**The Long Term Economic Performance in Germany**

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***Abstract***

In the EU, real convergence is currently taking place because of the disappointing growth performance of the former economic leader Germany and others, rather than thanks extraordinary growth rates of the most of the catch-up economies. Analysis based on growth accounting proves that EU member nations approaching steady state and suffering stagnation (Germany, Italy) have to switch from a capital based to labour based growth and to boost investment in education and research. Germany can learn from former laggards (UK, Spain) who after painful reforms successfully widened their labour input to invigorate output. This is even more pressing due to the heterogeneity of real exchange and interest rates in the EMU which have facilitated exports but discouraged domestic demand.

***Key Words:*** Factors of growth in Germany, capital based growth, steady state, labour input, total factor productivity

***Introduction***

The question how growth can be accelerated is as old as economics itself. For centuries economist have been trying to figure out factors promoting faster rise in output and standard of living. Contemporary growth theories, foremost the neoclassical growth theory, predict that low-income economies tend to grow faster because of higher marginal production of capital. But empirical evidence does not support this view, as countless examples from the Third World tell. Yet under given circumstances, especially when nations have similar propensity to save and invest, enjoy equal access to technology, and if they do not differ significantly in their endowment with natural resources, the respective economies may converge in terms of per capita income. Put differently, European countries who integrate politically may soon equalise their standard of living because all other prerequisites are given. Hence the idea of EU integration may have a strong economic underpinning.

Growth theory's evidence suggests that conditional convergence between developed and catch-up economies is taking place at a rate of 2 percent p. a. (Barro, 1997, Sala-i-Martin, 1994). Absolute convergence will take place if the economies involved have equal rates of savings and access to the same technology (while roughly equal rates of population growth are assumed within the EU). In Europe, Greece and Spain caught up at a rate of less than 2 percent, and Portugal at a rate of 1 percent p. a. The reason for slower-than-theoretically-predicted conver-

gence may be institutional weakness in the respective country. With fewer impediments to growth nations may reach the same level of income at the theoretical rate, as the experience of Ireland demonstrates: Ireland's GDP, the country with the most spectacular growth in Western Europe, converged towards the EU average at a rate of 2 percent between 1961 and 2000 – exactly as theory predicts.[1]

Ironically, in Western Europe, more precisely in Germany, France and Italy, highest growth and greatest improvements in standard of living happened before, not after the political integration widened and deepened. And even if a negative correlation between integration and growth cannot be justified seriously, experience shows that the best European performers are now past their prime, which occurred in the late 1950s, as well as in the 1960 through the 1970s. Then, Germany, the Scandinavian countries and the Netherlands boasted per capita incomes well above the average of the (then) EU-15, whereas Spain, Ireland, Austria and, the United Kingdom were trailing or falling behind. The puzzling result is that some European examples seem to confirm and other to contradict textbook theory:

Beginning in the early 1960s, Portugal, a catch-up economy, steadily closed the per capita income gap, whereas Greece hovered around 70 percent of the EU-15 average without a clear-cut convergence success. Austria, a developed economy, was converging towards the EU-15 average, while Britain, the sick man of Europe in the mid-1970s, succeeded in turning around the negative trend of ever slower growth and rising unemployment. This is in accordance with other research results (Kaitila, 2004).

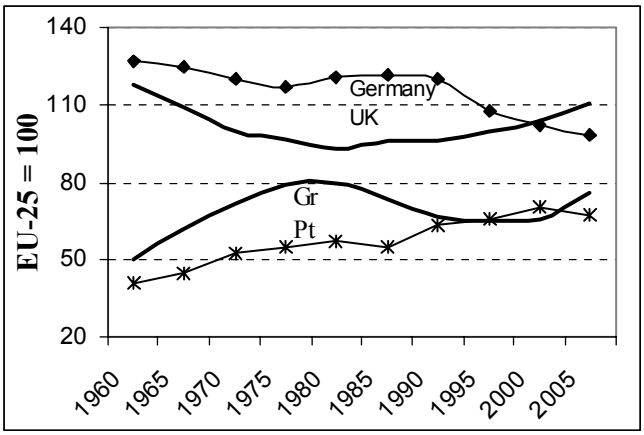
To better understand the German performance, a few comparator economies have been selected, namely such who serve as a typical representative of a broader group of EU member nations:

- France and Italy as big Eurozone economies;
- Great Britain and Ireland representing the Anglo-Saxon model of reforms;
- Denmark and Sweden for the distributive social model of the Nordic countries, and
- Spain as an example of a successful cohesion economy (other EU cohesion economies are Greece, Ireland and Portugal).

[1] This country's per capita income grew from 62 percent of the EU-15 average in 1960 to 125 percent in 2005.

Japan, the non-European post-war success story, and the US, the country with the most dynamic knowledge-based growth – the benchmark economy of the EU Lisbon strategy - serve as a comparator.

Diagram 1: Per capita indexes in advanced and catch-up European economies 1960-2005, EU-15 = 100 percent




Source: EU-Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Table 9.

To analyze the different outcomes of the efforts across Europe to raise income and reduce unemployment, a growth accounting is employed. The first section of the paper studies capital accumulation. In a second section labour input and changes in the level of technology by country are presented. A third section discusses how the currency union has affected individual performance of the participating countries so far.

The growth accounting analysis formulas and results in absolute as well as in per-worker terms are described and summarized in the Appendix in a series of tables. The statistical data refer to the actual and not to the potential growth. But the output gap problem is mitigated in the very long term between 1961 and 2005: while in the early period the economy did mostly overperform, as of the 1980s the output gap turned positive. We therefore assume it has been close to zero on average. While formulas (5) and (6) provide an opportunity to better understand labour productivity progress across sectors, economies and periods of time, we believe analysis based on absolute terms, i.e. on formulas (3) and (4), is better suited to explain growth in Germany and continental Europe, where the employment (unemployment) rate is still relatively low (high). Also, this way to study differences in growth performance across European countries is straightforward with regard to the technological progress, *the* key variable of growth.

