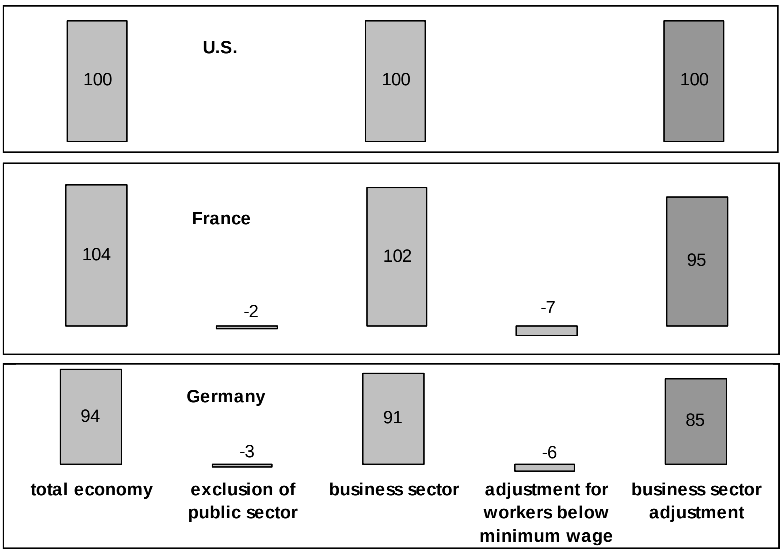
Source: AMECO; Groningen Growth and Development Centre, 60-Industry Database, http://www.ggdc.net; OECD; own calculations

A comparison of labour productivity levels simply measured as total output of the economy, i.e. GDP, divided by the total hours worked, reveal important shortcomings resulting in distortions. One has to compare issues only through excluding those biases which are hardly measurable and thus hardly comparable. Such computation was made by McKinsey (McKinsey 2002) by adjusting the figures:

- Net output created by the public sector is extremely difficult to measure. By focusing on the private business sector McKinsey excluded public administration, education, and health from the productivity measure.
- The minimum wage is typically higher in Europe than in the US. Hence, high reservation wages prevent the employment of the lowest productivity workers which result in a higher productivity of those employed. In comparing labour productivity across countries the analysis has to control for this effect.

McKinsey made the analysis for France and Germany in relation to the US. For nearly fifty years France and Germany were steadily narrowing the labour productivity gap with the US, but from the mid 90's onwards this situation reversed. US productivity grew at a faster rate than in France and Germany and this gap started to widen again. When using adjusted data the productivity gap compared with US levels, in 2000, is estimated to have been 5 % in France and 15 % in Germany.

Figure 4: Labour Productivity adjustments, 2000, GDP per hour worked, Index 100=US level



Source: McKinsey Global Institute, 2002; OECD; Groningen Growth and Development Centre, 60-Industry Database, http://www.ggdc.net

The slower growth of labour productivity within recent years is one of the explaining factors for the still existent gap in GDP per capita between the EU and the US. Still, this factor must be combined with other explaining factors, for example the labour input. These two factors in combination determine how many people earn how much money to spend. If productivity is lower and a smaller percentage of the European population is in work (and work fewer hours) than in the US, this also means that, on average, each individual in the EU earns less and has less income available to spend and save than their counterpart in the US.

2.3. CAUSE FOR A NEW EUROSCLEROSIS DEBATE?

Looking back at the past few decades, the performance of Europe has been substantially better than is typically perceived. However, it is overshadowed by the impressive growth of the US economy over the past couple of years. But over the last 25 years, productivity growth has been much faster in Europe than in the US. Productivity levels (GDP per working hour) are roughly similar today in the EU and in the US. The main difference is that Europe has used some of the increase in productivity to increase leisure time rather than income, while the US has done the opposite. It is thus mostly the expression of a preference, where most, but not all, of the fall in working hours over the past 30 years is due to a preference for more leisure opportunities as incomes have increased. Europeans simply have a higher preference for leisure than the Americans.

Moreover, the recent recovery of the US economy should not be mystified. Surely, America's stronger rebound since the global economic downturn in 2001 results out of greater flexibility in its economy, but the main explanation for America's rapid recovery is that it has enjoyed the biggest monetary and fiscal stimulus in its history. Since 2000 America's structural budget deficit has increased significantly and stands now at almost 5 % of GDP. Meanwhile, the euro area has had no net stimulus. America has a current account deficit of 5 % of GDP, while the euro area has a small surplus. American households now save less than 2 % of their disposable income, while the saving rate in the euro area stand at a comfortable 12 %. Total household debt in America amounts to 84 % of GDP, compared with only 50 % in the euro zone.

Another important caveat should be mentioned when comparing the EU with the US: the comparison of official statistics can be misleading. It is probable that one compares apples with pears simply because there are differences in the way that GDP is measured in different countries. For example, the American statistics count firms' spending on computer software as investment, so it contributes to GDP. In Europe it is generally counted as a current expense and is excluded from final output. Another example to understate Europe's growth performance relative to the US is the price deflator used to convert growth in nominal spending on information technology equipment into real terms. In the US, if a computer costs the same as two years ago, but is twice as powerful, then this is counted as a 50 % fall in price. Though logical, most of the European countries do not allow fully for improvements in computer quality.

Finally, the measure of living standard (GDP per capita) should not be mixed up with welfare. Robert Gordon (2004) has pointed out that the simple GDP comparisons overstate America's living standards, and he finds impressive arguments. R. Gordon argues that a significant fraction of GDP in the US does not improve welfare but rather involves fighting the environment, whether this need is created by nature or man-made decisions. America has to spend more than Europe on both heating and air conditioning because of its more extreme climate. This boosts GDP, but does not enhance welfare. America's higher crime rate means that more of its GDP is spent on home and business security. The cost of keeping two million people in prison, a much larger percentage of its population than in Europe, boosts America's GDP, but not its welfare. These kinds of investments (not to mention the belligerence of the US) are simple less necessary in Europe. Who knows how much GDP is spent on extra highways and extra energy to support the dispersion of the American population into huge metropolitan areas spreading over hundreds or even thousands of square miles (grounded on excessive energy use)? Furthermore, the conveniences of Europe's public transport systems do not show up in GDP figures.

Taking all these factors into account (and adding in the value of extra leisure time), R. Gordon reckons that perhaps half to the remaining measured EU / US gap in living standards would vanish with a full balance sheet linking welfare to measured output.

And last but not least one should not forget that economic ups and downs in Europe are very much determined by the big countries, i.e. especially Germany as the largest country in the

EU. Most of the underperformance in Europe can be explained by Germany, whose economy has struggled since German reunification. This translated into to a transfer of enormous volumes of money. Strip out Germany and the euro area's annual growth in GDP per person rises to exact the same rate as in the US. However, many regard these computations as gimmicks which may cover the political value *per se* of the reunification.

3 The boom, which Europe missed? ICT and the *„new economy bubble“*

3.1. ICT AS A SOURCE FOR ECONOMIC GROWTH

If there was a consensus at the beginning of this decade about anything regarding the growth performance, it was that the core of the ‘growth-engine’ was acceleration in technological progress centred on Information and Communication Technology (ICT) and the internet. Hence, the clearest manifestation of the boom, the post-1995 productivity growth revival, could be traced directly to the ICT revolution. One way of describing the changing relationship between technology and economic performance is the famous Robert M. Solow’s 1987 saying that, “we can see the computer age everywhere but in the productivity statistics.” This ‘Solow paradox’ was taken for a decade as a truism, reflecting a co-existence of explosive growth in computer use with a dismal growth in labour productivity. But by the middle of the 90’s a new picture emerged, indicating that the technological revolution represented by the *New Economy* was responsible directly or indirectly, not just for the productivity growth acceleration in the US, but also the other manifestations of the boom-phase, including the stock market and wealth boom. Thus, as was admitted by its inventor, Solow’s paradox is now obsolete.[4]

Whether the ICT investment boom in the 90’s was the sole cause of the productivity growth revival or only a large cause, its role in the revival was central, raising the question of whether or not it can recur in the future or was fundamentally temporary. The importance of this question is clear considering the present question of whether productivity slowdown in the EU is of structural nature.

Today one can find a mass of literature on the interplay between ICT investment and the productivity growth revival in the US (see Jorgenson and Stiroh 2000, Jorgenson 2001, 2002, Oliner and Sichel 2000, 2002). The primary goal in these studies is to calculate the impact of ICT to labour productivity not only in the computer-producing industry but its spillovers into the whole economy. It thus separates the computer-producing sector from the computer-using sector. However, no one denies that there has been an impressive acceleration of output and productivity in the production of computers, but the real issue has been the response of productivity to the ICT investment by 95 % of the rest of the economy, i.e. sectors which are engaged in using computers rather than producing them. Three effects of ICT on the whole economy can thus be distinguished:

- The performance of the ICT-producing sector.
- The investment of the non-computer producing economy in ICT-equipment, which accelerates the rate of capital input (*capital deepening*). This reveals the fact that any growing economy achieves a growth rate of its capital input that is faster than its labour input, thus equipping each unit of labour with an ever-growing quantity of capital.

[4] See New York Times, 12. March 2000.

- The third effect would imply that investment in ICT has a higher rate of return than other investments and creates spill-over effects on business practices and productivity. Evidence of this spill-over effect could be the acceleration in the total factor productivity (TFP) in the ICT-using economy, as an indirect effect of ICT investment.

3.2. AN EMPIRICAL ASSESSMENT OF THE ICT BOOM IN THE US

Oliner and Sichel (2002) - as the most prominent approach - began their computations with the labour productivity growth and then subtracted the contribution of capital deepening and changes in labour quality, arriving at the growth rate of TFP. The location of TFP growth by industry was then examined, and the total of TFP growth is disaggregated into the portion occurring in the ICT sector and a residual for other sectors. The results are shown in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

Table 2: Contributions to Growth in Labour productivity by Source

	1973-1995	1995-2001	Post-1995 Change
Labour Productivity	1.40	2.25	0.85
Contribution from:			
Capital Deepening	0.71	1.17	0.46
Information Technology Capital	0.42	0.97	0.55
Other Capital	0.30	0.20	-0.10
Labour Quality	0.27	0.25	-0.02
Total Factor Productivity	0.42	0.83	0.41
Information Technology Capital	0.30	0.73	0.43
Other Sectors	0.12	0.10	-0.02
Memo: Total IT Contribution	0.72	1.70	0.98

Source: Oliner and Sichel (2002), Gordon (2003)

As was mentioned by Gordon (2003), "… these findings are very striking". This is shown in the right column, where the total revival of labour productivity growth is 0.85 points, divided into contributions of 0.55 points of capital deepening, 0.43 points of acceleration in TFP growth in ICT industries. However, the non-ICT part suggests a relatively minor impact. Capital deepening of non-ICT capital contributes –0.10 points and the acceleration of TFP growth in non-ICT part of the economy exhibits -0.02 points. Gordon (2003) concludes that Oliner and Sichel (2002) 'over-explain' the post-1995 productivity growth revival without any reference to innovation or organisational improvements outside the production and use of ICT capital. In most of the *New Economy* studies the contribution of ICT (or high-tech) investment to average labour productivity has been exaggerated. The possibility that Oliner and Sichel (2002) exaggerated the role of ICT (either the role of ICT capital deepening or indeed of ICT gains in TFP) would imply that the residual role of non-ICT TFP growth is greater than it appears in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

At the same time, numerous recent studies question the share of ICT-use to the post-1995 productivity growth revival. Most of these studies are related to the wholesale and retail sector where the productivity growth is most evident. The findings of Foster et al. (2001) – to mention only of few of these endeavours - are based on a study of individual retail establishments and show that over a ten-year horizon *all* retail productivity growth can be attributed to more productive entry of new firms that displace the less productive existing firms. ‘Net entry accounts for virtually all of the labour productivity growth in retail trade. The reason for this is that, “very large rates of entry exist along with the very low productivity rates of existing businesses” (p. 36). Despite the massive investment of the retail industry in ICT equipment, the productivity dynamics of newly established firms reflect substantial learning and selection processes.

The Foster et al. (2001) findings seem to contrast to the Oliner and Sichel conclusions that all of the productivity growth of the 1990’s was the direct result of the purchase of new computers and ICT-equipment. One can, however, presume that all retailers, regardless of whether they are new or old establishments, have adopted ICT technologies making it likely that the productivity revival in retailing involves far more than the use of computers, and may include large size, economies of scale that reduce cost and raise revenue and other efficiency gains.

The studies by Triplett and Bosworth (2003) are focused on the acceleration of labour productivity in the service sector and examination of the sources of this productivity growth. They saw the major source of the average labour-productivity-growth acceleration in service industries in the great expansion of total factor productivity after 1995. It went from essentially zero in the earlier period to a rate of 1.4 percent per year, on a weighted basis. Considering that TFP is always a small number that is a remarkable expansion. ICT played, in their analysis, a substantial role in labour productivity growth, but its role in the acceleration in the post-1995 period was smaller, largely because the effect of ICT in these service industries is already apparent in the numbers before 1995. Purchased intermediate inputs also made a substantial contribution to average labour productivity growth, especially in the service industries that showed the greatest acceleration. This finding reflects the role of ‘contracting out’ to improve efficiency.

The eminent role of the service sector in the acceleration of productivity in the US was also emphasised by Lewis (2004). In today’s industrialised countries only 20-25 % of workers work in manufacturing and about 5 % in agriculture. Thus most workers are employed in the service sector, which means that the standard of living is primarily determined by the productivity of service industry workers. However, in the second half of the 1990’s, only six of the sixty sectors making up the US economy accounted for about 75 % of the total gross productivity growth acceleration of all sectors with some productivity acceleration. These sectors were wholesale trade, retail trade, security broker, microprocessors, computer assembly, and mobile telephone services. Within these sectors, it is most surprising that even the productivity acceleration in microprocessors was not caused by technological innovations (ICT inherent), but the result of traditional microeconomic competitive dynamics. In the middle of the 1990’s, Intel, challenged by a competitor for the first time, changed its product line strategy to bring its more powerful chips to the market faster. This action alone abruptly increased the value of the microprocessor chips sold to the market.

The productivity acceleration of the retail sector was determined by one big player: Wal-Mart's innovative way of retailing and its sufficiently large market share ('Wal-Mart Effect'). By the end of the 1990's Wal-Mart has increased its market share to 30 % and one third of the productivity growth jump in general merchandise retailing came from Wal-Mart's accelerated rate of improvement. Competitors thus faced the choice of either getting as good as Wal-Mart or going out of business. The remaining or new established firms began (or started) their rate of productivity improvement in an attempt to catch up with Wal-Mart which caused a general productivity growth acceleration. And the cause of Wal-Mart's success in productivity growth in the second half of the 1990's was less information technology as the adoption of Wal-Mart's 'big box' store, an invention which goes back into the 1960's.

Finally, we want to question the role of ICT as the central explaining factor for productivity acceleration by contrasting the EU with the US.

3.3. THE MISSED CHANCE? EUROPE AND THE ICT BOOM

Behind the idea of contrasting the US with Europe concerning the role of ICT as the main determinant for productivity was the following question: how could ICT be the main source of the US growth revival, as it was described by Oliner and Sichel (2002), while Europe fell behind? Business firms and individuals in Europe use the same computers and software as Americans and retailing in Europe uses the same ICT equipment as in the US. The share of ICT services in total business services value added in some Nordic countries surpass the US and the same can be shown with the PC intensity. These indicators may challenge the notion that ICT investment has been the main source of the contrasting productivity performance in Europe.

Quantitative evidence is provided by van Ark et al. (2002) in which a taxonomy was developed in order to divide industries into ICT producing, ICT using and non-ICT industries differentiated by manufacturing and service sector. This classification was taken from the OECD (2002a) with the aim of separating the industries that make intensive use of ICT from those that do not, allowing one to trace the location of productivity growth acceleration and deceleration to particular industrial sectors (see also O'Mahony et al. 2003).

