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New economy in Europe – reality or mirage?

From a macroeconomic perspective the term “new economy” describes a phenomenon of persistent strong and low-inflation growth due to the large diffusion of information and communication technologies (ICT). This paper looks into Europe’s position with respect to the new-economy phenomenon. Section III classifies the internet as a new general purpose technology (GPT). The prerequisites for the structural change induced by the internet on the micro-level are analysed in Section IV which compares the diffusion of ICT in various European countries. Section V presents findings of several empirical studies on productivity growth in Europe which look into the relation between ICT spending and labour productivity growth. Finally, the paper analyses determinants of total factor productivity growth which are of special importance in Europe.

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New economy in Europe – reality or mirage?

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November 2001

Abstract

From a macroeconomic perspective the term “new economy” describes a phenomenon of persistent strong and low-inflation growth due to the large diffusion of information and communication technologies (ICT). This paper looks into Europe's position with respect to the new-economy phenomenon. Section III classifies the internet as a new general purpose technology (GPT). The prerequisites for the structural change induced by the internet on the micro-level are analysed in Section IV which compares the diffusion of ICT in various European countries. Section V presents findings of several empirical studies on productivity growth in Europe which look into the relation between ICT spending and labour productivity growth. Finally, the paper analyses determinants of total factor productivity growth which are of special importance in Europe.

Keywords: new economy, productivity growth, ICT, general purpose technology.

JEL Codes: O47, P52

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I. Introduction

The term "new economy" has been in fashion over the past few years and – at the same time – has been widely (mis-)used. It has reached almost the same degree and scope of use as the term "globalisation", naming many different phenomena. From a macroeconomic perspective the term "new economy" suggests a permanent increase in productivity growth and a reduction in structural unemployment with low inflation. At the same time, greater stability of output growth was often cited with respect to the macroeconomic growth "miracle" in the US in the 1990s (EU Commission 2000: 19). However, the recent sharp correction in US growth casts some doubts on the hypothesis that higher trend growth goes hand in hand with dampened cyclical movements.

At the same time there is considerable debate over the question whether the increasing diffusion of information and communication technologies (ICT)¹ is a driving force of higher labour productivity growth.² Often, the US experience during the 1990s, which is characterised by a positive correlation between ICT spending and productivity growth, is taken as proof. However, several empirical studies reveal that most of the productivity effect can be traced to the information-technology (IT) producing sector. A rise in Total Factor Productivity (TFP), by contrast, is fairly limited. This puzzle is solved to some extent when the internet is understood as a general purpose technology (GPT). In that case a large-scale productivity-enhancing effect can be observed only after a time lag when the structural change at company and sectoral level (caused by the increasing use of information technology, i.e. computers, the internet, wireless technologies) results in higher total factor productivity growth. While the evidence of the "new economy phenomenon" for the US is fairly thin so far, it is even more limited for Europe. This article provides evidence of the "new economy phenomenon" in Europe. Before analysing the macroeconomic

¹ ICT is defined as information technology plus telecommunications equipment and telecommunications services.

² Moreover, the new economy phenomenon goes hand in hand with other important changes in economic framework conditions, namely liberalisation and deregulation, increased competition and more flexible labour markets. Also, globalisation is often mentioned as an important driving force.

development, the article focuses briefly on the findings for the US and the concept of a GPT.

II. The findings for the US

When asking what Europe's position with respect to the new economy phenomenon is, it is helpful to analyse the "benchmark", namely the United States. In an analysis of productivity growth the relevant measures are labour productivity³ and total factor productivity (TFP)⁴. Labour productivity growth is – ceteris paribus – determined by changes in the capital stock (capital deepening) and changes in total factor productivity, representing an increase in overall economic efficiency (technical progress). Thus we can denote the growth rate of labour productivity ($y - l$) as follows,

$$y - l = (k - l) * wk + tfp,$$

where y is the growth rate of output, l is the growth rate of labour input, k is the growth rate of capital stock, tfp is the growth rate of TFP and wk is the weight of capital in production.