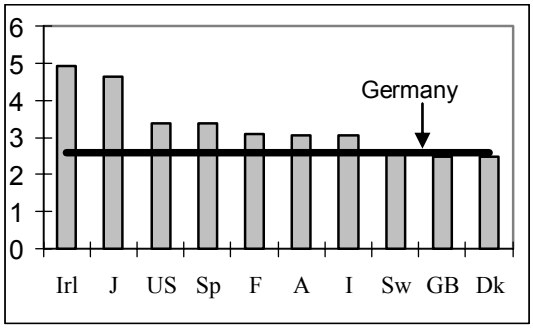
***Growth accounting in the EU 1960-2005: Outcome and interpretation***

Capital input and steady-state level of capital

As stated, the economic performance of Germany against the record of the other advanced countries mentioned above has been unimpressive in the long term (Diagram 2 and Table A1). On average, the country has been not growing faster than, say Great Britain. Yet Britain was often deemed the sick man of Europe, whereas Germany was mostly referred to as the economic engine of Europe. Germany's economy obviously has entered a period of steady decline relative to the rest of the European Union. The reason is ever weaker growth in this country, and not any statistical effect of extraordinary dynamism in partner countries, as one might assume.

Among the big European states, the catch-up economy of Spain has performed since 1960 according to the neo-classical model, although France's GDP has been impressively dynamic too. As for Spain, here growth has been higher than in the rest of Europe save Ireland, so Spain's economy succeeded in real convergence.

Diagram 2: Real GDP 1961-2005, year-to-year percentage change




Source: European Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Tables 79-108.

In the post-war period and well into the 1970 Germany successfully rebuilt and increased its capital stock which resulted in a high capital intensity and labour productivity. But later the country started to suffer from productivity slow-down. In this respect a comparison across the board reveals significant differences among the member states. In the last 45 years, GDP growth was trailing the net capital stock growth in Austria, Germany, Italy, Spain and Japan, prompting capital productivity to decline. In all other observed economies capital productivity was increasing at a pace of 0.2 percent per year between 1961 and 2005.

In a steady state, GDP growth rate can temporarily accelerate if the investment rate increases. However, in the EU this indicator has shown clear tendency to decline – according to Eurostat by 4.3 percentage points between 1960 and 2005[2]. The development in Germany is more severe: while capital formation has been contributing less to output growth, gross investment rates fell by roughly 8 percentage points between 1960s and the early 2000s.[3] As a result the net change in capital per worker and therefore the growth rate of capital stock per worker has been falling too. Diminishing change in the net capital is an indication that Germany and other industrialised nations – Denmark, France and Sweden – are approaching their steady states in terms of capital per worker.

This outcome is on the one hand not unusual for "old" industrialised nations like Germany, where the net capital stock to GDP ratio is one of the highest in the world (3.5)[4]. But capital export at a high rate makes the old the capital-based model more and more limited in this country.[5] Especially capital intensity has been expanding only modestly in Germany in the last two decades.

Against this background, Spain is an interesting case. In Spain, in the early stages of catching-up, i.e. in the 1960s and 1970s, capital stock was growing at the fastest rate in Western Europe, while employment was even shrinking (Table A 2). Therefore growth in this country was clearly capital-intensive, so the capital per worker ratio was expanding at that time. Later the trend reversed: As of the mid-1980s, employment accelerated and capital stock growth slowed, producing a labour-based, instead of the hitherto capital-based growth. This way Spain successfully switched its growth paradigm towards strong reliance on labour input, which helped to significantly cut the unemployment rate in this country between the late 1980s and 2005. The mirror picture of this is a declining growth in net capital per worker, indicating the economy is approaching (but not reaching yet) alongside with Germany and others, a steady state.

Labour input and technological progress

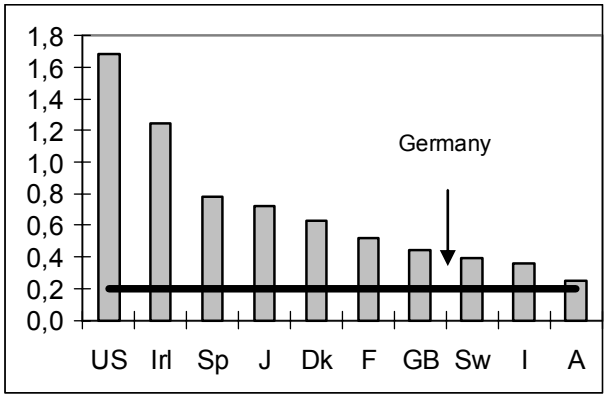
Since the marginal product of capital is meanwhile low in Germany, the other source of growth is population growth, and – importantly – the rate of technological progress. But in Germany more labour input cannot come out of the population growth, as it is stagnating. Rather, the

[2] Source: EU Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Table 19.
[3] Source: Op cit.
[4] Source: EU Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Country Tables.
[5] In Germany investment rate was 18.1 percent of GDP or 5.2 percent of the capital stock between 2001 and 2005. With a depreciation rate of some 4 percent only little is left for reinvestment, so increase in capital per worker is minimal.

strategy should be to increase labour input at the expense of unemployment. Spain is a successful example for this, as well as Great Britain. This country was able to reverse the negative trend of ever rising unemployment in the 1960s and 1970s. For the last 25 years Britain's economy has been growing at almost the fastest rate in real terms among the big EU-15 member states, second only to Spain. In the UK, the growth rate of labour input – roughly one percent per year as of 1986 - has slightly outpaced the rate of population growth, what helped to reduce unemployment.