Fehler! Verweisquelle konnte nicht gefunden werden. shows that the main difference between the US and the EU neither lies in the ICT producing nor using sector. A look at the non-ICT sector, which includes about two thirds of the total economy, makes the core of the European problem visible: this sector exhibited a deceleration of productivity growth in the late 1990's greater than the deceleration of the European economy as a whole. Concerning the manufacturing sector alone, **Fehler! Verweisquelle konnte nicht gefunden werden.** clearly shows a decline to a rate which was still higher than in the US.

A main hypothesis of most of the New Economy papers is that Europe has missed the ICT revolution in the sense that production of ICT has been more limited in Europe. **Fehler! Verweisquelle konnte nicht gefunden werden.** shows that the share of the ICT producing sector in GDP is higher in the US than in Europe (7.3 % versus 5.9 %). But this difference is small. Moreover, the labour productivity growth rates within the ICT-producing sector in both the

US and the EU are considerably greater than in all other sectors and show a similar time pattern with accelerated growth in the late 1990's (although at a higher rate in the US).

Table 3: Labour Productivity by Sector, annual growth rates in % and GDP shares

	Productivity growth				GDP share	
	US		EU		2000	
	1990-95	1995-00	1990-95	1995-00	EU	US
Total Economy	1.1	2.5	1.9	1.4	100	100
ICT producing industries	8.1	10.1	6.7	8.7	5.9	7.3
ICT producing manufacturing	15.1	23.7	11.1	13.8	1.6	2.6
ICT producing services	3.1	1.8	4.4	6.5	4.3	4.7
ICT using industries	1.5	4.7	1.7	1.6	27.0	30.6
ICT using manufacturing	-0.3	1.2	3.1	2.1	5.9	4.3
ICT using services	1.9	5.4	1.1	1.4	21.1	26.3
Non-ICT industries	0.2	0.5	1.6	0.7	67.1	62.1
Non-ICT manufacturing	3.0	1.4	3.8	1.5	11.9	9.3
Non-ICT services	-0.4	0.4	0.6	0.2	44.7	43.0
Non-ICT other	0.7	0.6	2.7	1.9	10.5	9.8

Source: van Ark et al. (2002)

Another hypothesis might point to an insufficient use of ICT. **Fehler! Verweisquelle konnte nicht gefunden werden.** shows that the core of the US success story appears to have been in ICT-using industries. In the second half of the 90's labour productivity growth in the ICT-using service sector was indeed much higher in the US than in the EU: 5.4 % versus 1.4 %. This finding is quantitatively important because this sector accounts for about one fourth of GDP.

In a separate analysis van Ark et al. (2002) examines the difference between the EU and the US in terms of industry contributions to aggregate productivity growth. Thus they allocate the aggregate difference in productivity growth between the US and the EU (which is 1.1 percentage points from 1995-2000) to the individual industries. The result is quite impressive and reveals the heart of the US success story: 0.9 percentage points of the of 1.1 differential, i.e. literally *all* the productivity growth differential of the US over the EU in the late 1990's, comes from three industries: retail, wholesale, and securities trading industries. Productivity in the securities sector seems largely attributable to transactions associated with the US bubble economy of the late 90's. But nevertheless these sectors account for most of the labour differential between Europe and the US. Semiconductors however, as an ICT-producing industry, show the highest share and contribute substantially to labour productivity growth. The remaining industries had a small positive or negative differential, netting out to zero.

Table 4: Contribution to the US-EU productivity gap by industry, 1995-00

Top 5	Industry	Total
1	Semiconductors	0.361
2	Securities	0.355
3	Retail trade	0.317
4	Wholesale trade	0.233
5	Construction	0.157
Bottom 5		
1	Food products	-0.067
2	Health	-0.064
3	Government	-0.061
4	Social/personal services	-0.061
5	Computer services	-0.052

Source: van Ark et al. (2002)

What is common to these sectors beside a pattern of ICT producing or ICT using activities? First of all, these sectors were highly competitive due to the presence of aggressive market leaders, as in retail, wholesale and electronics, or as a result of deregulation, as in securities (or telecom). Secondly, they were free to respond to demand factors through the creation and pricing of new products and services.

It is without question that the contribution of the ICT-producing sector to productivity was significant. Although it accounted for 7 % of GDP in 2000, this sector contributed a disproportionate 36 % to productivity growth between 1995 and 2000. The semiconductor industry, especially, experienced one of the highest labour productivity growth rates in the 90's. But the role of ICT was only one of several factors at work in the productivity jump in the US. Innovation (including but not limited to ICT and its applicants), competition, and demand factors were important causes as well. The data from the ICT using sectors highlighted the enabling role of ICT as a key component for managerial innovation that allows firms to compete in a modern economy. It enabled the managerial and technical innovations that emerged in response to changing competitive landscapes and demand environments faced by firms in the 90's. Thus, simply spending on more ICT does not automatically lead to higher productivity growth. ICT investments were often necessary to improve productivity, but they mostly required corresponding business process changes in order to have a significant impact.

The right competitive context was also essential. Retail saw strong growth from dominant players and thus increases in competitive intensity. Large retailers like Wal-Mart leveraged ICT to manage the increasing complexity of their operations and to improve their efficiency in the face of competition. Or to offer another example, competition enhancing deregulations along with ICT investments helped banks to manage transaction complexity and achieve scale benefits.

The very detailed sector specific studies across 15 countries done by McKinsey (2002) indicate that the key to productivity gains at the sector level is not only investment in ICT but the successful development, diffusion and leverage of business and technology innovation. This is one crucial explaining factor for the slowdown of productivity growth in Europe: the ability to develop innovative products, services and process is essential and should not be underestimated as a method to improve an individual company's performance and productivity. But the diffusion and leverage of innovation, the creation of conditions that reward innovation of all kinds, plays a far greater role in explaining productivity differences. As specific sector cases illustrate, insufficient competition, poor regulation of complex sectors, the presence of obstacles to new business development, the constraints of distortions caused by zoning and development regulations, and weak corporate governance are among the leading culprits limiting innovation across Europe (McKinsey 2002).

These findings indicate the major (possible) factors explaining Europe's poor performance in the late 1990's. Just as was argued earlier, the US retailing sector has achieved efficiency gains for reasons not directly related to computers. Therefore, one can suggest in parallel that Europe has fallen back because European firms are much less free to develop the 'big boxes' retail formats. This leads to regulation issues, among other things, as a major hindrance for competition and flexibility in Europe. Just to mention only one example: the European Commission sees one of the main hindrances to the realisation of the Lisbon strategy in the weaknesses of the internal market and the lack of competitiveness.

> "*The internal market is still highly fragmented in the services sector, especially in distribution and retail sales. The service sector accounts for 70 % of GDP. But companies and consumers continue to suffer from many restrictions on establishing businesses and the provision of cross-border services. This seriously restricts the European economy's competitiveness*." (EC 2004a).

4 The Lisbon-Process – A first assessment

4.1. THE LISBON STRATEGY

In Lisbon, March 2000 the political leaders of the European Union aimed at an ambitious vision for the coming decade:

> "*The Union has today set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion. Achieving this goal requires an overall strategy aimed at ... sustaining the healthy economic outlook and favourable growth prospects by applying an appropriate macro-economic policy mix.*
>
> *This strategy is designed to enable the Union to regain the conditions for full employment, and to strengthen regional cohesion in the European Union … If the measures set out below are implemented against a sound macro-economic background, an average economic growth rate of around 3% should be a realistic prospect for the coming years*."(European Council, Presidency Conclusions, 23 and 24 March 2000).

Reading these conclusions one can see how Lisbon was, in fact, a 'quick fix', declared by the European leaders and driven by the notion that Europe needs nothing more than new targets. Regarding the European performance during the 1990's, neither a 'healthy economic outlook', nor a 'realistic prospect of a growth rate of 3 % for the coming years' seems realistic. Moreover, the gap between unfulfilled expectations and reality can certainly contribute to the downbeat morale which is currently impeding the recovery. Instead of formulating good-will prophecies leaders should, in the future, be leading the reform process towards more realistic and achievable objectives.

Concerning the question of how to reach the goal, two years later the European Council found an answer at the summit in Barcelona in March 2002. The Heads of States and Government agreed to the following goals:

- R&D investment in the EU must be increased with the aim of approaching 3 % of GDP by 2010 up from 1.9 % in 2000.
- They also called for an increase of the level of business funding. Two-thirds of this new R&D investment should come from the private sector.

After four years' implementation of the Lisbon strategy, the European Council and the European Commission decided to prepare a mid-term review at the spring European Council in March 2005. Accordingly, the European Commission, in line with the conclusions of the spring 2004 European Council, set up a High-Level Group of Independent Experts chaired by Wim Kok to decide upon the content of the review. The group submitted its report to the European Commission on 3th of November 2004.

The report is a sober and realistic one without excessive replication of already well known phrases. Halfway to 2010 the report draws a, "… very mixed picture of the process" and emphasised that "… much needs to be done in order to prevent Lisbon from becoming a synonym for missed objectives and failed promises."

The report put its focus very clearly on the enabling role of the Member States and the impression that the so called 'Lisbon-process' can not end on a single date, or, in case the targets are not reached, new targets must be found.

> *"… but the European Union and its Member States have clearly themselves contributed to slow progress by failing to act on much of the Lisbon strategy with sufficient urgency. This disappointing delivery is due to an overloaded agenda, poor coordination and conflicting priorities. Still, a key issue has been the lack of determined political action. … The process will never end on a single date, rather it will be subject to continual renewal, reappraisal and recommitment." (Kok-Report p. 6 ff.)*

The Lisbon strategy has to be seen in a wide context consisting of internal (the greying of Europe) and external challenges (international competition, rapid growth of the Chinese economy, etc.), the challenge of enlargement and, last but not least, the challenge to remain both open and socially cohesive. If Europe wants to preserve and improve its social model it has to adapt it.

> *"The Lisbon strategy is not an attempt to become a copy-cat of the US – far from it. Lisbon is about achieving Europe's vision of what it wants to be and what it wants to keep in the light of increasing global competition, an ageing population and the enlargement. It has the broad ambition of solidarity with the needy, now and in the future. To realise this ambition, Europe needs more growth and more people in work." (Kok-Report p. 12)*

The problem leading to the stagnating and disappointing progress is one of European political governance *per se*, i.e. the 'dangerous liaison' between Member States and the European level, which is not particularly goal-oriented and enables, despite lip services, the protection of positions decided at the Member State level. The EU is trapped in this deceptive construction because in many policy areas relevant for growth, the EU cannot act at all or not without the explicit consent of the Member States. The European policy is based on 'good-will coordination'.

> *"The problem is, however, that the Lisbon strategy has become too broad to be understood as an interconnected narrative. Lisbon is about everything and thus about nothing. Everybody is responsible and thus no one." (Kok-Report p. 16)*

The report defines five broad priority areas of policy where the European Union and individual Member States need to make progress to help ensure economic dynamism within individual states and the vigour of the whole European economy from which each member state benefits. The task of the Member States is …

> *"… to develop national policies in each Member State, supported by an appropriate European-wide framework, that address a particular Member State's concerns and then to act in a more concerted and determined way." (Kok-Report p. 7)*

The five broad priority areas of policy are (Kok-Report p. 6):

- The knowledge society: increasing Europe's attractiveness for researchers and scientist, making R&D a top priority and promoting the use of information and communication technologies;

- The internal market: completion of the internal market for the free movement of goods and capital, and urgent action to create a single market for services;
- The business climate: reducing the total administrative burden; improving the quality of legislation; facilitating the rapid start-up of new enterprises; and creating an environment more supportive to businesses;
- The labour market: rapid delivery on the recommendations of the European Employment Taskforce; developing strategies for lifelong learning and active ageing; and underpinning partnerships for growth and employment;
- Environmental sustainability: spreading eco-innovations and building leadership in eco-industry, pursuing policies which lead to long-term and sustained improvements in productivity through eco-efficiency.

The results achieved so far do not favour an optimistic conclusion. Table 5 gives an overview about the main target areas and the respective figures for the EU as well as for the US The ambitious aim to achieve a growth rate of 3 % was clearly missed. The trend growth rate in the EU today is about 2 % only, well below the target. With respect to other targets (e.g. R&D; employment) the results are disappointing at least for the time being.

Table 5: Indicators fort he main aims of the Lisbon/Barcelona Process

	Target 2010	Status Quo (2004)
GDP per capita	Catching up	EU = 72 % of USA
GDP Growth	3 %	2 % (Average 2000-05)
Productivity growth		0,5 % - 1 % (USA: 2 %)
Employment Participation		
Total	70 %	64,4 %
Age 55-64	50 %	40,1 %
Women	60 %	55,6 %
R&D (% of GDP)	3 %	2,0 %

Source: Kok (2004),EC (2004)

5 The European Research Area

5.1. R&D EXPENDITURES IN EUROPE

The overall trend of R&D expenditures at EU-level in the 90ies shows a stagnant, yet even declining (in the first half of the 90ies) pattern. However this overall trend masks quite divergent patterns at the level of individual countries. Since the huge bulk of R&D expenditures is concentrated on the three biggest EU member states (namely Germany, France and UK which together account for roughly two thirds of total R&D expenditures of the EU-15) the overall pattern is determined by the development of these three countries. All these countries experienced declining R&D quotas (% of GDP) during the nineties (or at least, in certain significant sub-periods of this decade): Germany's R&D quota fell from about 2.7 % of GDP (1990) to 2.5 % in 2002 (the trough was about 2.3 % in the mid 90ies); France moved from slightly above 2.3 % to slightly above 2.2 % and UK fell from 2.2 % to slightly below 2.0 %.

However, to understand the complexity of the European development of R&D expenditures, it is necessary to grasp the quite divergent patterns which are to be found at the level of individual member states:

- First, huge disparities in the relative level of resources devoted to R&D still exists within the EU-15 and this degree of disparity is now much more pronounced within the EU-25. The minimum is marked by countries with a R&D quota of about 0.7 % (e.g. Greece, Portugal, Poland), whereas the maximum is well above the principle aim of 3 % (Sweden 4.3 %, Finland 3.4 %).
- These huge disparities concerning the level of R&D are accompanied by huge disparities in the growth rates of R&D expenditures. During the last decade two countries (Sweden and Finland) experienced rather dramatic growth rates. Sweden increased her R&D quota from 2.5 % (1990) to the mentioned record high of 4.3 % in 2002 and Finland from ca. 1.9 % in 1990 (then well below the EU-15 average) to its recent point of 3.4 % in 2002. Since Sweden was at the top already in 1990 (albeit only by a small margin) her development throughout the 90ies may be characterised as forging ahead, whereas Finland started below the EU average. Hence Finland may best be characterized as first catching up (80ies), then overhauling (early 90ies) and last forging ahead (late 90ies, early 00s).
- Beside these two examples of rapid increase in R&D expenditures growth rates of R&D have been rather modest in most countries. At least three other countries (namely Denmark, Belgium and Austria) achieved continuous growth rates during the 90ies high enough to catch up (or to overhaul as in the case of Denmark and Belgium in the later 90ies) with the EU average. Although these countries had been below-average R&D intensities their level of GDP/capita was above the average. So to some extent, their R&D intensity "lagged behind" their overall "state of development", so their convergence process concerning R&D may not be surprising.