Among the studies analysing the development of productivity in the US, the work of Oliner and Sichel (Oliner, Sichel 2000) on the one hand and Gordon (Gordon 2000a) on the other are the ones most frequently cited. According to Gordon's empirical estimates the increase in (trend) labour productivity in the US of 0.81 pp in 1995-1999 (compared with 1972-1995) is mainly attributable to capital accumulation (0.33 pp) and less so to a rise in TFP (0.29 pp). Moreover, in an estimate for the sub-sectors of the manufacturing sector, the rise in TFP is concentrated in the durable goods sector, suggesting that the production of ICT goods has become more efficient.

By contrast, Oliner and Sichel – and more recently Nordhaus (Nordhaus 2001) – show that a larger share of the productivity rise can be attributed to an increase in total factor productivity in the non-farm business sector. Oliner and

³ Labour productivity is measured as output per employee or output per hour worked.

⁴ Total factor productivity describes the relation between output and a set of input factors whereas partial productivity measures concentrate on the relation between one factor of production and output.

Sichel estimate that labour productivity increased by 1.05 pp in the period from 1996 to 1999 over the period from 1990 to 1995. This increase is attributable to capital deepening (0.49 pp), but also to a considerable rise in total factor productivity (0.68 pp) which is observed both in the ICT sector and in the rest of the non-farm business sector.

Evidence for a substantial spill-over effect from ICT usage to other sectors of the economy, i.e. efficiency-improving effects, are consequently fairly limited. By contrast, most evidence is in favour of the hypothesis that ICT production undergoes substantial productivity-enhancing effects itself.

III. The internet: a new general purpose technology?

As shown above, capital deepening has been an important determinant of rising productivity growth even in the US. The effect of higher ICT investment on total factor productivity remains uncertain, however (ECB 2001: 39). Nevertheless, this puzzle can be solved to a certain extent when assuming the internet to be a new general purpose technology which has the property of resulting in a fundamental restructuring of the economy in general, and production in particular (Speyer 2000). Under this assumption, the rising usage of the internet does increase productivity, but only after a time lag.

General purpose technologies constitute a radical innovation.⁵ Whether this is the case for the internet is still under debate. Recent articles in the Financial Times reveal that even among academics there is no common understanding concerning this issue. In a reply to an article by Prof. Robert Shiller which had classified the internet as "Just another superhighway" (Schiller 2001) Prof. Ian Mackintosh argues that "the road system was merely an extension and improvement of existing means of physical communication and is, by definition, of limited scope. The internet, on the other hand, has presented us with a radically new means of electronic communication and is essentially infinite in its economic impact." (Mackintosh 2001). While it is certainly debatable whether

⁵ They are thus to be distinguished from incremental technological change, where progress is observable only in small steps.

the impact of the internet is really "infinite", the statement reflects the diverging assessment of the two scholars with respect to the internet being a GPT.

Such an assessment can only be made with certainty in retrospect. However, there are several characteristics of the internet which let us conclude that it can be classified as a new GPT. First, the internet certainly has a **wide range of applications**. Being more than simply a (interactive or one-dimensional) communication medium the web displays information, serves as a platform for trade or collaboration and as a distribution channel. Second, it can be **used in many different industries**, be they financial services, retail, automotives, the chemical industry or part of the public sector. Third, the internet not only itself **undergoes rapid technological change**, but it is also an important driver in the development of **complementary technologies**, be they hardware, software or infrastructure. Fourth, **business processes** undergo substantial **reorganisation** when the internet is made applicable to them. Virtual marketplaces with a focus on procurement, for example, require companies to computerise every step of their supply chain in order to reap the benefits of online inventory management and ordering. From this example it becomes clear that the internet is not a technology to be used in itself but is an "**enabling technology**" – one important characteristic of a GPT.