The importance of labour input and technology for growth is even better visible in the current laggards in terms of GDP dynamics among the advanced nations - Germany and Japan. Yet there has been no help by the other factors of growth: as of the 1990s labour input growth in Japan has been practically zero. Indeed, it has been very moderate in Germany too - 0.34 percent per year in spite of the fact, that significant population growth resulted from German reunification in 1990. The ballooning labour force did not translate into more labour input and growth; rather, a hysteresis of unemployment, accompanied by declining output growth, occurred. For a long while the unemployment rate in Germany has been deemed dramatic and only recently the previous trend seems to change. All other economies under review here have enjoyed greater labour input growth in the long and medium run (Diagram 3).

Diagram 3: Employment growth by country 1960-2005, percent per year




Source: European Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Tab. 79-108.

When it comes to the pace of technological progress, it was not sufficient to invigorate the economy in that country; in fact it has been declining from decade to decade (Tables A2 through A4). For instance, in Japan TFP and labour augmenting technological progress were sluggish in the last decade. The result is that notwithstanding capital intensity was growing at a speed of

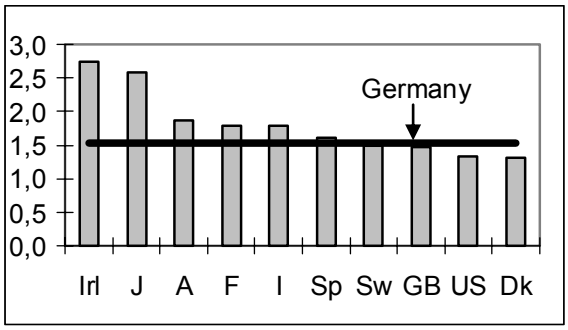
roughly 2 percent per year; the average output growth was meager.[6] This contrasts with the early stages of the Japanese economic miracle and even with the 1960s and 1970s, as TFP has been growing much faster, and clearly faster than in the US. But as of the 1990s the trend reversed: TFP accelerated in America while being lacklustre in Japan (and Germany, Diagram 4).

If we can learn from history, we may see that Britain was approaching its individual collapse in the mid-1970s. Then, a desperate effort to avoid the crash was waged, while employment was identified at the core of the British illness: In the 1960s and 1970s employment growth in the UK was negligible while GDP growth rate used to be far below Western Europe's average. After the turnaround, as of the mid-1980s, and even more as of the mid-1990s, the employment growth accelerated, and helped to almost eliminate unemployment and to raise Britain's per capita income over the Western European average.

Some critics claim the Anglo-Saxon model in Europe (namely in the UK and Ireland) is only successful on paper because of low social standards in those countries (and as well as in the US, the Lisbon strategy benchmark). With this respect the Nordic model is hailed as superior to the Anglo-Saxon model (Aiginger, 2005). Yet in the early 1990s the distributive "big government" social model of the Scandinavian countries was put at risk too, either because of the collapse of the former Soviet Union (Finland) or because of new challenges by globalisation and the demise of the "old economy" (Sweden, Denmark). The only solution for the Nordic countries was to accelerate the rate of technological progress to boost output growth and retreat from the event horizon of social slump and economic woes. Indeed, TFP started to growth by a half percentage point faster from then on in Scandinavia, and GDP growth recovered from the transitional crisis of the 1990s. TFP rate in Denmark matches the performance of the benchmark economy of the US and clearly outpaces Japan and many Western European countries (Diagram 4). Finland and Sweden are identified as the best performers of the Lisbon strategy with respect to innovation and technical modernisation, falling only closely short of the US (World Economic Forum, 2004, Table 1). Obviously, not a given "standard model", but proper economic policy is overwhelmingly at the core of any growth success.

Diagram 4: TFP growth 1961-2005 by country, percent per year

[6] Because the capital intensity increase is weighted by the share of capital in national income (roughly 0.3 for Japan) output growth is small when TFP is small too.




Calculated on data from: European Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Tables 79-108.

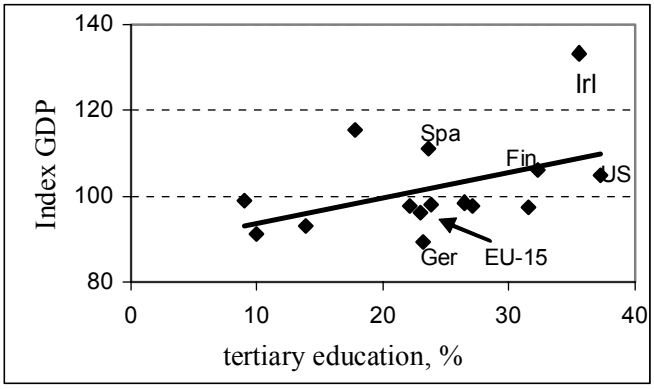
***On the quality of labour***

After an influential article (Mankiw/Romer/Weil, 1992) stressed the necessity to disaggregate the Solow residual and to treat the human capital stock separately, a flood of literature followed. Ever more complicated models emerged introducing ever more parameters capturing patent stock, education, distance to the technological frontier, and so forth. One general weakness of all of this research work is the unsolved problem of the proper gauging the elasticities (the respective shares in the national income of all applied variables) while assuming constant returns, i.e. elasticities sum up to unity. The Mankiw/Romer/Weil paper gives an idea why wage inequality in developing countries is higher compared to industrialised economies with their greater supply of skilled labour (see in Appendix Model 2, Equation (10), below). But it convincingly suggests that education matters: Skilled labour input prompts output growth even if other factor inputs stagnate. This translates into higher standard of living (in terms of higher per capita income) given number of college graduates; see Diagram 5 for the EU.