- The southern member states of the EU-15 (with the addition of Ireland) experienced traditionally low R&D intensity (the R&D quotas in 1990 vary between below 0.5 % for Green up to about 1.3 % for Italy). The record for these countries is rather mixed. Up to the middle of the 90ies these countries suffered from stagnant R&D growth rates (R&D quotas) or even experienced a decline (Italy fell from 1.3 % to 1 % in 1995). Since then their R&D intensities show signs of a continuous rise, albeit at a very modest pace, with R&D quotas recently in the range of 0.6 % (Greece) to 1.1 % (Italy).
- The accession of the new member states emphasises the pattern of the uneven landscape within Europe. All new member states do have below-average R&D intensities. Slovenia and the Czech Republic are on the top of the new member states concerning R&D intensities with R&D quotas of 1.3 % (Czech Republic) and 1.6 % (Slovenia). The other countries are in the range of the "old" Southern member states like Greece, Portugal and Spain with R&D quotas of 0.4 % (Latvia) and 1.0 % (Hungary). Despite their rather divergent level of R&D intensity these countries share the common experience of a rapid structural transformation of their respective national innovation system due to their general political-economical transformation throughout the late 80ies/90ies. Interestingly, the initial phase of transformation, namely the phase of down-scaling seems to be passed through in those countries, since the rapid decline of R&D intensities came to halt in those countries in the second half of the 90ies. Since then, these countries experienced moderate growth or at least stagnant growth concerning their R&D quotas. Nevertheless, their growth rates are below the necessary rates to catch up with the (currently stagnant) EU-average. Thus, given the trends of the 90ies and early 00s the great European divide concerning R&D patterns will be sustained for decades to come.

The aggregate development of the R&D expenditures masks the shifting contribution of the main financing contributors to these overall R&D expenditures, namely the public sector on the one hand, and the private business sector on the other hand. Today, the private business sector accounts for the major bulk of R&D expenditures. This is especially pronounced in those states which have the highest R&D intensity, as in Sweden and Finland: about 70 % of GERD is financed by the private business sector in those countries. On the contrary, countries with low R&D intensities do have typically a significant smaller share of private business financed R&D (e.g. only about 30 % in Portugal). Austria's position is between those extremes (share of business financed R&D of 40 %). However, this figure masks the fact, that a considerable amount of Austria's GERD (namely 20 %) is financed by abroad. These funds mainly stem from the foreign private business sector and flow to Austria to finance the R&D activities of Austrian subsidiaries of multinational firms.

Throughout the European Union there is a general trend of a disproportional fast growth rate of private financed R&D expenditures (in relation to public funded R&D) leading to ever increasing shares of private funded R&D of GERD as mentioned above. Indeed, the main part of the growth of R&D expenditures stems from R&D financed by the private business sector. This holds especially true in Sweden and Finland, where the growth of private R&D outpaced public funded R&D to a huge extent. To sum up, a significant increase of the R&D intensity was only possible in those countries which experienced dynamic growth of private financed R&D.

5.2. SIMPLE SCENARIOS TO 2010

To assess the path to achieve the Barcelona Goal of a R&D quota of a GERD of 3 % of GDP a simple basic scenario has been calculated. Following information can be obtained from these scenario calculations:

(a) Necessary annual growth rate for R&D to achieve the Barcelona goal of 3.0 % in 2010

(b) Amount of additional funding (in absolute terms) required to achieve the Barcelona goal (annual, cumulative)

The data sources and premises for the scenario calculations are as following:

- OECD-Main Science and Technology Indicators (R&D figures, structure of R&D expenditures)
- Annual nominal GDP growth between 2002 and 2010 of 4 %
- In general the year 2010 is defined as year of achievement. If a country has an alternative goal (R&D quota, year of achievement) this country-specific goal is used for the scenario calculations. Such country-specific goals are to be found especially among the new member states.
- Assumption of a constant annual growth rate of R&D expenditures. Thus the necessary R&D growth rate is defined as following:

$$GR = \left(\sqrt[8]{\frac{R\&D_{2010}}{R\&D_{2002}}} - 1 \right) \cdot 100$$

- Assumption of a constant financing structure of GERD.

The results of the calculations are given in Figure 5 and Figure 6. Concerning the status-quo the differences in R&D intensity are significant. Currently, two countries (Finland and Sweden) are already above the Barcelona target of 3.0 % R&D expenditures on GDP. Both countries have been experiencing strong and sustained growth rates of R&D throughout the 90ies (and Sweden was, traditionally, a high R&D intensity country). Therefore for those countries the EU Barcelona target does not apply, Finland has set her own target of 3.5 % (2010) whereas Sweden just declares to sustain her already achieved high R&D intensity around the level of 3.0 %. Also, Finland and Sweden had been a notable exception with regard of the trend of the development of their R&D intensity throughout the 90ies. Most other countries (especially the bigger EU member states like Germany, UK and France) actually experienced a decline of their R&D intensity at least in some periods of the 90ies.

However, some smaller countries (notably Belgium, Austria and – at least in the first halt of the nineties - Ireland) were able to achieve a pronounced increase of their R&D intensity. Belgium and Austria converged to the EU-15 average in 1996 and 1998 respectively and are even bypassing the EU average since then. The southern member states of the EU are still lacking behind with regard of their R&D intensity.

Obviously, the new EU member states do play a special role, since (with the exception of Cyprus and Malta) they experienced a fundamental transformation in their economic, and hence their innovation system throughout the 90ies. The nature of this profound structural transformation process is often characterized as an idealized „3-phase-model“ characterised as following:

- Phase 1: Abandoning/De-scaling of the former centrally-planned institutions of research and technological development and a de-coupling of the R&D system from the economic system associated with a sharp decline in indicators measuring the quantity of inputs (R&D expenditures, R&D employment, both public as well as business R&D).
- Phase 2: Consolidation and founding of new (often scattered) institutions. The R&D system in this stage is characterized as very uneven with the potential danger to degenerate into a somewhat “divided” economic system as a whole: Some (mainly foreign-owned) modern business sectors (based upon inflow of FDI) but with very weak linkages to the regional environment (weak embededness) are confronted with a huge bulk of local indigenous industries with no or low R&D activities and hence low absorptive technological capabilities.
- Phase 3: Re-Integration of institutions into new national innovation system paralleled with a (Re-) Internationalisation under different premises and – eventually - technological catching-up.

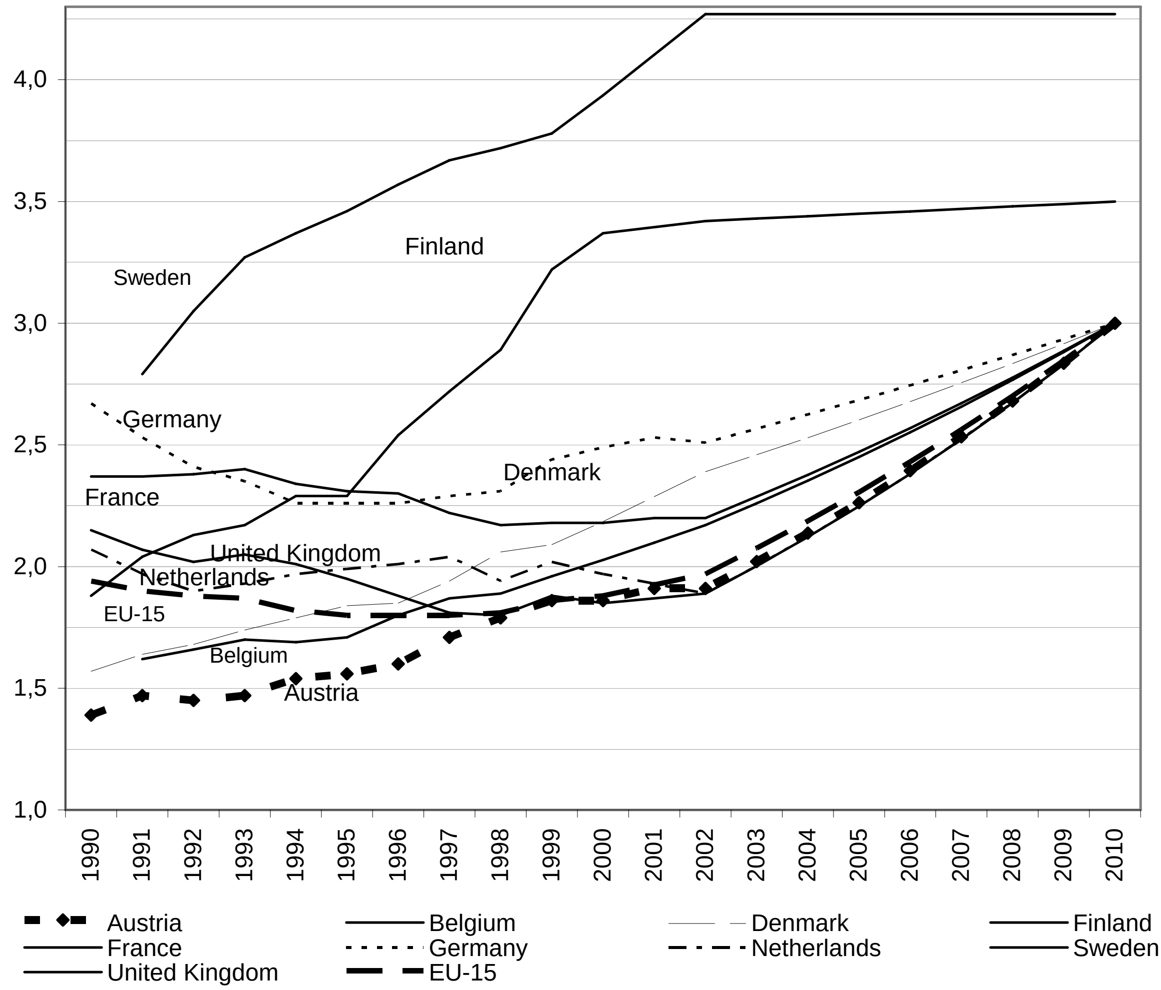
As Figure 6 shows there has been indeed a somewhat u-shaped development of R&D intensity in the new EU member states. It appears that the trough has been around the mid to late nineties. Since then, the R&D intensity has been stabilized and in some countries there are signals for a new and sustained growth of R&D intensity (albeit at a very modest pace).

Concerning the necessary development to achieve the aforementioned aim of 3 % R&D of GDP following conclusions can bee derived:

- At the EU level a significant change in the trend would be required to achieve the Barcelona goal. This holds true especially for the big countries which dominate the EU R&D expenditures in absolute terms (and hence do have the greatest statistical weight in calculating the EU averages). The necessary annual growth rates of R&D expenditures for those countries would be between 8 % (France) and 10 % (UK).
- For those “old” EU member states with traditionally low R&D intensities (Italy, Spain, Portugal, Greece) the 3 % goal seems to be over-ambitious. Indeed, some of these countries, do have individual goals which are significant below the EU-wide 3 % goal.
- Some smaller countries (Denmark, Belgium, Austria) seem to be on the track to achieve the 3 % goal at least approximately given a sustained continuation of their recent growth path of R&D expenditures.
- The new CEEC member states are still in the transformation process of their RTD system. Although their R&D expenditures are increasing recently the gap is still too far to

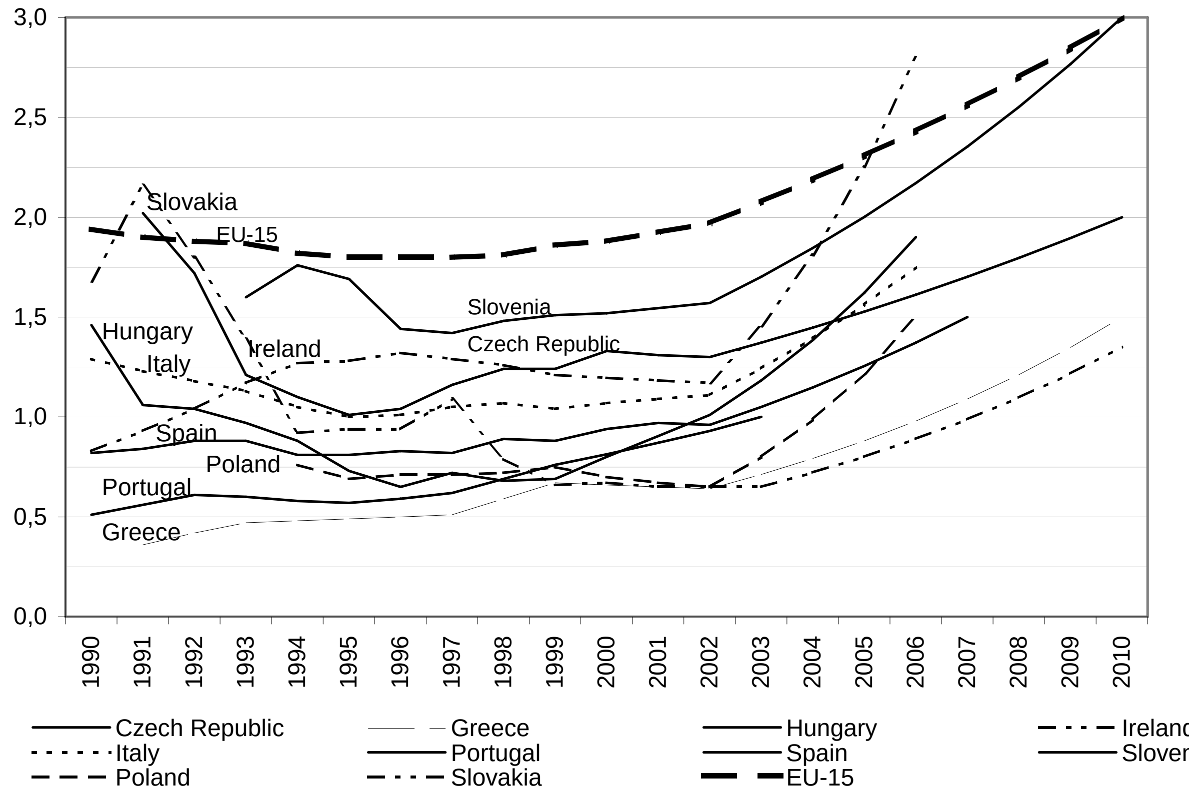
achieve the 3 % goal in a foreseeable future. Thus, sustaining their first signs of increasing R&D expenditures should be the main goal for those countries and should have priority over setting a too-far-away quantitative goal.

Figure 5: R&D intensity in EU member states: trend and scenario



Source: OECD; own calculations

Figure 6: R&D intensity in EU member states: trend and scenario



Source: OECD; own calculations

5.3. THE EUROPEAN RTD POLICY SYSTEM

In January 2000 the European Commission defined the development of a truly integrated European Research Area as a strategic aim:

> *"… [T]he Commission claimed to overcome the existing multi-layer architecture of European research and policy-making with three distinct research and technology policies on each governance level, with … a minor and complementary role of Europe as compared to the national level. … It attempts to build up a European research identity and enable more effective and strategically planned pan-European cooperation …a European Research Area in which researchers, scientific knowledge and technology flows freely …" (Edler und Kuhlmann, 2005, 59)*

There are three pillars to be identified which act as catalysts for enhancing the integration of the European research system:

- New instruments and measures concerning the EU RTD framework programmes, which enhance the integration of research actors.
- The ‚Open Method of Cooperation' (OMC) which enhances the cooperation of national political agents.
- ERA-NET-activities, which enhance the integration at the administrative level.

On the European level, research and technology policy becomes manifest in the Framework Programmes (FPs). Thus, primarily the Framework Programmes shape the European “R&D landscape”. Looking at recent evaluations of the Framework Programmes and at diverse national impact assessments, the following conclusions can be drawn[5]:

- The FPs result in a clear **”Europeanisation effect”**. Despite the recent trend of increased international collaboration in research, the FPs were able to direct this development to a “federating pattern” insofar as they did not only reduce the cooperation barriers by stimulating international cooperation in general but also increased the intra-European cooperation in particular. The FPs triggered the formation of sustainable research networks, an intensified cooperation on the European level, mutual publication activities etc.