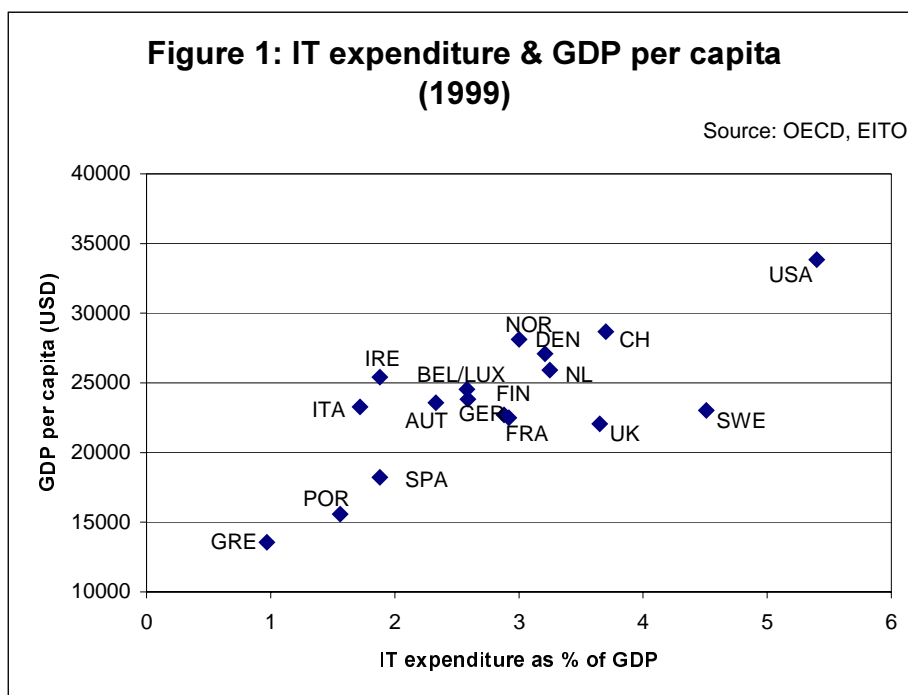
Having thus classified the internet as a GPT it becomes quite evident that the full productivity-enhancing effects will be felt only with a significant time lag. This is evident from historical examples. But it also makes sense when considering the reorganisation efforts which companies have to undergo when employing the internet, the uncertainty under which they act when assessing the potential benefits of using the net and the replacement costs of existing technologies. Such a delayed effect would also be consistent with the empirical fact that some increase in total factor productivity growth has already taken place in the US – which is significantly ahead of Europe with respect to ICT spending and internet diffusion – but not yet on a large scale in Europe.

IV. The microeconomic changes in Europe

According to the empirical findings of the studies on the US, investment in as well as the employment of ICT have the potential of positively affecting labour productivity growth. ICT can influence labour productivity growth through different channels. One is of course capital deepening, i.e. the relative accumulation of ICT capital versus labour. Production becomes more capital intensive and labour productivity rises. A second channel is through spill-over effects from the increased diffusion of ICT in the economy. This would result in higher TFP growth. ICT can be employed in various forms: the internet, mobile services and the use of communication technologies to name a few. The networking of businesses and the leaner allocation of resources in business processes with the help of the internet should – after a time – positively influence total factor productivity growth. This will be the case if companies are able to reorganise and streamline their production process, e.g. by employing supply-chain management tools, or optimise customer relationship management (CRM). Moreover, economy-wide network externalities as ICT spreads could contribute to stronger productivity growth. The third channel refers to the rapid technical progress in the production of IT goods themselves which should be reflected in TFP growth. To sum up, both the employment of ICT within, and between, companies and the technical progress in the production of ICT should be driving forces of an increase in the efficiency of the economic process (TFP growth).

While capital deepening is fairly easy to measure by comparing ICT spending across European countries, the increase in TFP is, by definition, not directly measurable. A case could be made, though, that efficiency rises when a certain threshold (tipping point) in the diffusion of IT technology within an economy is crossed. Only then are positive network effects likely to occur: "... information technologies, such as Internet-ready computers, may create network effects that spur the dissemination of information, resulting in disembodied technical change" (Gust, Marquez 2000: 678). The diffusion of ICT can be measured by

the penetration of internet connections, PCs or mobile subscriptions.⁶ However, the available data refer to households and thus do not reflect the employment of ICT technologies on a business level where the efficiency-improving effects should be felt primarily. Because of the lack of cross-country data on the business level we use household data to give a basic idea about the degree to which diffusion of ICT technology varies from country to country within Europe. Moreover, as internet penetration of households is in some cases complementary to that of businesses – e.g. in the financial services industry where online banking requires households to be online – the following analysis might have more than an illustrative justification.



⁶ It is clear, however, that ICT spending is a more suitable indicator to analyse the economic impact of ICT than PC penetration or other quantitative indicators (Daveri 2000: 6) and should be used in regression analysis. However, internet and PC penetration can serve as a valuable proxy for the quantitative diffusion of technology in an economy and the incurred network externalities.