Mankiw et al. deliver an elegant result (equation 10), but only because α is arbitrarily set at one third. In practice and for the purpose of feasible research, it is hard to find evidence that the "right" elasticities are 1/3. Consequently, it is hard to obtain the marginal products just by applying convenient calculus. The alternative is the – admittedly simpler – equation (1) or (2) in the Appendix model 1. While they are highly aggregate to analyse properly the knowledge and technology-based growth in an *individual* country they are suited for the purpose of cross-country comparisons, especially within an economic bloc like the EU. Since the neo-classical growth theory assumes that the reduction of the technological gap between the leading nations and the laggards is exogenous, obviously, in the European Union there are no particular barriers to innovations. At the end convergence in technology would gradually occur. With saving

and investment rates, technology and resource endowment becoming similar, the economies of the Union shall converge over time and reach same level of development. Therefore, if unequal growth performance by country is producing economic divergence within the EU, the conclusion might be that the reason is poor national economic policy in laggard economies[7]. One candidate is education, especially higher education, which is closely linked to technological progress and thus symbolizes knowledge based growth. As a trend, countries with larger part of population holding university degree tend to grow faster, although there are significant exemptions in Europe (Diagram 5).

Diagram 5: Correlation between quality of education and GDP-position relative to average 1996-2005




Note: Index GDP: GDP country index 2005/GDP country index 1996. EU-25 in 1996 and in 2005 = 100; Tertiary education: University attainment of the 25- to 64-year-old population (1991-2002). Source: Eurostat, Queen tree, General Economic Background, GDP per capita in PPS; OECD, Education at a glance, Table A3.4a, www.oecd.org/dataoecd/52/38/33669031.xls.

[7] Other researchers do not believe in closing the technological gap. They conclude there might be merely a "beta" convergence regarding the level of income in individual nations (Jungmittag, 2003). If this assumption holds, a significant real ("sigma") convergence of standard of living of nations may never happen, not even within economic blocs like the EU.

***On the structural effects***

As the midterm review of the Lisbon strategy figured, there has been no convergence among the old industrial countries towards the per capita level of the US. Moreover, some best performers of the post war period, Germany and Italy, partly France, obviously lost momentum under the "normal" conditions of the post-reconstruction period. This can be contributed to a prolonged reliance upon the "traditional", historically successful German way of ever growing physical capital stock as a prerequisite of increasing output. But in the last quarter century, returns on capital have been diminishing in Europe and in its leading economy, Germany. The result is that, despite higher investment in the capital stock, the EU scores less success in terms of employment and growth than the Lisbon strategy benchmark economy of the US (Table 1).

Table 1: Macroeconomic fundamentals in the EU-15 and the US, 1981-2004 average, percent

| | Investment rate | Research and Investment, share of GDP | GDP growth rate | Unemployment rate |
|---|---|---|---|---|
| EU-15 | 21.4 | 1.8 | 2.2 | 8.6 |
| Germany | 22.1 | 2.2 | 1.9 | 7.5 |
| USA (benchmark) | 19.1 | 2.6 | 3.3 | 6.1 |

Sources: European Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Tab. 3-19; Eurostat, Tab. http://europa.eu.int/comm/eurostat/newcronos/reference/display.do?screen=welcomeref&open=/science/research/r_d/rd_exp/nat_exp&language=de&product=EU_science_technology_innovation&root=EU_science_technology_innovation&scrollto=137.

The research and development (R&D) statistics in Tables 1 and 2 may shed some light on the way the American economy has performed better. Not only has the US spent more on R&D than Europe and Germany as percentage of the respective GDP. It succeeded in shifting the branch composition of its capital stock: away from the "old economy" and more in favour of the high-tech sector of the economy, foremost towards the information and communication technol-

ogy (ICT, Table 2). Earlier than the EU, America started spending considerably more on ICT and much less on passive capital investment like factory buildings and somewhat less on investment in traditional sectors like machines and other non-ICT equipment. So there may be no Solow productivity paradox[8] in Europe, as some authors assume (Pilat, 2004). Rather, the ICT-impact on growth in Europe may rise after the new technology has penetrated Europe's economy more broadly, as new technologies start having effect on productivity when they have reached a 50% penetration rate.

Table 2: Investment composition: Shares in non-residential gross fixed capital formation in the EU-15 and the US 1980-2001, all fixed investment = 100

| Share | EU-15 | USA |
|---|---|---|
| ICT-equipment | 13 | 23 |
| non-ICT equipment (machine building. engineering) | 32 | 30 |
| non-residential buildings | 43 | 37 |

Source: Marcel Timmer, Gerard Ypma and Bart van Ark, IT in the European Union: Driving Productivity Divergence?, Research Memorandum GD-67, Groningen Growth and Development Centre, October 2003, in: http://www,ggdc,net/pub/online/gd67(online).pdf, Table 2.

***Currency union and growth performance in Germany***

To function properly the EMU must meet the criteria of an optimal currency area; the latter is characterised by its capacity to absorb shocks symmetrically. The EMU's capacity to efficiently absorb exogenous shocks can be shown in relation to the development of real exchange rates and interest. Under the conditions of a common currency, changes to the real rate of exchange effectively have to assume the adjustment function of nominal appreciation and depreciation.

With the irrevocable pegging together of exchange rates from 1999, a process began which involved the reordering of the individual economies' competitive positions on the basis of differ-

[8] In 1987, Robert Solow remarked: One can see the computer age everywhere but in productivity statistics."

ent national price changes. It was the case that competitors with cost- and thus price-advantages made use of the common currency in order to better position themselves *vis a vis* their Euro-partners with cost disadvantages. At the beginning of the 1990s, there was a marked tendency towards the alignment of inflation rates amongst the member states. This was contained, however, so that within the common currency area considerable inflation-differentials persisted. Moreover, the large differences between countries as regards price indices since 1999 (the kick-off year of the common currency) have not tailed off.[9] Since the run-up to the EMU, price rises in Germany have been lowest – at around 48% of the index of the EU-12 - followed by France, where inflation rates also lay under the EMU average. By contrast, the price rises in Italy, Spain and a few smaller partners were tangibly larger: In Greece, the inflation rate in this period was 2.63 times, and in Ireland around double, the EU-12 average (see Table 3).