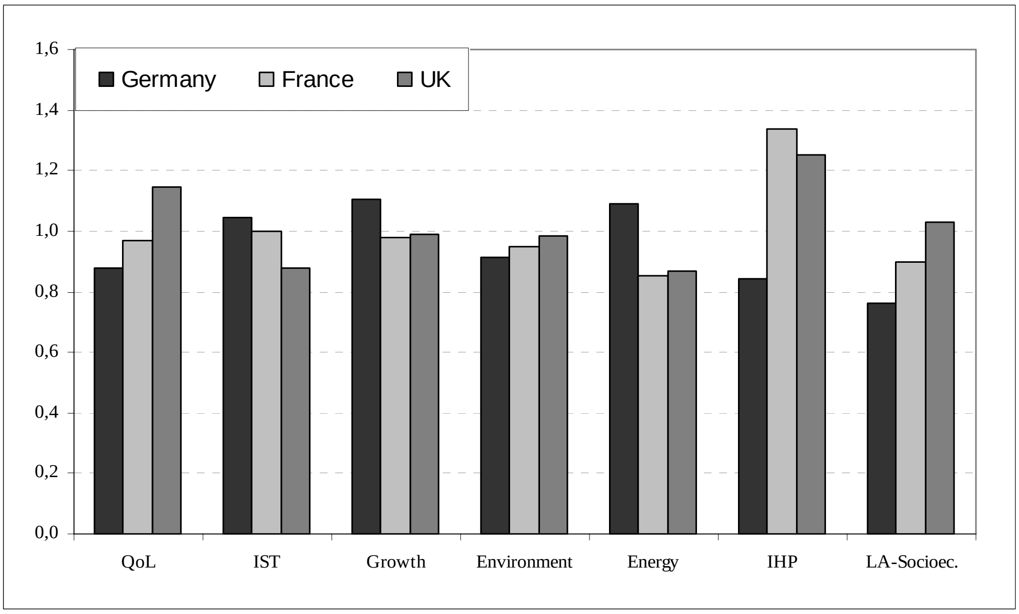
- The FPs result in a clear **”convergence effect”**. The structure of the FPs induces (at least at higher levels of aggregation) a thematic structure to which the countries have to adopt as can be seen in similar patterns of (thematic) specialisation across countries (compare Figure 7). According to the experiences made after the accession of Sweden, Finland and Austria, the participation patterns of the new accession countries in the FPs can be expected to follow the similar trend, i.e. result in a convergent development.

- Especially for small countries there is evidence of a **”steering effect”**. Referring to the overall public R&D budget available in small countries or rather countries with low R&D intensity, the European funds (FPs) are of major importance. The thematic structure of the FPs are in a sense the guideline to which the national patterns have to adhere to.

- Finally, there is evidence of an **“allocation effect”** of the FPs. The differences of success rates across countries are negligible small (compare Figure 8). At the same time, it seems that the return flows do not depend on the scientific and technological capabilities of a certain national innovation system (e.g. the return flows of European funds to Greece exceed the return flows to Finland, despite the fact that referring to the common indicators the finish innovation system is a priori more efficient and thus should be more absorptive as well).

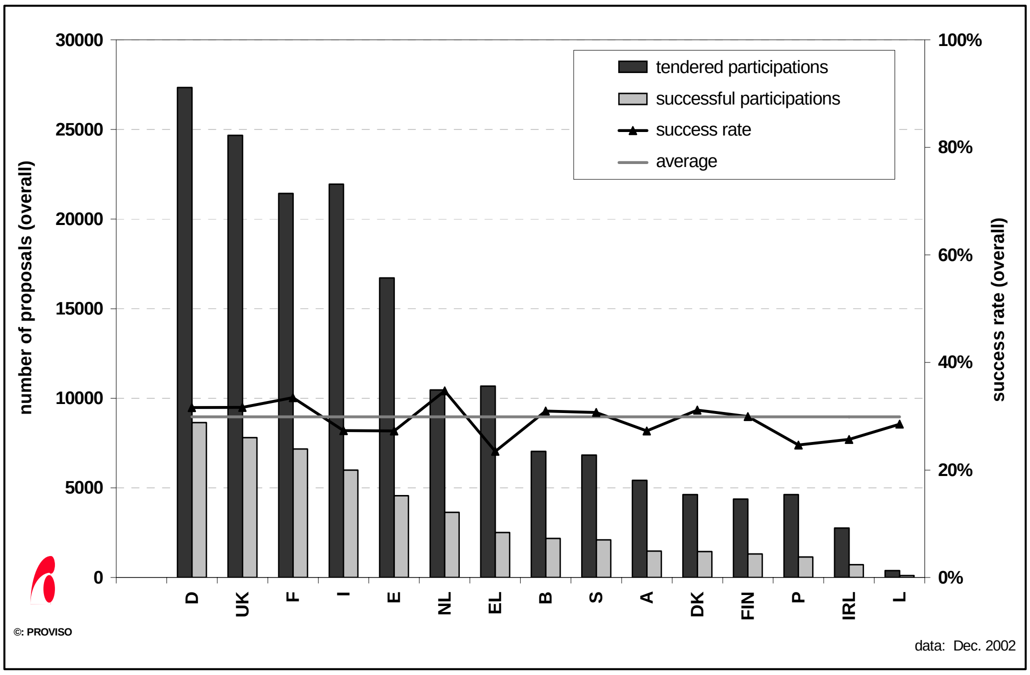
[5] For a detailed empirical analysis cf. “FP5 Impact Assessment” (Atlantis et al. 2004)

Figure 7: "Convergence effect" of the Framework Programmes: RCA values (RP5) for the three largest countries



Source: Proviso, own calculations

Figure 8: Success rate in FP5 – international comparison



Source: Proviso, own calculations

The so called New Instruments of FP6 should narrow the above effects in order to stimulate the European Research Area. The introduction of Integrated Projects (IP), Networks of Excellence (NoE) and measures in line with Article 169 of the EU Treaty aimed to build critical mass in the field of research of the business sector, the university and the non-university sector. Moreover the degree of institutionalisation and the sustainability of their R&D activities should be increased. First experiences with these New Instruments show that their implementation was not frictionless. The following critical points have emerged during the implementation stage:

- very short preliminary lead time,
- no archetypes available (e.g. forms for contracts etc.),
- unclear definitions, e.g. which structure/aims a NoE should finally have,
- lack of information (e.g. uncertain information about planned project budgets),
- non-distinct terms (e.g. breakthrough innovation),
- unclear differentiation (e.g. between IPs and STREPS),
- it was almost impossible for SMEs to become involved,
- initiation- and transaction costs were high, resulting in a prohibitive price for participation even for some large companies with FP-experiences,
- newcomers' high barriers to entry result in a hazard of the emergence of "closed clubs".

An interim assessment of the 6th Framework Programme and in particular its specific programme "Integration and Strengthening the European Research Area" was commissioned to a high level expert group chaired by Prof. Marimon by the European Commission in October 2003. The effectiveness of the New Instruments introduced in FP6 should be evaluated referring to their impact on the following main aspects:

- the "European value added" (the value added by pan-European research compared to single-state measures),
- creating critical mass,
- bundling of research capacities,
- simplification of administration.

The expert panel handed in their report (so called Marimon-Report) to the Commission on 1st of July 2004. The main findings of the report are:

- The New Instruments are significant tools to foster trans-national cooperation in research. The first call already devoted more than 50 % of the total budget to the New Instruments, reflecting their significance. However, their introduction was not unproblematic and triggered negative resonance in the science and industry communities.[6] Related inconveniences mentioned are the notably grown management costs, high transaction costs, lack of information, lack of transparency during proposals' evaluation, higher barriers especially for small research groups or institutions etc. Nevertheless, a continuation of the New Instruments is suggested by the experts since discontinuities of the instruments used, are said to result in negative impacts as well. Therefore the experts pointed out many aspects of design and implementation that need to be improved.

[6] A comparison of the degree of ‚dissatisfaction' between FP 5 and FP 6 for a confirmation: the instruments of FP 6 are rated worse across almost all of the dimensions (administrative costs, attractiveness and compatibility related to the research needs, cost-benefit-ratio, likelihood of successful application etc.) tested (cf. Atlantis et al. 2004).

Moreover, the European commission is recommended to establish clear guidelines and criteria for the use of the different instruments of the FPs and communicate them clearly to the applicants and participants.

- There is a lack of participation of small and medium sized enterprises (SMEs) in the New Instruments (IPs, NoE), while SMEs were found to prefer the Traditional instruments of cooperative research such as STREPs, CRAFT etc. Therefore, the specific measures (which are appropriate for small research projects as well) should play a major role in the future.
- Despite the appreciated fact that the Networks of Excellence are key for the integration of Europe's research cooperation and the concept of structuring and strengthening the European Research Area, the NoEs met with severe criticism. Especially the concept of "durable integration" is in question. In addition, difficulties with the new FP6-processes caused a certain degree of uncertainty for potential applicants. Therefore, the experts suggested to further design the instrument of NoE in a way that different forms of collaboration as well as different sizes of partnerships are covered.
- The average size of the projects in FP6 is notable (New Instruments: 32 participants per project, All Instruments: 17 participants per project). However, the common perception that the New Instruments have to be very large is misleading. It is argued that the concept of "one size fits all" should not apply across all thematic areas and Instruments. Moreover the concept of "critical mass" is not only a pure size phenomena, it rather depends on the topic, the participants, the thematic area and the value added. Despite this, the misunderstanding of 'size' and 'critical mass' has led to oversized consortia.
- Out of the New Instruments, the Integrated Projects (IPs) were ranked best. However, the experts recommended the improvement of the underlying processes such as consortia-building, submission and evaluation of proposals or contract negotiation. Besides there should be a greater emphasise on communicating the aim of the IPs (the delivery of new knowledge and competitive advantage to European industry) as well as the specific aspects that differentiates an IP from a STREP.
- The instruments, such as STREPs and small consortium IPs, which are appropriate for players smaller in size (e.g. SME and / or smaller research entities), should play a greater role in the future, as those instruments are better adapted to risk-taking, industry, and participants from the New Member States.
- The current design of the New Instruments (esp. NoE) does not attract as many new research groups/ networks as networks, which are familiar with the FPs' regulations. This implies a risk of the emergence of "closed clubs", which not necessarily comprise the best research units or rather the leading edge in a specific research area. This tendency should be avoided in the future by an improved design of the instruments.
- The portfolio of instruments for collaborative research should be designed in a way that they better fit other forms of public and private funding across the European Union.

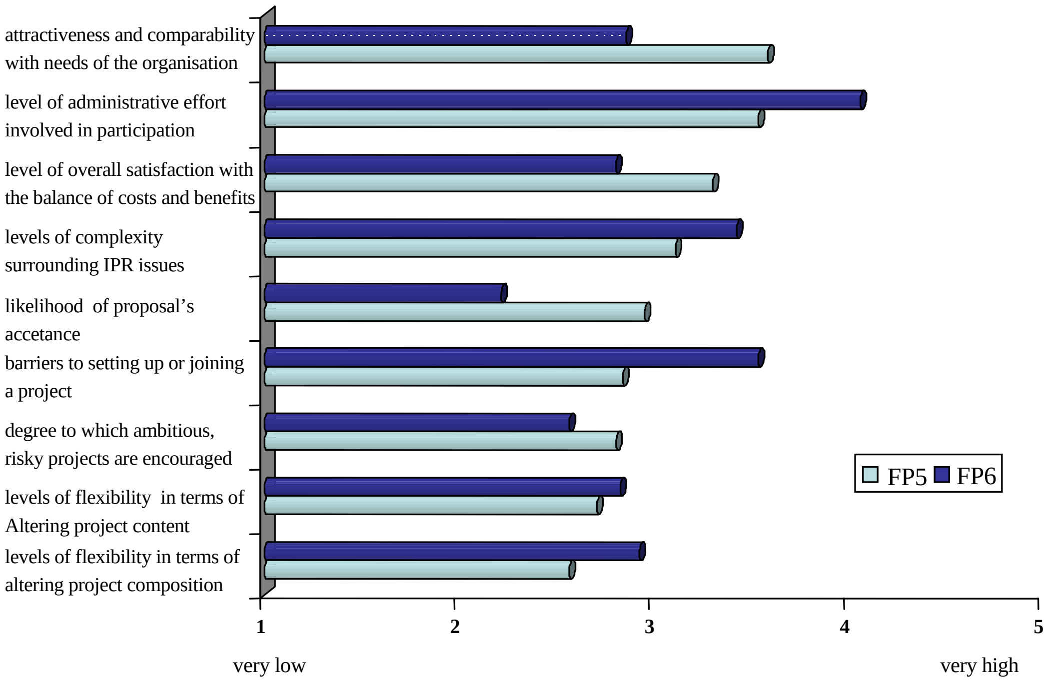
Already the results from the evaluation exercise of FP5 (cf. Atlantis 2004) illustrate the decrease of commitment of the research community to the FPs. In particular this holds true for the changeover from FP5 to FP6 with an increased number of dissatisfied R&D units, institutions and researchers. The fact that first time participants in FP5 were less likely to apply for FP6 funding or more likely to fail in their applications than more experienced participants was already of major concern in the assessment of FP5 (cf. Table 6).

Table 6: Participation in FP6 – differences between „Oldtimer“ and „Newcomer“

	RP5 *"Oldtimer"*	RP5 *"Newcomer"*	Overall
	%	%	%
successful RP6 proposals	68,2	36,7	56,2
rejected RP6 proposals	17,3	16,9	17,1
no further application	8,5	35,1	18,9
not sure/ n.a.	6,0	11,3	7,9
total	100,0	100,0	100,0

Source: Atlantis (2004)

Figure 9: Degree of satisfaction – FP5 and FP6



Source: Atlantis (2004)

The development of a truly integrated European Research Area is a somewhat logical step on the road to a more comprehensive and integrated European Union. However, the status quo of the European Research Area's design is still best described as "15+1-situation", at least for the time being. It has to be born in mind that neither a determination of national policies' coordination nor an obligation for certain actions exists in the field of research and technology policy at the European level (contrary to other fields of policy like monetary and fiscal policy). De facto, there are only recommendations or rather the acknowledgment of strategic aims (e.g. the Barcelona target to increase the R&D intensity to 3 % of the GDPs) for which a binding character is missing compared to other policy areas:

> *„Instead, it had to resort to a type of 'moral suasion' by group pressure which is the underlying principle of the 'open method of coordination' (OMC) of national RTD policies by means of benchmarking, comparison and mutual learning"* (Polt and Havas, 2003).

On the other hand, there is some empirical evidence on the increased integration/ Europeanisation of innovation policy and the policy debate (cf. Edler and Kuhlmann, 2005). However, different (partially divergent) processes exist, which do not necessarily follow an "efficient" linear pathway. This leaves room for a re-design of the role of national authorities. At the same time, there is a confusing simultaneity of support, abatement and ignorance of European coordination and steering mechanisms. The de-nationalisation of research and technology policy is not always and not only positively viewed by every player. Overall, the leeway of national policies decreases as an increase in bi- and multinational initiatives reduces the importance of regional measures. On the contrary political actors are strengthened in their national arenas by the European Commission: they can argue that a qualitative and quantitative upgrading of national RTD-systems is necessary due to the Lisbon-/ Barcelona-process. In several countries, policy makers could link the Lisbon-/ Barcelona-targets to their national policies and herby stress on their position in a skilful way (cf. Edler and Kuhlman, 2005).