Table 3: Inflation index by country 1995-2004, EU-12=100

| Germany | France | Italy | Spain | Ireland | Greece |
|---|---|---|---|---|---|
| 48 | 76 | 155 | 189 | 211 | 263 |

Inflation: GDP deflator. Source: EU-Commission, DG EcFin, European Economy, Statistical Annex Autumn 2006, Table 24

Developments in the wages and productivity of the EU-12 in the past years have been very different, with the result that wage costs tend to diverge from country to country. Within the Euro-group, Germany's, Ireland's and Austria's competitiveness has grown. In France and Finland it has remained constant, and in the Netherlands and Italy it has fallen. The differential price development (according to various deflators) under the conditions of currency union has caused a real depreciation in Germany and France, and a real appreciation in Italy, Spain and other countries. The improved competitiveness created an export boom in Germany (symbolised by the term 'World champion in exports') and to a degree in France as well. The formerly successful Italian export economy lost market share in the EU, whilst the Spanish current account dramatically worsened. Significantly, Italy's, Spain's and Greece's relative improvement in competitiveness has clearly slowed since the introduction of the Euro; in Ireland, by contrast, scarcely any negative Euro-effect can be identified.

Along with the real exchange rates, the composition of real interest rates in the individual participant countries showed divergent developments. Especially the relationship between labour

[9] The not weighted standard deviation of the inflation rate in 11 nations (without Luxemburg) in 1997-2000, 2001, 2002, 2003, and 2004 was 6.3, 5.2, 5.7, 5.6, und 6.1, respectively.

costs and price level create, under conditions of a common EMU-interest policy, divergent rates of real interest which either favour growth in individual economies (regions) or curb it. Lagging demand throughout the economy is reflected in below average inflation rates; quick growth is, on the other hand, associated with above average price levels. The EMU-wide lowest inflation rate in Germany between 1995 and 2005 resulted in the EMU-wide highest real interest levels; the opposite has occurred in Spain and Ireland which are actually enjoying negative interest. The differences in the inflation environment under the conditions of converging rates of nominal interest in the EMU favour borrowers in these and other countries with higher inflation rates rather than in low inflation economies: they receive credit at a similar nominal rate of interest; they use it at a lower real costs. This explains to a large degree the ongoing construction boom in Spain and the successful GNP development in Ireland. On the other hand, borrowers in countries with low inflation rates feel the Central Bank's single monetary policy is too tight. This is not a particular problem when small economies are affected by it –they can count on the 'big ones' to play the role of locomotive in the economic cycle. Yet in the EU-12, it is precisely these large economies that are suffering from weak demand. This in turn has implications for the ECB's monetary positioning: because the potential gaps become permanent, they level down their growth and inflation targets, and the money stock growth hat would have a positive effect on demand is curbed. In time, the potential gaps close but joblessness stabilizes at a high level.[10]

To sum up: two contradictory tendencies can be identified in two of EMU's largest economies, which yield around half the common BNP: on the one hand, real exchange rate depreciations – coupled with a expanding demand in the other industrial countries as well as in Eastern Europe- tangibly revitalized Germany's export sector ("export champion"). On the other hand, too high a level of real interest in this county has been restraining investment activity and slowing growth until recently. Certainly, in the past, real interest rates were just as heterogeneous in the European countries. Germany was deemed a country of relatively high interest rates, against which the economies with large price rise rates (Greece, Italy) showed clear interest differentials (Table 4). The fragmented nature of the European capital markets produced the low interest rates in these countries, and this has today largely been overcome: in the EU unhindered cross-border capital movements were only a reality from 1990. This hampered an effective interest arbitrage and made governments in Athens and Rome into providers of investment securities in a monopoly. They later inflated the credit debt away. By contrast, Germany enjoyed a stability

[10] The NAIRU/NAWRU is assumed to be close to the actual unemployment rate in the slow growing EMU-economies. For instance, there is hardly an inflation differential between them and the more dynamic OECD countries (see estimations in: Maria Antoinette Dimitz, Output gaps and technological progress in European Monetary Union, Bank of Finland Research Department, Discussion Paper 20/2001, p. 17).

bonus in the 1970s and 1980s, and was deemed an excellent location for investment because of the predictable monetary policy of the Federal Bank. With the creation of the EMU, this advantage was lost, since the ECB is today responsible for all countries that earlier distinguished themselves through their monetary stability.

The distinctiveness of the EMU which does not have a nation-state as a political, linguistic and cultural basis rules out ad hoc solutions for such intra-EU divergence, as illustrated by the distinct performance. Individual actions in terms of fiscal policy are made impossible either by the Stability and Growth Pact or through the ECB's moves against them. Unlike the USA, the adjustment reactions arising from cross-border migration of factors remains only of limited effectiveness. Work mobility, in particular between the EMU economies, is a marginal phenomenon. The EMU-capital, let alone the services market is not fully integrated either and there is no real fiscal federalism in the EU. The outcome is an EMU far from being a working optimum currency area.

Table 4: Average real interest rates* in the EU-15 1971-2004, percent p.a.

| Greece | Italy | Ireland | UK | Luxemburg | Sweden | France | Austria | Germany | Belgium |
|---|---|---|---|---|---|---|---|---|---|
| -1.9 | 2.2 | 2.4 | 2.8 | 2.8 | 2.8 | 3.4 | 3.6 | 3.8 | 3.9 |

*Treasury bonds of the respective government over 5 years. Source: EU-Commission, European Economy, Statistical Annex Autumn 2006, Tables 24-50.

***Conclusions***

Growth, employment and technological progress are state-of-the-art in Scandinavia, and they are in good shape in Britain and – with discount regarding TFP – in Spain too (Tables A3, a3, A4, a4). But the until recently faltering big continental economies of Germany, France and Italy pull the EU average down, causing Europe to trail the US statistically. All three suffer persistent high unemployment, which is producing social unease and – if Okun is right – causing a considerable income loss (according to Okun's law, one percent of unemployment above the natural rate of unemployment costs two percent of output).

An intensive debate emerged among economists trying to understand why employment (and growth) has been so uneven by country in Europe in the recent decades, and why the US has been able to sustain its lead in technology, output growth, and jobs. The startling fact is that,

after a phase of very rapid catching-up with the US in the early post-war period, the US-EU convergence in the levels of per capita GDP at current prices and purchasing power parities came to an end at the beginning of the 1980s. They have been hovering around 70 percent of the US level for three decades. The reason for the unchanged income differential is the clash between two trends in the EU, which have cancelled each other out over the past few decades. Firstly, labour productivity rose steadily compared with the USA; secondly, the number of hours worked declined at the same rate. Thus the income differential was maintained.

Obviously, especially the continental EU did not seize the chance: If working time increased while productivity gap became narrower, the per capita income differential would shrink. However, this outcome is thwarted by the long-term trend of a decline in the rate of employment within the EU. Between 1970 and the end of the 1990s the employment rate in Europe levelled off at around 60 percent (in Germany at approximately 65 percent), whereas all best performers – Britain, Scandinavia, as well as the US and Japan - continually maintained higher rates of employment.

Despite some recent increase in the labour input – mostly associated with slight rise of the employment rate in the EU-15, labour input is widely deemed central to the continental Europe's growth problem. Hence, a heated debate over "leisure" versus "work", symbolising European and American work preferences is going on. A number of hypotheses are put forward to understand the different work ethics on both sides of the Atlantic. Some economists believe taxation, in particular the effective marginal tax rate on labour income, may best explain the large change in relative US-EU labour supply over time (Prescott, 2004). The puzzle becomes even more intricate when introducing socio-cultural components. The latter is relied upon to note that Europeans seem to have taken a good portion of their secular increase in income in less work while Americans have instead taken it in more consumption (Blanchard (b), 2004).

More convincing are explanations reverting to the effects of economic policies in the past and marginal utility of leisure. To some authors the punch line is that Europeans today work much less than Americans because of the policies of the unions in the seventies, eighties and part of the nineties and because of labour market regulations (Alesina, et al., 2005).

So the conclusion is that rise in employment in Germany, France and Italy is the most urgent task and that the need of action with this respect is most pressing. Technological progress is vibrant in the Nordic countries with their high employment rates as well as in Britain. A dynamic labour input in Spain indicates labour utilisation is improving and thus keeping the economy on track. In Germany, similarly, there is a need for more employment to boost output growth and to

allow the capital stock to rise for a while only in line with employment. Germany reports the highest capital stock to GDP ratio in the EU-15 and its economy is therefore closer to steady state. Hence output growth is responding less on capital input but more on labour input, as well as on the rate of TFP. With labour resources poorly utilised – unemployment rate was rising steadily in the last one and a half decade – it is clear the emphasis must be on labour.

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***Appendix***

**Model 1**

***The growth accounting model***

Starting point is a standard form $Y = AK^{\alpha}L^{\beta}$ production function with technology level A and elasticities to sum up to unity. Within the neo-classical growth model the technology parameter A can enter the production in any of several points, usually

$Y = AF(K,L)$ (1).

If assumed that technology is only labour-augmenting, the function is modified to

$Y = F(K,AL)$ (2).

Using a Cobb-Douglas function to interpret equation (1), the output growth $\Delta Y/Y$ is attributed to the weighted rate of growth of capital $\Delta K/K$ and labour $\Delta L/L$, and the non-weighted growth rate of technology $\Delta A/A$. In growth accounting, the weights used are the capital's and labour's share in national income, respectively. The term "technology" is with some justification sometimes simply called "productivity", which reflects more correctly any influence on the output growth, even such not directly linked to technology.

If looking at the absolute values of output and input, and asking how much output changes in reaction of a given change in the input, we may revert to equation (1) to obtain a growth accounting equation of the form

$$\Delta Y/Y = \alpha\Delta K/K + (1-\alpha)\Delta L/L + \Delta A/A \qquad (3).$$

Note, that to obtain (3) we need the linear form of the production function:

$\ln Y = \ln A+\alpha\ln K+(1-\alpha)\ln L$. Small changes of the logarithms $d\ln Y = d\ln A+\alpha d\ln K+(1-\alpha)d\ln L$ give the respective growth rates: $dY/Y = \alpha dK/K + (1-\alpha)dL/L + dA/A$, or - what is the same – equation (3).

In (3) the growth rate of technological progress is weighted by unity, what means it influences both, capital and labour input; this sort of technological progress is also called total factor productivity (TFP).

Applying the same techniques to equation (2), the function obtained is of the form

$$\Delta Y/Y = \alpha\Delta K/K + (1-\alpha)\Delta L/L + (1-\alpha)\Delta A/A \qquad (4).$$

Here the growth rate of technological progress is weighted by the same factor as the labour input. It influences only the labour input and is thus called labour augmenting technological progress.

In growth accounting, most authors prefer to work not in absolute but only in per-worker terms. In equation (3) the growth rate of output per worker $\Delta y/y$ equals the growth rate of GDP $\Delta Y/Y$ minus the growth rate of employment $\Delta L/L$. Similarly, by subtracting the employment growth from the terms on the right side of equation (3), we obtain

$$\Delta y/y = \alpha\Delta k/k + \Delta A/A \qquad (5).$$

Now the central indicators of growth are labour productivity and capital intensity along with TFP.