In addition an increased collaboration in administration has emerged on the European level as a result of the introduction of ERA-NET. This initiative seen as a "bottom-up" development (i.e. without thematic specification/ requirements of the European Commission) leads to an integrated European Research Area as well. The ERA-NET-activities increasingly aim at the co-ordination and networking/ integration of former solely national-focused programmes. Obviously, national promotion agencies will sooner or later define joint, trans-national programmes (as intended and financially supported by the European Commissioned) if existing programmes are already mutually opened. An overall of € 140m can be spent for ERA-NET measures, of which € 130m are devoted to coordination activities and € 10m to specific promotion efforts. The ERA-NET is open to every trans-European, national or regional agency, that is responsible for the administration and funding of research activities.

The European Commission highlighted the "need to introduce a European level support mechanism for individual teams' research projects" in its report "Europe and basic research" published in 2004. The recommendations have prompted plenty of debate about the merits of introducing a dimension of fundamental research at a European level. At present the establishment of an "European Research Council" (ERC) is seen as the most adequate response to the challenges outlined in the report. The ERC should have the following characteristics:

- Operational/ institutional autonomy (detached from the Commission),
- adherence to international standards of research funding: competition based selection and an application of peer review,

- allocation of funds to awarded applicants in accordance with quality criteria only,
- promotion of research teams as well as single researchers. Non-trans-nationality of research teams should not be a KO-criteria,
- efficient administrative structure and reliable governance.

The establishment of a pan-European agency like the ERC raises questions about the division of functions on the European and national level. To what extent has a clear complementarity, and defined roles of the European agency and its national counterparts to be ensured? The consensus is expressed in the agreed prevention of a rigid division as the inevitable overlapping of national levels and the European level are not only bound to disadvantages.

The debate about the Europeanisation of the research system should also recall the developments aside the dimension added by the European Union. There is already a tendency of increased integration of the national research systems.[7] The European Science Foundation (ESF) for example links national and European resources for the promotion of European researchers by its EUROCORES programme.[8]

Another current development is the increase of trans-national collaboration or rather integration of European research institutes, ranging from strategic co-operation to equity participation. This pattern of internationalisation at the level of research institutes is equivalent to the internationalisation of companies' direct investments in R&D. Thus, the players in the research system(s) respond to the challenges faced, actively shape their environments and herby push the process of integration.

[7] Other established organisations such as CERN (European Organisation for Nuclear Research), EMBO (European Molecular Biology Organisation), JET (Joint European Tours) play a major role, as well as multilateral agreements such as EUREKA diminish the national boundaries of the research systems, and finally contribute to the increased European/ international (i.e. not necessarily restricted to EU boundaries) integration of RTD.

[8] The European Science Foundation was already established in 1974. At the moment this platform hosts 76 member organisations from 29 European countries.

6 The integration of the new CEE member states into the EU RTD framework[9]

6.1. ASSESSMENT OF THE EUROPEAN RTD SYSTEM FROM THE VIEWPOINT OF CEE COUNTRIES

The reintegration into the political and economic systems of Europe – that is, accession to the European Union – has posed a complex, tremendous challenge for Central European countries (CECs) since the beginning of the 1990s. First, the demanding and socially rather costly process of political and economic *transition* had to be completed. Not only macroeconomic stabilisation was required, but fundamental organisational and institutional changes were also needed to transform these countries into stable, middle-income economies, capable of catching up with the more advanced ones in the longer run. These sweeping changes were reflected in the ownership, production, employment and trade structures in CECs in the 1990s, albeit at a different speed, and taking country-specific routes. These economies, in practice, had already been integrated into the EU markets in various ways – via foreign trade links, by joining international production networks, as well as by ownership links – to a large extent, even before becoming member states.

In the meantime, *accession* negotiations had been completed by the end of 2002, and all CECs – among the ten new member states – joined the EU on 1 May 2004. Harmonisation of the written rules has been a formidable task, indeed. Yet, adapting and adjusting the institutions, values and behavioural rules, remains a colossal task well after the formal entry into the EU. In other words, the real challenge is not just to achieve formal membership, but *cohesion* with the advanced, core member states of the EU. Having completed the first round of transition, CECs have again reached at cross-roads: the world economy, as well as the EU itself, has significantly changed during this historically short period of time. Moreover, the EU is going to be reshaped not just because of the global, structural changes, but as the result of the very process of enlargement as well.

CECs now have to consider what role to play in the globalising learning economy: do they passively accept the fate of a merely surviving economy, relying on extended and extensive EU assistance? Or, by implementing a sound and well-articulated strategy, do CECs intend to be prosperous countries in 20-25 years? In that future their citizens would enjoy high living standards, good health and a clean environment, and to sustain that, companies would become strong competitors, and thanks to that, CECs would become net contributors to the EU budget, supporting the cohesion of the even larger EU and its co-operation with neighbouring countries.

The EU leaders have set ambitious goals as a response to the current challenges of globalisation in the form of the Lisbon-Barcelona strategy. It is the best interest of the new member states to define appropriate goals for themselves in this broad framework, in line with the

[9] This chapter is based on a manuscript written by Attila Havas and Wolfgang Polt in spring 2005.

method of open co-ordination. In other words, it would be a serious mistake just to mechanically pursue either the so-called 3 per cent target, or the priorities set in the 6th RTD Framework Programme (or the forthcoming ones).

The paper, based on interviews with high-ranking policy-makers in 4 CECs[10], as well as on background documents and the relevant literature, aims at reviewing the current challenges and options for decision-makers in CECs. More specifically, it discusses

- the context, in which research, technological development and innovation (RTDI) policy decisions should be made;
- RTDI policy goals in the context of FP4-6 (the impacts of FPs on national policies and the other way around, priorities in terms of S&T fields and participants in FP projects, etc.);
- the implementation of national policies on FP participation;
- S&T results and socio-economic impacts of FP participation;
- the prospects of FP participation, in particular and RTDI co-operation at an EU-level (benefits and drawbacks of the 'new instruments' for the new member states and small countries, in more general; the options provided for and challenges posed by the Lisbon-Barcelona strategy).

The paper summarises common features of CECs, but also highlights some country-specific characteristics when discussing the above issues. When summarising the findings, it provides some relevant time series collected by the EU and the OECD, as well as "stylised facts". Yet, specific country cases are not discussed in detail. It is not meant to assess any individual decision or policy approach, let alone ranking countries. However, it draws conclusions as policy proposals to launch a lively discussion, and provide food for thought for follow-up activities, both in terms of policy formation and research on policy processes.

6.2. THE MAIN CHALLENGES

The main challenges of the *transition* to market economy, *accession* to the EU and *cohesion* with the more advanced EU member states have already been presented in the introduction. The inherent contradiction of the transition and cohesion process lies in the tension between the short-term and long-term issues, which have to be tackled simultaneously, while intellectual and financial resources have not been sufficient to deal with all these issues in the same time. Given the planned economy heritage, it was not only the "usual" macroeconomic stabilisation that was required in CECs at the beginning of the 1990s but a much more challenging, more complex modernisation programme introducing fundamental structural and institutional changes. In other words, systemic changes were required in order to transform CECs into viable economies, capable of economically, socially and environmentally sustainable development.

Besides establishing the fundamental institutions of market economies and political democracies – which undoubtedly have had long-term impacts – most efforts had been directed towards solving short-term problems until the mid- or late 1990s. Thus, it had neither been pos-

[10] Unfortunately, no reply whatsoever has been received from 3 countries (1 Central European and two Baltic ones).

sible to pay sufficient attention to the emerging global trends, nor to devise appropriate strategies to improve long-term competitiveness in these new settings. By now, however, CECs have joined the EU, and experienced some negative impacts of the global changes.[11] Would these be strong enough signals to shift the attention of CE policy-makers towards strategic thinking, i.e. somewhat away from 'fire fighting' (assuming that there would be no major 'burning' issues)?

6.3. RTDI AND SOCIO-ECONOMIC DEVELOPMENT: MINDSETS OF DECISION-MAKERS

Would these recent developments also cause a change in the perceived role of RTDI? It might seem to be an odd question in advanced countries, where RTDI is understood as one of the major tools for enhancing international competitiveness and improving quality of life, and thus playing a crucial role in socio-economic development. In CECs, however, R&D is put into a different basket as it is largely regarded as a luxury item. Some high-ranking policy-makers – e.g. the former President of the Hungarian Academy of Sciences[12] (1996-2002), who was a minister of cultural affairs just before the transition – still write about 'science and cultural policy', without ever mentioning innovation (Glatz, 2002). The same author has also coined a new term, 'enterprise science policy', just to avoid using the well-known – and correct – term of innovation strategy (Glatz, 1998, pp. 42-44). In a similar vein, he speaks of the science policy of the EU – and not of RTDI policies and RTD Framework Programmes (Glatz, 1998, pp. 44-46, 111-114). A long list of similar statements can be compiled, e.g. at a UNIDO meeting, held as recently as December 2003, high-ranking officials of the Bulgarian and Rumanian Academy of Sciences claimed that the only source of knowledge is basic research. It is not just a pedantic remark in an obscure, doctrinaire academic dispute to point out how inappropriate these notions are. This sort of terminology clearly shows that policy-makers do not realise the link between RTDI efforts and socio-economic development.

More precisely, it is worth distinguishing two groups of policy-makers, with different roles and responsibilities. Those who are in charge of fiscal policies, focus on short- (or, at best, mid-) term financial target indicators, and tend to pay less attention to long-term issues and impacts. Moreover, they have not seen domestic innovation efforts as a contributor to economic growth either in the planned economy period or in the recent past of market economy; while RTD is perceived by them as a 'burden' on the budget. They, therefore, incline to cut RTD spending whenever there is pressure to reduce budget imbalances, without taking into account the wider, longer-term socio-economic consequences. As a 'mirror' of this ignorance, their colleagues running various S&T organisations only think in terms of isolated science priorities, advocating for more spending on R&D. The latter ones think that R&D results would automatically lead to socio-economic benefits, i.e. they make a connection between RTD and catching-up in their special way. The main deficiency of this view is that it disregards that (i) innovation is a much more complex process; (ii) innovation systems are ham-

[11] Some foreign firms are already relocating their activities from CECs to China and other Asian countries or Eastern European ones.

[12] Academies of Sciences in the former Soviet bloc were quasy science ministries, and they are still running quite a number of research institutes, financed by the state budget. Thus their leaders are still policy-makers, and not just elected representatives of learnt societies.

pered by systemic failures; and thus (iii) there is a strong need for a number of policy tools to remedy systemic failures – besides the ones aimed at increasing R&D spending.

Just to illustrate this point, a high-ranking Hungarian politician[13] systematically repeated in 2003 at various occasions – conferences, radio interviews, etc. – that a paramount priority for Hungary would be to accommodate a new physics research facility, the European Spallation Source.[14] In a similar vein, a leading official of the Hungarian Academy of Sciences (HAS) in December 2003 listed the 'usual suspects' – ICT, biotechnology, nanotechnology – as the most promising fields of S&T, i.e. where R&D must be supported as a key to success. *Nota bene*, this list was given at a conference entitled "Hungarian Science for the Economy and Society", aimed at discussing possibilities for further co-operation on strategic issues between the government and HAS – that is, not topics for 'blue-sky' research.

This way of thinking neglects the fact that there are different types, forms and sources of knowledge – not only R&D conducted in certain, glamorous fields of science. It fails to realise the significance of exploitation of knowledge for socio-economic purposes, by emphasising solely the importance of knowledge creation. From a different angle, it neither takes into account the "other facet" of R&D, namely learning (Cohen and Levinthal, 1989, 1990), nor other ways and channels of learning, which are all crucial to strengthen innovation competences, among them the so-called dynamic technological capabilities (Bell and Pavitt, 1993), and make informed decisions as to what technologies would be appropriate for a given firm or country, how to operate and adapt those technologies to new settings, and most importantly, how to improve upon them. In sum, it clearly cuts innovation from R&D, considering the latter one to be a luxury, or a privilege, for a narrow elite, by ignoring the abundant evidence on the nature and economic relevance of the innovation process, and the concomitant policy implications. From a practical point of view it also means that scarce resources would be spent on prestige projects, as opposed to focussing R&D and innovation efforts to address relevant socio-economic challenges, e.g. health-related and environmental problems, international competitiveness of the domestic firms, etc.

The mindsets of decision-makers are partly influenced by the legacy of the planned economy period, when return on R&D expenditures was a non-issue: R&D activities were primarily conducted for military purposes and the remaining, much smaller part was financed to boost national prestige. A second factor is that foreign investors have introduced innovations – new products, services, processes, as well as new organisational and managerial techniques – 'in bulk' and fast, and thus somewhat eclipsed the role of (domestic) R&D in the innovation process.

As already mentioned, the practical repercussions of these misconceptions are rather severe: whenever austerity measures had to be introduced in CECs in the last 15 years to balance the central budget, RTDI expenditures were always among the first targets. In other words, it is a counter-productive strategy to put innovation into the shade and talk only about 'science':

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[13] He was a general political state secretary at that time, overseeing the Centre for Strategic Analyses (STRATEK) at the Prime Minister's Office. STRATEK is dealing with strategic-political analyses and planning, decision-preparatory studies for, and impact analysis of, planned legislation, EU integration, demography, and innovation. For more details, see http://www.stratek.hu.

[14] This is not only an astronomically expensive project, but also a highly controversial one, and hence its implementation, not surprisingly, has been postponed by the European Union. For further details, see: http://www.neutron-eu.net.

instead of securing more funding, the likely outcome is that RTD(I) activities would always be financed from the residue of the central budget, once all the 'important' objectives are funded. More importantly, the real issue, that is, exploiting RTDI results to enhance competitiveness and improve quality of life is eclipsed by this way of thinking. This outdated, inappropriate perception of RTDI, therefore, should be changed.

Cohesion can only be achieved if it is supported by technological, organisational and behavioural innovations introduced in catching up regions and countries. Thus, RTDI policies are of crucial importance for CE policy-makers when they are trying to formulate adequate responses to the challenges mentioned above. Without devising and implementing sound policies to foster both knowledge creation and exploitation (diffusion) of knowledge, these countries would continue lagging behind the advanced EU members, moreover, the current development gap is likely to widen and deepen.

6.4. TRANSITION CHALLENGES: THE NEED FOR INNOVATION

Innovation can and should play an important role in solving some of the major transition challenges, too. Loss of former markets, and hence the need to find new ones, necessitates the introduction of new products, production processes and services, as well as modern managerial techniques and other types of organisational innovations to raise productivity. Pressures at the macro-level, notably severe budget, trade and balance of payment deficits, also call for a successful, competitive economy, capable of 'growing out' from these traps. Poor quality of life (considering its economic, health, environmental aspects) cannot be improved without thousands of incremental and radical innovations in a large number of fields. Finally, brain drain, which is rather harmful both from an economic and social point of view, can only be reversed, or at least slowed down, by offering attractive conditions for researchers and engineers; i.e. interesting projects, appropriate funds, much better equipment and higher income.

Unfortunately, no comparable data are available on the results of innovation activities in CECs. The EU has conducted the so-called Community Innovation Survey (CIS) three times; the latest survey covers the period of 1998-2001. The results are published in EC, 2004, but only for 17 countries, namely the EU15, plus Iceland and Norway.

Another useful source of comparative data would be the European Innovation Scoreboard (EIS). The most relevant innovation output indicators are as follows:

- sales of 'new to the firm but not new to the market' products (% of turnover in manufacturing),
- sales of 'new to the firm but not new to the market' products (% of turnover in services),
- sales of 'new to market' products (% of turnover in manufacturing),
- sales of 'new to market' products (% of turnover in services).

Again, these data are not available for CECs even in the most recent version of EIS. (EC, 2003b)

However, one can rely on a sort of indirect reasoning when analysing innovation activities in CECs. In brief, fierce competition, in both export markets and the open, liberalised domestic ones, compels domestic firms to innovate. Indeed, case study evidence strongly suggests that they introduce new products and/or processes; they would have not survived otherwise. In most cases, however, these innovations are not based on domestic R&D projects. Quite often they rely on technologies provided by parent companies or other foreign partners, *e.g.* under a subcontracting agreement. Foreign firms are also encouraging their local suppliers to introduce new managerial techniques and other organisational innovations.[15] Joining the international production networks, especially in electronics and automotive industries, has also opened up the gates of the global markets for endogenous firms in CECs. Domestic innovative activities outside the domain of formal R&D do play an important role, too, *e.g.* engineering and re-designing to adjust to local needs and production facilities, as well as upgrading production equipment and tooling up to increase efficiency and/or to introduce new products and processes.

In the case of Hungary, foreign trade data show a radical restructuring both in terms of the main export markets – a swift move towards the overriding share of the EU (see Table 7) – and in the composition of exported goods, namely, a move towards higher value-added products. Meat and semi-finished products had been "dethroned" by telecom equipment, electric, energy generation and office machinery by the end of the 1990s, and that trend has continued until 2003 (see Table 8). This remarkable performance in such competitive markets could have not been achieved without strong innovation performance. Most likely similar developments have occurred in the other CECs, too, albeit at a different pace, and taking country-specific routes, e.g. in terms of sectoral composition of exported goods.

Table 7: Share of the EU/EC countries in Hungary's foreign trade (per cent)

	1989	**1994**	**1999**	**2000**	**2001**	**2002**	**2003**
Exports	24.8	51.0	76.5	75.1	74.2	75.1	73.6
Imports	29.0	45.0	64.0	58.4	57.8	56.3	55.1

Source: author's calculation based on foreign trade data published by the Central Statistical Office

[15] For a more detailed analysis of the major automotive cases, see Havas [2000].

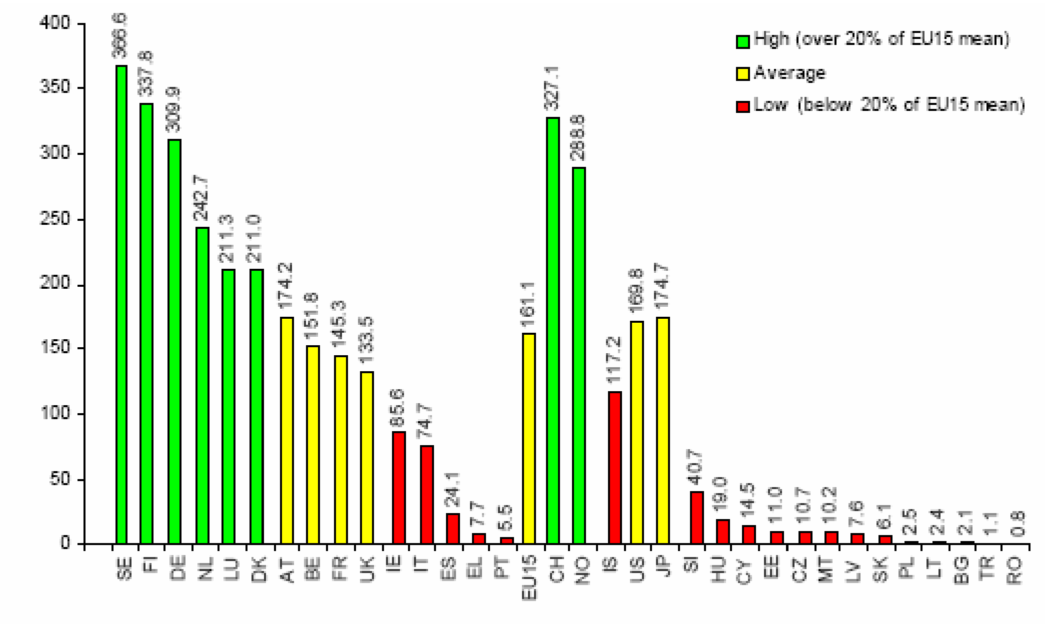
Table 8: Share of the top 10 commodity groups in Hungarian exports (1990, 2003)

1990		2003	
Commodity groups	**Share (%)**	**Commodity groups**	**Share (%)**
Meat products	10.1	Telecommunications equipment	17.1
Chemical semi-finished products	8.6	Electric machinery and components	12.0
Steel semi-finished products	7.1	Energy generation machinery	11.1
Clothing	6.8	Vehicles	8.2
Vehicles	4.8	Office machinery	7.0
Metallurgical raw materials	4.2	General industrial machinery	3.5
Canned fruits and vegetables	3.3	Clothing	3.4
Chemical raw materials	3.2	Other metal products	2.2
Metal semi-finished products	2.3	Furniture and furniture components	1.9
Pharmaceuticals	1.7	Miscellaneous manufactured articles	1,9
Total	*52.1*	*Total*	*68.3*

Source: author's calculation based on foreign trade data published by the Central Statistical Office

A sort of "intermediate" innovation output indicator, however, is available, namely the number of patent applications. Recent data depict a rather gloomy situation in CECs (Figure 10-Figure 11).

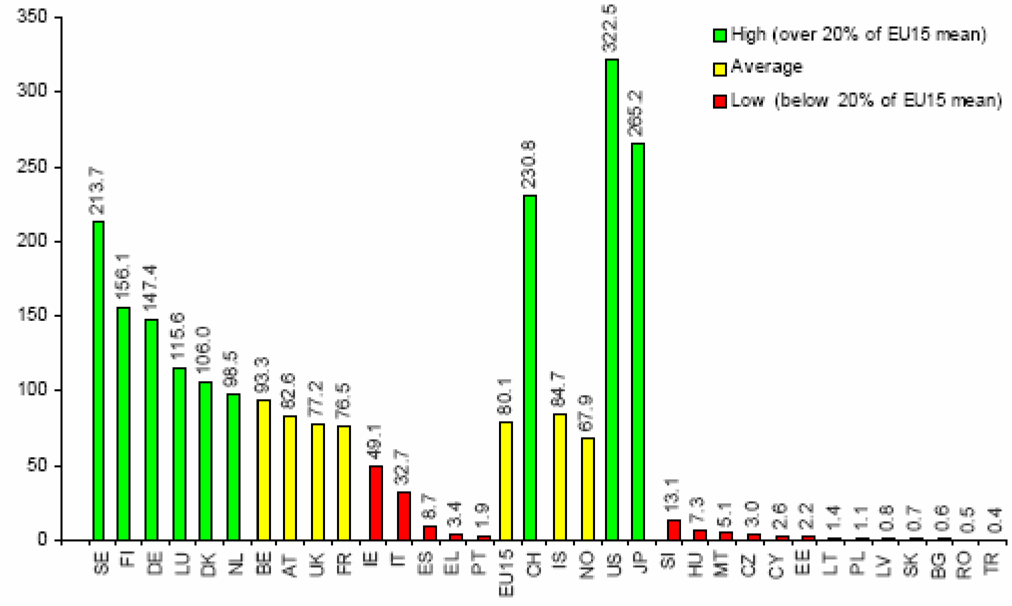
Figure 10: EPO patent applications (per million population)



Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 21

Figure 11: USPTO patents granted (per million population)



Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 23

Box 1: Definition of „USPTO patents granted"

Numerator: Number of patents granted by the US Patent and Trademark Office (USPTO), by date of publication. Patents are allocated to the country of the inventor, using fractional counting in the case of multiple inventor countries.

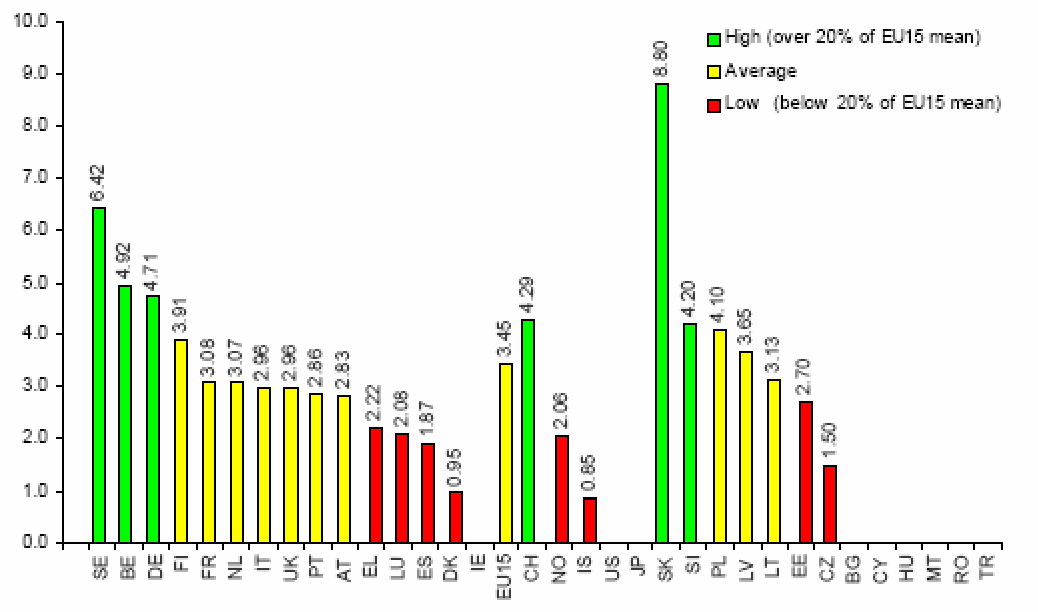
Denominator: Total population as defined in the European System of Accounts (ESA 1995).

Source: EUROSTAT: *Structural indicator II.5.2*.
http://europa.eu.int/newcronos/suite/info/notmeth/en/theme1/strind/innore_pat_uspto_sm.htm

Source: EC, 2003b, p. 23

Two types of input data, namely innovation expenditures (% of turnover in manufacturing and services) are also available for some CECs, see Figure 12-Figure 13.

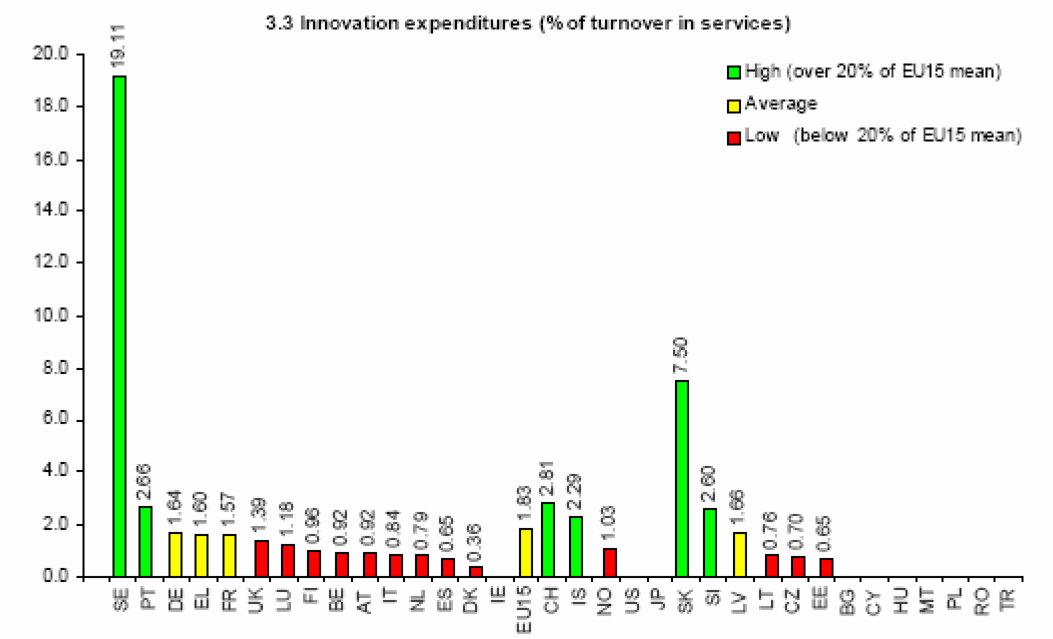
Figure 12: Innovation expenditures (% of turnover in manufacturing)



Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 29

Figure 13: Innovation expenditures (% of turnover in services)



Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 30

Box 2: Definition and methodological notes on „innovation expenditures"

Numerator: Sum of total innovation expenditure for all manufacturing/services enterprises. Innovation expenditures includes the full range of innovation activities: in-house R&D, extramural R&D, machinery and equipment linked to product and process innovation, spending to acquire patents and licenses, industrial design, training, and the marketing of innovations.

Denominator: Total turnover for manufacturing/services. This includes firms that do not innovate, whose innovation expenditures are zero by definition. Manufacturing refers to section D of NACE, services to sections G+I+J+K of NACE.

Source: EUROSTAT: 3rd Community Innovation Survey (CIS-3); national sources
Note: All enterprises with 10 or more employees are included.

Interpretation
This indicator measures the total innovation expenditure as a percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas. Overall, the indicator measures total expenditures on many different activities of relevance to innovation. The indicator partly overlaps with indicator 2.2 on R&D expenditures. A better version would exclude R&D, but concerns over data reliability have prevented this option.

Source: EC, 2003b, p. 29

The above figures show that as far as manufacturing is concerned, two countries, namely Slovakia and Slovenia are doing very well, i.e. spending on innovation above the EU15 mean, while three others, Poland, Latvia and Lithuania are very close to the EU15 mean, whereas Estonia and the Czech Republic are lagging behind. (There is no data for the remaining Central European country, namely Hungary.)

As for services, Slovakia and Slovenia are again above the EU15 mean, Lithuania is around at that level, while Latvia, the Czech Republic and Estonia are below 50 per cent of the EU15 mean.

In sum, innovation is a must to address above challenges, but definitely not a panacea: a coherent cohesion strategy is required, composed of appropriate human resource development, health, macroeconomic, investment promotion, regional development and environmental policies – just to mention the cornerstones – aligned with each other, as well as with the overall, broad aim of socially, economically and environmentally sustainable – and rapid – development.

6.5. RTDI SYSTEM CHALLENGES

The legacy of central planning and the transition process together have caused a number of problems in the CE RTDI systems.[16] Both public and private R&D funds have been cut se-

[16] Space limits do not allow an extensive discussion of these issues here. More details can be found, e.g. in Acha and Balázs, 1999, Bucar and Stare, 2002; Chataway, 1999, EP, 2002; Havas, 2002, 2003; Havas and Nyiri, 2004, Kubielas, 2003; Meske *et al.* (eds), 1998, Müller, 2002; Nauwelaers and Reid, 2002; Reid *et al*. 2002, Radosevic, 1994, 1998, 1999, 2002; as well as the recent Trend Chart reports on CECs.

verely since the early 1990s, due to austerity measures, worsened by the weak position of the funding bodies in the contest for budgetary resources. Again, country differences are not negligible, both in terms of measures and dynamics (time of occurrence during the 1990s) (see Table 9, Table 10, Table 11; Figure 14-Figure 15).

Table 9: GERD as a percentage of GDP

	1991	1998	1999	2000	2001	2002
Czech Republic	2.02	1.24	1.24	1.33	1.30	1.30
Hungary	1.06	0.68	0.69	0.80	0.95	1.02
Poland	..	0.68	0.70	0.66	0.64	0.59
Slovak Republic	2.13	0.79	0.66	0.65	0.64	0.58
EU-25	..	1.73	1.77	1.80	1.83	1.83
Total OECD	2.22	2.16	2.20	2.24	2.28	2.26

Notes: .. not available; for methodological notes, see the original table
Source: OECD Main S&T Indicators, 2004/1, p. 18

When interpreting the above data, one should also take into account the much lower level of GDP per capita in the CECs compared to the EU15 or the OECD average. In other words, the rather low shares of GERD in GDP in these countries are even lower when expressed in absolute numbers, i.e. GERD per capita population (Table 10).