Also, by modifying (4) we figure out that the central indicators are labour productivity and capital intensity along with labour augmenting technological progress:

$$\Delta y/y = \alpha \Delta k/k + (1-\alpha)\Delta A/A \qquad (6).$$

**Model 2**

The basic Mankiw/Romer/Weil model is best applied when the input's income shares are the same, one third:

$$Y = AK^{\alpha}L^{\alpha}H^{\alpha}, \qquad (7),$$

where $\alpha = 1/3$ and H is the amount of human capital in the economy expressed by the number of college degrees among the workers L.

Then the respective marginal products, MPL and MPH, and therefore the wage levels, are

$$MPL = 1/3A(KH/L^2)^{1/3} \quad (8), \text{ and}$$

$$MPH = 1/3A(KL/H^2)^{1/3} \qquad (9).$$

Marginal products of labor and human capital are calculated as follows:

$MPL = A1/3K^{1/3}L^{-2/3}H^{1/3} = A1/3K^{1/3}\,H^{1/3}\,L^{-1/3}\,L^{-1/3} = A1/3(K/L)1/3(H/L)1/3 = A1/3(KH/L^2)^{1/3}$. Similarly, $MPH = A1/3(KL/H^2)^{1/3}$. Consequently, $MPH/MPL = w_s/w = (KL/H^2)^{1/3}/(KH/L^2)^{1/3} = (L^3/H^3)^{1/3} = \sqrt[3]{(L/H)^3} = L/H$.

Obviously, the relative wage of the skilled workers ($w_s$) increases when the number of unskilled workers increases, and falls when the amount of skilled labour increases:

$$w_s/w = MPH/MPL = (9)/(8) = L/H \qquad (10).$$

Tables A1-A4: Growth rates of macroeconomic indicators by OECD and EU industrialised countries and periods of time, percent per year.

Source: European Commission, DG EcFin, European Economy, No 4/2004, Statistical Annex, pp. 99-330.

Table A1

| **1961-2005** | USA | Japan | Austria | **Ger-many** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital stock, net | 2.9 | 5.0 | 3.4 | **3.0** | 2.4 | 3.1 | 2.3 | 3.3 | 4.2 | 4.0 | 2.7 |
| GDP | 3.4 | 4.6 | 3.1 | **2.6** | 2.5 | 3.1 | 2.5 | 3.1 | 4.9 | 3.4 | 2.6 |
| Employment | 1.7 | 0.7 | 0.2 | **0.2** | 0.6 | 0.5 | 0.4 | 0.4 | 1.2 | 0.8 | 0.4 |
| Labour produc-tivity | 1.7 | 3.9 | 2.8 | **2.4** | 1.9 | 2.6 | 2.0 | 2.7 | 3.7 | 2.6 | 2.2 |
| Capital produc-tivity | 0.5 | -0.4 | -0.3 | **-0.4** | 0.1 | 0.0 | 0.2 | -0.2 | 0.7 | -0.6 | -0.1 |
| Capital intensity | 1.3 | 4.3 | 3.1 | **2.8** | 1.8 | 2.5 | 1.8 | 2.9 | 3.0 | 3.2 | 2.3 |
| LATP | 1.9 | 3.8 | 2.7 | **2.2** | 1.9 | 2.6 | 2.1 | 2.6 | 4.0 | 2.3 | 2.2 |
| TFP | 1.3 | 2.6 | 1.9 | **1.52** | 1.3 | 1.8 | 1.5 | 1.8 | 2.7 | 1.6 | 1.5 |

Table A2

| **1961-1985** | USA | Japan | Austria | **Ger-many** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital stock, net | 3.01 | 6.42 | 3.76 | **3.86** | 3.15 | 3.83 | 2.28 | 4.24 | 4.85 | 4.32 | 3.43 |
| GDP | 3.63 | 6.47 | 3.65 | **3.08** | 3.01 | 3.86 | 2.39 | 4.05 | 4.11 | 4.61 | 3.00 |
| Employment | 1.90 | 1.01 | 0.05 | **0.04** | 0.92 | 0.41 | 0.11 | 0.13 | 0.20 | -0.26 | 0.74 |
| Labour produc- | 1.73 | 5.46 | 3.60 | **3.04** | 2.09 | 3.45 | 2.28 | 3.92 | 3.92 | 4.87 | 2.25 |

| tivity | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital productivity | 0.62 | 0.05 | -0.11 | **-0.78** | -0.14 | 0.04 | 0.11 | -0.18 | -0.74 | 0.28 | -0.44 |
| Capital intensity | 1.11 | 5.41 | 3.71 | **3.82** | 2.23 | 3.42 | 2.17 | 4.10 | 4.66 | 4.58 | 2.69 |
| LATP | 2.0 | 5.5 | 3.6 | **3.0** | 2.0 | 3.5 | 2.3 | 3.8 | 3.6 | 5.0 | 2.1 |
| TFP | 1.4 | 3.8 | 2.5 | **1.9** | 1.4 | 2.4 | 1.6 | 2.6 | 2.5 | 3.4 | 1.4 |

Table A3

| **1986-2005** | USA | Japan | Austria | **Germany** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital stock, net | 2.9 | 3.2 | 2.8 | **1.9** | 1.4 | 2.1 | 2.3 | 2.1 | 3.5 | 3.6 | 1.7 |
| GDP | 3.1 | 2.4 | 2.3 | **2.0** | 1.8 | 2.2 | 2.62 | 1.82 | 5.92 | 3.1 | 2.1 |
| Employment | 1.4 | 0.4 | 0.50 | **0.47** | 0.28 | 0.7 | 0.9 | 0.6 | 2.6 | 1.3 | -0.05 |
| Labour productivity | 1.7 | 2.0 | 1.8 | **1.5** | 1.6 | 1.4 | 1.8 | 1.2 | 3.4 | 1.9 | 2.1 |
| Capital productivity | 0.3 | -0.9 | -0.5 | **0.1** | 0.4 | 0.0 | 0.3 | -0.3 | 2.4 | -0.5 | 0.4 |
| Capital intensity | 1.4 | 2.8 | 2.3 | **1.4** | 1.2 | 1.4 | 1.4 | 1.5 | 0.9 | 2.4 | 1.7 |
| LATP | 1.8 | 1.6 | 1.6 | **1.6** | 1.7 | 1.5 | 1.9 | 1.1 | 4.4 | 1.6 | 2.3 |
| TFP | 1.3 | 1.1 | 1.1 | **1.1** | 1.2 | 1.0 | 1.3 | 0.7 | 3.1 | 1.1 | 1.6 |