Table 10: GERD per capita population (current PPP $)

	1991	1998	1999	2000	2001	2002
Czech Republic	206.0	161.2	163.3	182.4	193.5	196.2
Hungary	86.7	72.1	76.5	95.0	123.5	142.3
Poland	..	63.4	68.5	67.4	67.0	63.7
Slovak Republic	145.2	77.2	65.8	69.4	72.5	70.8
EU-25	..	352.6	375.4	398.2	421.6	436.4
Total OECD	400.3	470.2	496.9	532.7	557.0	566.7

Notes: .. not available; for methodological notes, see the original table
Source: OECD Main S&T Indicators, 2004/1, p. 18

An especially worrisome feature is that in some CECs, notably in Hungary and Poland, the share of GERD financed by businesses is rather low, and even decreasing in recent years. This trend should be reversed, no doubt. A related snag is the reliability of these data in one case: as the OECD itself has stated, the seemingly favourable Slovak data are overestimated (Table 11).

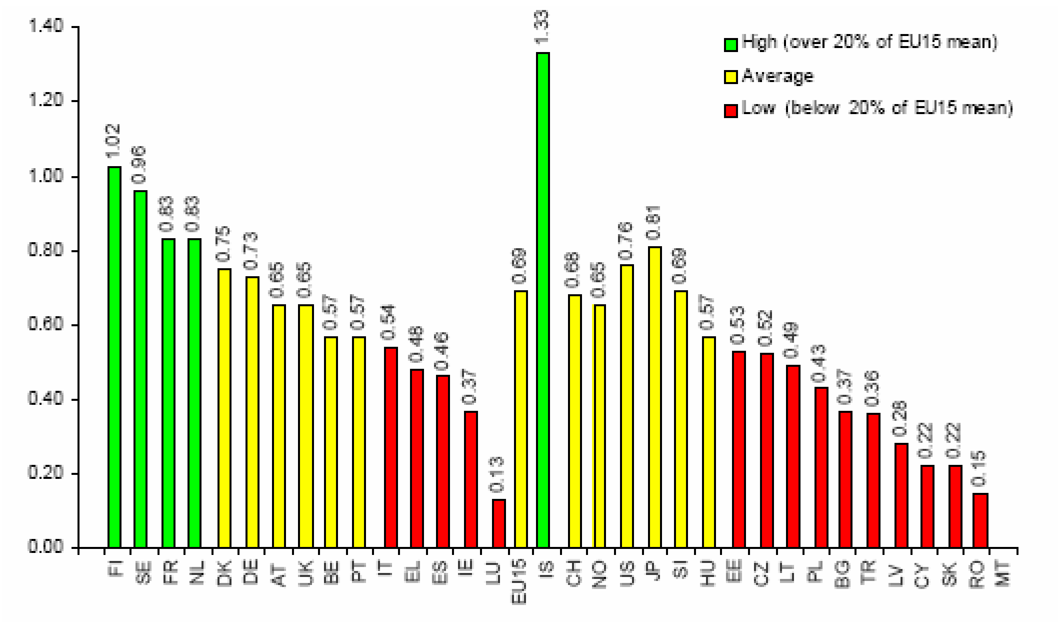
Table 11: Percentage of GERD financed by industry

	1991	1998	1999	2000	2001	2002
Czech Republic	..	60.2	52.6	51.2	52.5	53.7
Hungary	56.0	36.1	38.5	37.8	34.8	29.7
Poland	..	37.8	38.1	32.6	30.8	31.0
Slovak Republic	68.3	51.8[a]	49.9[a]	54.4[a]	56.1[a]	53.6[a]
EU-25	..	54.0	55.2	55.6	55.4	..
Total OECD	58.7	62.1	63.0	64.4	63.6	62.3

Notes: .. not available; for methodological notes, see the original table
[a] overestimated data (see the original table)
Source: OECD Main S&T Indicators, 2004/1, p. 24

The EIS data, providing a detailed country-by-country comparison, can only be read as strong warning signals, similarly to the above OECD ones: public R&D expenditures are below the EU15 mean in most CECs, the only exception is Hungary, at the level of the EU15 mean (Figure 14).

Figure 14: Public R&D expenditures (GERD - BERD) (% of GDP)

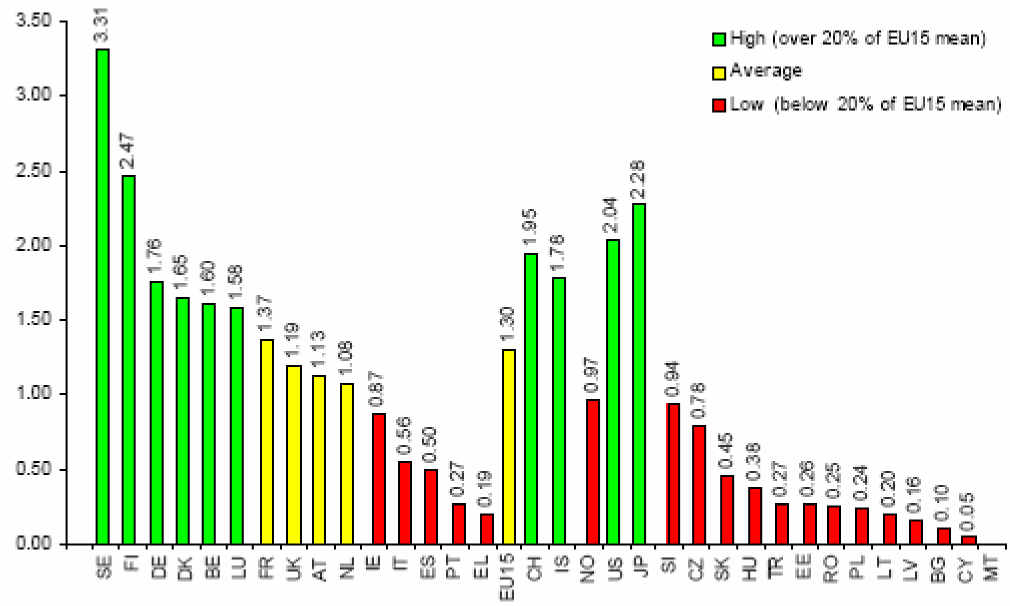


Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 30

What is even more alarming is the low level of the business R&D expenditures (BERD) in all CECs: even the best performer, Slovenia is almost 40 per cent below the EU15 mean, and the others are way behind (Figure 15).

Figure 15: Business R&D expenditures (BERD) (% of GDP)



Source: EUROSTAT, R&D statistics; OECD. Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 30

Given the financial constraints outlined above, the number of research scientists and engineers, as well as that of the R&D institutes, has decreased in most CECs, albeit with non negligible country differences, again. For instance, the number of researchers is recently picking up both in the Czech Republic and Hungary (Table 11). It should be added, however, that e.g. in Hungary the really drastic shrinking occurred as early as the end of the 1980s: in 1988 the country had 21,427 researchers. Compared to that level, one cannot speak of any recovery. (Lack of comaprable data, however, prevents a more detailed analyses of the dynamics of these processes in CECs.)

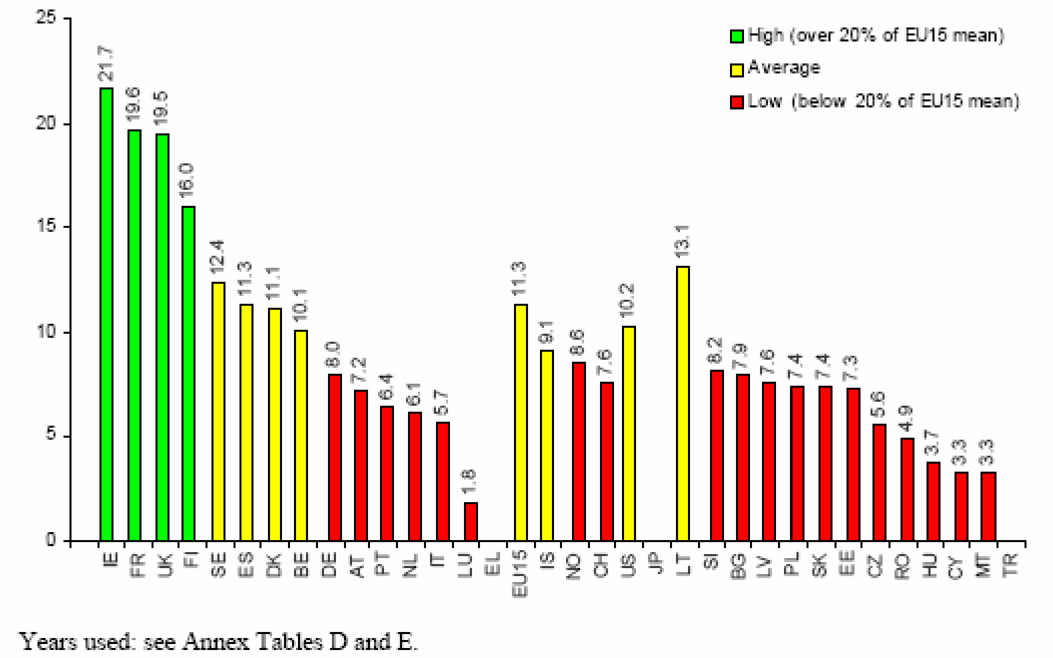
Table 12: Total researchers, FTE

	1991	1997	1998	1999	2000	2001	2002
Czech Republic	..	12 580	12 566	13 535	13 852	14 987	14 974
Hungary	14 471	11 154	11 731	12 579	14 406	14 666	14 965
Poland	..	55 602	56 179	56 433	55 174	56 919	56 725
Slovak Republic	..	9 993	10 145	9 204	9 955	9 585	9 181

Notes: .. not available; for methodological notes, see the original table
Source: OECD Main S&T Indicators, 2004/1, p. 21

These recent, unfavourable trends are reflected in the current unpopularity of science and engineering (S&E) studies in most CECs: young people are simply reluctant to specialise in S&E when job prospects are gloomy in this field (Figure 16). Moreover, the scarcity of business and law graduates, especially until the late 1990s, and hence the much brighter opportunities and higher salaries in those types of jobs, has made those studies much more attractive.

Figure 16: S&E graduates (‰ of 20 - 29 years age class)



Source: EC, 2003b, p. 3

Box 3: Definition and methodological notes on „S&E graduates"

Numerator: S&E (science and engineering) graduates are defined as all post-secondary education graduates (ISCED classes 5a and above) in life sciences (ISC42), physical sciences (ISC44), mathematics and statistics (ISC46), computing (ISC48), engineering and engineering trades (ISC52), manufacturing and processing (ISC54) and architecture and building (ISC58).

Denominator: The reference population is all age classes between 20 and 29 years inclusive.

Source: EUROSTAT: *Structural indicator II.4.1 (Total tertiary graduates in science and technology per 1000 of population aged 20-29).*
http://europa.eu.int/newcronos/suite/info/notmeth/en/theme1/strind/innore_sh_sm.htm

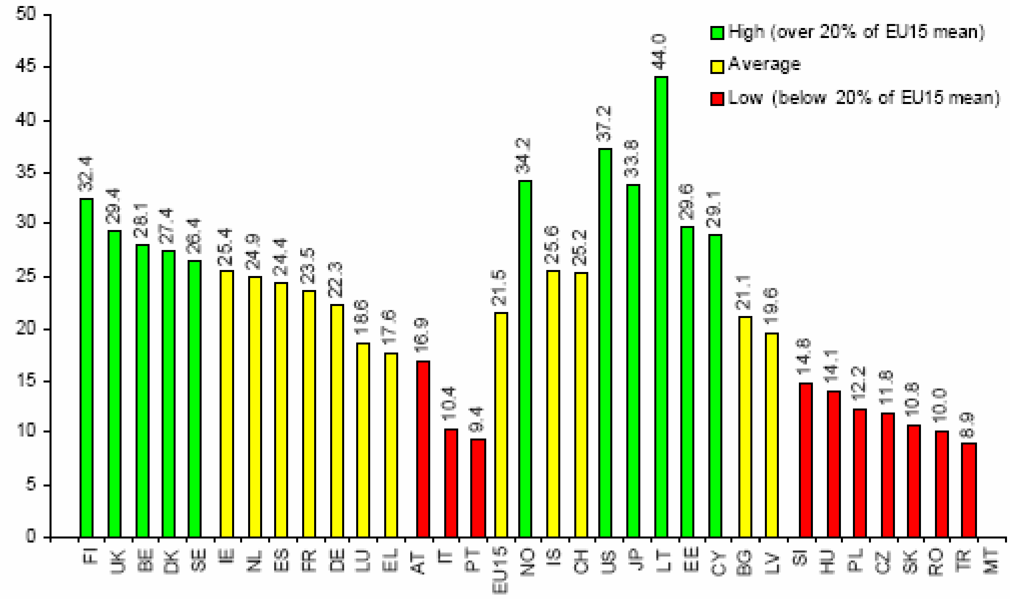
Interpretation
The indicator is a measure of the supply of new graduates with training in Science & Engineering (S&E). Due to problems of comparability for educational qualifications across countries, this indicator uses broad educational categories. This means that it covers everything from graduates of one-year diploma programmes to PhDs. A broad coverage can also be an advantage, since graduates of one-year programmes are of value to incremental innovation in manufacturing production and in the service sector.

Source: EC, 2003b, p. 3

From a different angle, one can safely note, even without relying on comparable data, that brain drain has occurred both internally, in forms of skilled and experienced researchers leaving the R&D sector for other types of jobs, and externally, i.e. trained people leaving their country altogether (either for R&D or other types of jobs abroad). Further, lack of funding obviously made equipment increasingly obsolete – with some exceptions, of course – while the 1990s witnessed a strong need for ever more expensive equipment to keep up with other countries. Again, no data are available to support this observation; yet, it is quite a plausible one.

CECs cannot be complacent in terms of the educational attainment of their workforce, either, although it is quite often praised as an important asset. Yet, available data do not support this positive assessment (Figure 17). One should bear in mind, however, the methodological warning on the limits of international comparisons in this field, stressed by EC, 2003b (see Box 4 below).

Figure 17: Population with tertiary education (% of 25 - 64 years age class)



Years used: see Annex Tables D and E.

Source: EC, 2003b, p. 5

Box 4: Definition and methodological notes on „population with tertiary education"

Numerator: Number of persons in age class with some form of post-secondary education (ISCED 5 and 6).

Denominator: The reference population is all age classes between 25 and 64 years inclusive.
Source: EUROSTAT: Labour Force Survey.

Interpretation
This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, particularly in the service sectors, depends on a wide range of skills. Furthermore, it includes the entire working age population, because future economic growth could require drawing on the non-active fraction of the population. International comparisons of educational levels however are notoriously difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree.

Therefore, differences among countries should be interpreted cautiously.

Source: EC, 2003b, p. 5

From the point of view of catching-up, i.e. the cohesion of the enlarged EU, it is even more worrying that research and higher education are still somewhat isolated in most cases, in spite of the well-documented fact that the most important contribution of academic research to socio-economic development is training skilled labour, who can then work in various sectors of the economy, exploiting not only their scientific knowledge, but their problem-solving skills as well. (Pavitt, 1991, 1998, Salter and Martin, 2001) Another severe problem, noted at a number of meetings, and confirmed by sporadic empirical research, too, is the lack of relevant managerial skills in academia, in particular the ones required for project development, managing international projects and IPR issues, as well the exploitation of results. Further, academy-industry links are still weak in all CECs, albeit to a somewhat different degree – lack of comparable data, however, prevent a more detailed discussion of these differences.

Capital markets have gone far, compared to the planned economy period, but are in their infancy when the needs of innovative enterprises are considered. A special aspect of it can also be seen as a chicken-egg problem: policy-makers tend to emphasise the small sums of venture capital, while business people are likely to stress the lack of worthy projects (i.e. the lack of market opportunities/ incentives to pull together more substantial venture capital funds).

In sum, not only the various elements of CECs' national innovations systems (NIS) are underdeveloped, but their NIS are poorly integrated, too. On top of that, a number of observers have identified a further obstacle to development, namely the persistence of the linear model of innovation in mindsets of policy-makers; that is, the lack of up-to-date, relevant policy knowledge.

To conclude, drastic restructuring, institution-building, learning and unlearning are required in various sectors and at all levels (policy-making, research organisations, firms, individuals), i.e. a sort of "planned, policy-assisted creative destruction" is needed. Yet, in most CECs the innovation policy constituency is small, fragile and somewhat disorganised. Moreover, the RTDI policy framework is bipolar (S&T or Education vs. Economy Ministries), and thus in most cases communication and co-ordination among the ministries responsible for various elements of RTDI policies are either lacking altogether, or rather weak. Public spending on RTDI can only be inefficient in these settings.

6.6. EXTERNAL CHALLENGES

The global movement of capital, activities of multinational companies (MNCs) and the ever more widening and dense web of international production networks pose either threats or opportunities, depending on the policies and other capabilities of a given country.

Foreign direct investment can be '*foot-loose*', i.e. characterised by low knowledge-intensity, low-value added activities, offering low paid jobs. These investors are ready to leave in any moment for cheaper locations. Other types of investors, though, are '*anchored*' into a national system of production and innovation: these are characterised by knowledge-intensive, high-value added activities, they create highly paid jobs, build close contacts with local R&D organisations and higher education institutes, and develop a strong local supplier base.

One of the often used – but easily misleading – indicators of international comparison is the proportion of foreign firms in output, exports or employment. CECs, of course, should seize the potential benefits of learning from leading firms, gaining access to their markets, etc., so as to speed up their catching-up process. Thus, attracting foreign investors with long-term commitments and close links to the domestic firms and knowledge infrastructure are legitimate policy targets – as opposed to pursuing mechanistically the share of foreign firms in economic activities. More generally, the different types of FDI projects should be recognised, and their diverse impacts on the host economies are to be grasped. Policy-makers should also understand that it is not the sectoral pattern of production – the weight of the so-called low, medium or high-tech industries –, but a strong national innovation system, clear strategic goals and conscious policy implementation, what makes a difference between countries: which one can take advantage of globalisation, which one is used just as a temporary, cheap production site, and which is left out altogether from the international division of labour. What matters is putting an appropriate policy mix in place: not single-minded research or industrial policies, favouring high-tech sectors, but co-ordinated investment, industrial, RTDI, education, regional development, and competition policies are required to attract the 'right type' of FDI, and anchor it for a longer period. In short, both policy design and implementation capabilities are crucial – and largely missing in CECs currently.

Another snag of investment promotion is an imminent example of the overall short-term vs. long-term dilemma: how to strike a balance between immediate, volume job creation (which usually associated with low wages and short-term plans of 'foot-loose' investors) and generating skill-intensive jobs (which are usually fewer in number, but offer higher wages, and signal longer-term commitment of the investors). Again, the actual activities to be performed are more important than the sectoral 'label' of the investor: investment promotion schemes should favour knowledge-intensive activities. An even more difficult challenge is to avoid the 'rat race' among CECs for FDI. Yet, escaping this trap would be a highly advantageous development as the current practice inevitably and disproportionately favours the foreign investors.

6.7. SUMMARY OF MAJOR POLICY ISSUES AND TENTATIVE CONCLUSIONS

Managing the EU – national RTDI relationships is a difficult enough task in itself, but CE policy-makers have to cope with this task in a very demanding overall context. They are still faced by a number of pressing needs since the early 1990s (notably unemployment, inflation, budget imbalances, trade deficits), and thus cannot devote sufficient intellectual and financial resources to address long-term issues as they have to focus on the 'burning' ones. This is a genuine danger, indeed, since long-term drawbacks – stemming from neglecting long-term issues –, cannot be felt immediately, by definition.

In the meantime major changes are occurring in the international settings (ever increasing impacts of rapid S&T developments and growing ethical, social concerns about some of them, global activities of MNCs, expanding international production networks, anti-globalisation movements, EU enlargement, opening up of China and thus re-direction of global capital flows, ever stronger environmental concerns, deep conflicts among socio-economic systems based on different set of values, etc.). Given the fact that policy-makers are already preoccupied with the tasks posed by the recent past, and their time and attention is scarce, they might 'fight the previous war', as opposed to devising appropriate answers to the new set of challenges.

Policy learning stemming from international comparison is likely to help facing these challenges, but there is no 'one size fits all' (or 'best practice') way of governing national – EU RTDI co-operation/ policies. Thus, it would be a serious mistake trying to copy policy goals/ schemes of any successful country in a mechanistic way. In other words, learning by interacting/ comparing can only be a useful tool if policy-makers actively participate in these processes.

A number of issues can be highlighted as prime 'targets' for policy learning. Enlargement implies that a different EU is evolving. Obviously, the current decision-making processes cannot be applied in a more diverse, and significantly larger, entity (25 members as opposed to 15 ones). One option is that a less cohesive, 'two-speed' EU would emerge, with a core developing and integrating faster, and hence the gap between the 'centre' and 'periphery' is widening and deepening. This option is, of course, less favourable for most of the new member states, which would be left behind the 'core' (Slovenia, the most advanced one, might be an exception). An important issue, again for both national and EU policy-makers is, whether intensified, more successful RTDI activities can reverse this – almost automatic – course of events. On the one hand, improved competitiveness of the current member states, due to successful innovations, would generate more funds for cohesion policies. In other words, fewer and less intense tensions are likely to arise when contributions to the EU-budget can be financed from expanding domestic resources. On the other hand, successful exploitation of RTDI results in the new member states would improve economic performance, providing a larger pool of internal resources to tackle social, regional and environmental problems, and hence reducing the burden on the EU cohesion funds. To achieve that, the new member states are advised to tackle country-specific socio-economic issues by RTDI, as opposed to use their scare funds to follow FP priorities, by unconditionally supporting domestic R&D units participating in any FP project.

Cohesion can only be achieved if it is supported by technological, organisational and behavioural innovations introduced in catching up regions. In turn, the EU has put a strong emphasis on cohesion so far, and funding earmarked to promote this goal is closely related with RTDI: regional development funds are only accessible if a consistent RTDI strategy is part of the overall strategy. If these trends are going to continue – and at least in the next few years are likely to do so – CE policy-makers have a powerful tool to gain more political clout in domestic agenda setting and funding decisions. This tool is even further strengthened by the Lisbon-Barcelona process. However, it can be can be used in various ways: merely as a good, strong argument for more R&D spending, narrowly understood vs. as an impetus for devising and implementing coherent RTDI strategies. In other words, CE policy-makers have to make a choice between setting mechanistic (R&D spending) targets vs. exploiting opportunities stemming from international co-operation so as to implement a 'localised' Lisbon-Barcelona strategy, and by doing so, aligning and mobilising both public and private efforts.

The Lisbon – Barcelona strategy instigates a more fundamental question, both for the current and new member states.[17] It is difficult enough to convince finance ministers to increase R&D spending by raising public expenditures and inducing private ones through a set of incentives and favourable legislation. Yet, in order to reap the socio-economic benefits, one should also urge the introduction of organisational and institutional changes in the same time, so as to foster innovations. These are costly measures, however, requiring not only more money – beyond the already expanded funds used for financing narrowly defined R&D activities –, but scarce intellectual resources as well, to devise appropriate and efficient policies. Moreover, these additional, 'innovation-minded' policies might disturb strong groups, e.g. 'die hard' scientists, who would claim that extra funds are needed for scientific project themselves. One might conclude, therefore, that this is a self-defeating, counterproductive policy proposal, i.e. it is better to focus just on increased R&D spending. However, not to call for systemic policies – the ones aimed at fostering diffusion and exploitation of knowledge by tackling the so-called systemic deficiencies in regional and national economic systems – is likely to be 'suicidal', too. Substantially increased R&D spending – without 'innovation-minded' policies – is likely to evoke a more visible Solow paradox, or 'European paradox': excellence in research, but significantly poorer economic performance than in the other Triad countries. Hence, it might provoke a strong (counter-)attack from macro economists to cut RTDI spending, and can easily lead to the further diminution of RTDI policies altogether.

[17] In fact, this dilemma applies to RTDI policies in general, i.e. not only to the Lisbon-Barcelona strategy.

7 Conference „Crossing borders – venturing into the European Research Area" – Summary of discussions

In October 2003, 30th and 31st the 6CP Conference was organised by Joanneum Research and the Austrian Federal Ministry of Economics and Labour in Eisenstadt/Sopron to discuss the main challenges of European enlargement for technology policy. All in all, the conference provided a very good forum to discuss some pertinent questions of the future of European science, technology and innovation policy. Discussions were broad in scope, but centered predominantly around a cluster of questions, presented briefly below:

- The question of ***'excellence' versus 'cohesion'*** as targets for European RTDI policy – especially with its implications for the new member states
- The question of ***governance*** of European RTDI policy and the articulation of the various levels (regional, national, supranational) and policy fields (RTDI policy, regional policy etc)
- The ***relation*** between the ***Barcelona*** and ***Lisbon targets***, i.e. the relation between R&D policy and innovation policy.
- The question of the ***effectiveness of the Framework Programme*** to foster the EU's position in the triade.

In the following, some main issues raised in the discussions at the conference are presented.

- A major topic in many strands of the discussions was the question whether the increased emphasis on 'excellence' would run counter to the 'cohesion' target of the EU (e.g. the contribution by Peter Hilger, University of Helsinki, p_hilger@web.de). These concerns were based on the observation that the new member states are undergoing mayor structural changes in their S&T systems. Some of them have seen a steep decline in their R&D capabilities following the breakdown of the old system. A closer observation reveals that some of the new member states – despite their small R&D base and the problems they face - might be able to catch up rather quickly and participate successfully (like Estonia, presented by Ülle Must), while others will face major difficulties, if the excellence principle will be carried through rigorously. Some discussants pointed at the need for the EU to engage much more in infrastructure investment and the building up of S&T capacities in the new member states – and for that matter also in the candidate countries like Romania, Bulgaria, Turkey and also in the countries of the West Balkan initiative. This could be done without compromising on the quality criterion in the selection of individual proposals, but would involve considerable monies from the EU.

  The question of governance was addressed in several presentations and popped up in a number of discussions. Patries Boekholt (Technopolis, NL, patries.boekholt@technopolis-group.com)) maintained that the governance structures to implement the ERA are not yet in place, as the ERA would require a closer collaboration and greater coherence not only in the STI policies of the different member states, but also between STI policies and other policy areas (e.g. regional policy). Many discussants thought this to be an unlikely development to happen – others though it even an unnecessary one, as the realm of STI policy was seen to be one of the last (and legitimate) areas where the countries can compete as locations for R&D, advanced production and knowledge-intensive businesses. Too tight coordination at the European level would probably erase the positive effects of such competition. In reality, as was stressed in the paper by Stefan Kuhlmann (Frauenhofer ISI, stefan.kuhlmann@isi.fhg.de), different governance scenarios are conceivable – and in fact might co-exist without tilting the balance to either level (regional, national, supranational).

With respect to the regional dimension of the ERA, Richard Escritt (European Commission, richard.escritt@cec.eu.int) gave indications that this problem has been recognized by the commission, by presenting – among other things - two initiatives that address the abovementioned problems: (A) the 'Regions of Knowledge' initiative, which - though yet a small initiative in terms of budgets allocated - might have the potential to induce coherent STI policy making on the regional level; and (b) the ERAnet scheme, which supports the – otherwise self-organised – cooperation and coordination between national and regional bodies. Also, he pointed to the fact that a greater share of the structural funds will be devoted to R&D and innovation. This should also create greater coherence between the respective layers and fields of policy.

Some contributions (among others Chris Caswill, ESRC - Economic & Social Research Council, chris.caswill@esrc.ac.uk) asked the question whether, in an emerging European research Area, the hitherto national institutions must themselves become 'multi/supranational' or whether their contribution could be to foster more of 'crossing-borders', e.g. by further fostering personal mobility. In the case of a European Research Council, some arguments in favour of a supranational body were put forward, as the funding of basic research is the most likely candidate for producing 'public goods' on a supranational scale. In other respects, the answers were less certain. E.g. in the question on whether a European fund for technological innovation was needed, a number of participants pointed to the fact that –as such funding would be more amenable to private appropriation and have less obvious pan-European spill-overs – it would be hard to advocate for such a fund in most member states that would not or only to a lesser extent accrue a direct benefit.

- Another major strand of discussions centered around the question whether Lisbon and Barcelona actually 'lie on the same road'. This was taking literally by Michael Stampfer, (WWTF, michael.stampfer@wwtf.at) who explored the different geographical routes and potential symbolic implications of a tour between the two cities. In a more down-to-earth approach, John Barber (Department of Trade & Industry, U.K., john.barber@dti.gsi.gov.uk) pointed to the now well established finding from innovation research that R&D is not tantamount to innovation and by implication raising the level of R&D to 3% of GDP (the Barcelona target) will not necessarily result in the EU 'becoming the world's most competitive region' (the Lisbon target). The potential implications of this finding for European Research and Innovation Policy were raised in the discussion, with some discussants advocating for a greater role of the EU also in innovation policy (e.g. by setting up a similar 'Framework Programme for Innovation') as already exists for pre-competitive R&D, while others warning of the potential detrimental implications on competition in the markets if Europe was to adopt an 'industrial policy' approach of the old type (e.g. favouring 'European champions').

- Some discussants stressed the need to review whether the Framework Programmes for Research and Technological Development have really changed the competitive position of Europe vis a vis the USA, and Japan (or Asia at large). Despite the favourable evaluations of the FPs regarding their significant additionality for the participants and their contribution to the political goals of the EU, some doubts were raised especially with respect to the nature of the research projects of the firms being enough challenging, of strategic importance and of a long-term, high-risk nature. William Cannell (European Commission, william.cannell@cec.eu.int) presented a specific new activity, the NEST (New and Emerging Science and Technologies) in the 6^{th} FP, with which the commission has tried to react to these concerns.

8 Conclusions

The low performance concerning economic growth in the European Union (at least most of the EU-15 countries) is undisputable. Given this growth rate will be develop into a general low trend growth rate there is the potential danger that the EU will lose still more ground concerning the US with respect to GDP/capita. Thus, the impressive catching up process of Europe which was achieved in the latter half of the 20th century would have come to an early end. However, the causes of this pause (and possible halt) of the catching-up process are still unclear and disputed. Although the EU responded relatively quickly to this situation with the declaration of the Lisbon/Barcelona process the results achieved are disappointing, at least for the time being.

Nevertheless the need for enhancing the scientific and technological knowledge base and for fostering of co-operation and integration should not be questioned, even if the short-term results may not be that high as expected. The concept of the European Research Area is by its very nature to be considered as a long term aim and possible set backs in the short run have to be tolerated. In realising the aim of a truly European Research Area the EU faces quite a few obstacles and challenges.

First and foremost, the (too?) many different national interests have to be postponed for a wider (European) interest, a point difficult to sell. A new form of governance of the RTD policy system has to be developed. The implementation of a European Science fund may be a first step towards this direction.

Beside these policy steps at the institutional level of European RTD system (which may be regarded as ‘top-down’) there are signs that a driving force of European integration may be found at the ‘bottom-up’ level. European research institutions and actors are co-operating and interdependent to an increasing extent, thus becoming the forerunners of a truly European Research Area.

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