Table A4

| **1996-2005** | USA | Japan | Austria | **Ger-many** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital stock, net | 3.3 | 2.0 | 2.7 | **1.6** | 1.6 | 1.9 | 2.7 | 1.9 | 4.6 | 3.7 | 1.3 |
| GDP | 3.4 | 1.6 | 2.1 | **1.33** | 2.4 | 2.1 | 2.74 | 1.54 | 7.18 | 3.2 | 2.6 |
| Employment | 1.2 | 0.0 | 0.49 | **0.34** | 0.43 | 1.0 | 1.1 | 1.1 | 3.6 | 2.5 | 0.61 |
| Labour produc-tivity | 2.2 | 1.5 | 1.6 | **1.0** | 1.9 | 1.1 | 1.7 | 0.4 | 3.6 | 0.7 | 2.0 |
| Capital produc-tivity | 0.1 | -0.5 | -0.7 | **-0.3** | 0.8 | 0.2 | 0.1 | -0.4 | 2.6 | -0.4 | 1.3 |
| Capital intensity | 2.1 | 2.0 | 2.2 | **1.3** | 1.1 | 0.8 | 1.6 | 0.8 | 1.0 | 1.1 | 0.7 |
| LATP | 2.3 | 1.3 | 1.3 | **0.9** | 2.3 | 1.2 | 1.7 | 0.2 | 4.7 | 0.5 | 2.5 |
| TFP | 1.56 | 0.92 | 0.90 | **0.60** | 1.58 | 0.82 | 1.18 | 0.17 | 3.25 | 0.38 | 1.74 |

Tables a1-a4: Growth rates of macroeconomic indicators per employee by OECD and EU industrialised countries and periods of time. percent per year.

Source : European Commission. DG EcFin. European Economy. No 4/2004. Statistical Annex. pp. 99-330.

Table a1

| **1961-2005** | USA | Japan | Austria | **Ger-many** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labour produc-tivity | 1.7 | 3.9 | 2.8 | **2.4** | 1.9 | 2.6 | 2.0 | 2.7 | 3.7 | 2.6 | 2.2 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital intensity | 1.7 | 3.9 | 2.8 | **2.4** | 1.9 | 2.6 | 2.0 | 2.7 | 3.7 | 2.6 | 2.2 |
| LATP | 1.7 | 3.9 | 2.8 | **2.4** | 1.9 | 2.58 | 2.0 | 2.7 | 3.7 | 2.6 | 2.2 |
| TFP | 1.2 | 2.7 | 1.9 | **1.64** | 1.28 | 1.8 | 1.4 | 1.9 | 2.5 | 1.80 | 1.52 |

Table a2

| **1961-1985** | USA | Japan | Austria | **Ger-many** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labour produc-tivity | 1.7 | 5.5 | 3.6 | **3.0** | 2.1 | 3.5 | 2.3 | 3.9 | 3.9 | 4.9 | 2.3 |
| Capital intensity | 1.1 | 5.4 | 3.7 | **3.8** | 2.2 | 3.4 | 2.2 | 4.1 | 4.7 | 4.6 | 2.7 |
| LATP | 2.0 | 5.5 | 3.6 | **2.7** | 2.0 | 3.5 | 2.3 | 3.8 | 3.6 | 5.0 | 2.1 |
| TFP | 1.4 | 3.8 | 2.5 | **1.9** | 1.4 | 2.4 | 1.6 | 2.6 | 2.5 | 3.4 | 1.4 |

Table a3

| **1986-2005** | USA | Japan | Austria | **Ger-many** | Den-mark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labour pro- | 1.7 | 2.0 | 1.8 | **1.5** | 1.6 | 1.4 | 1.8 | 1.2 | 3.4 | 1.9 | 2.1 |

| ductivity | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital intensity | 1.4 | 2.8 | 2.3 | **1.4** | 1.2 | 1.4 | 1.4 | 1.5 | 0.9 | 2.4 | 1.7 |
| LATP | 1.8 | 1.6 | 1.6 | **1.6** | 1.7 | 1.5 | 1.9 | 1.1 | 4.4 | 1.6 | 2.3 |
| TFP | 1.3 | 1.1 | 1.1 | **1.10** | 1.21 | 1.0 | 1.3 | 0.7 | 3.1 | 1.1 | 1.6 |

Table a4

| 1996 -2005 | USA | Japan | Austria | **Germany** | Denmark | France | UK | Italy | Ireland | Spain | Sweden |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labour productivity | 2.2 | 1.5 | 1.6 | **1.0** | 1.9 | 1.1 | 1.7 | 0.4 | 3.6 | 0.7 | 2.0 |
| Capital intensity | 2.0 | 2.2 | 2.2 | **1.3** | 1.1 | 0.92 | 1.25 | 1.08 | 0.96 | 1.0 | 0.75 |
| LATP | 2.3 | 1.3 | 1.3 | **0.9** | 2.3 | 1.15 | 1.9 | 0.1 | 4.7 | 0.6 | 2.5 |
| TFP | 1.6 | 0.9 | 0.9 | **0.59** | 1.59 | 0.8 | 1.3 | 0.1 | 3.3 | 0.4 | 1.7 |