Figure 2: ICT spending per capita (EUR)

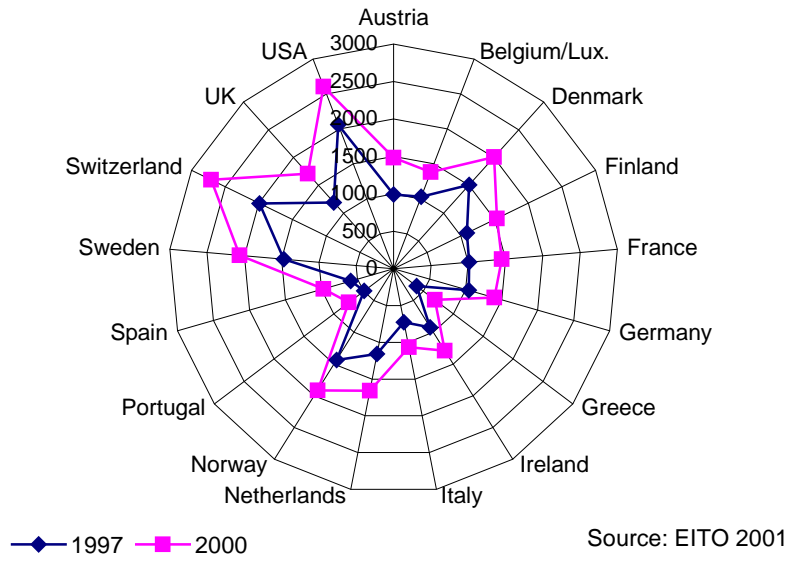
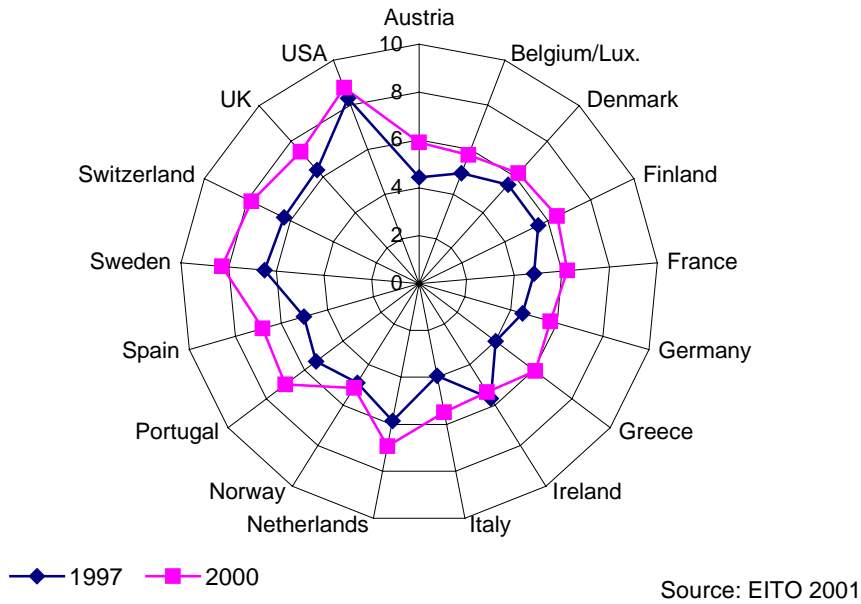


Figure 3: ICT spending (% GDP)



In an analysis of ICT spending in Europe (capital deepening) it is apparent that there are substantial differences from country to country. Generally, IT – less so ICT – spending correlates positively with GDP per capita (Figure 1). As Figure 2 shows, the US and Switzerland are clearly the leaders when measuring ICT spending per capita. Several Nordic countries (Sweden, Denmark, Norway) are next in line, while Italy, Portugal, Spain and Greece bring up the rear. In terms of ICT investment as a percentage of GDP (Figure 3), however, also the UK ranks among the most advanced nations. Some of the big European countries like France and Germany are close to the EU average (also Finland).

It is important to note that a number of those countries that belonged to the laggards in terms of ICT spending in 1997 stepped up their efforts substantially in recent years. This is especially true for Greece, Portugal and Spain with respect to ICT expenditure as a percentage of GDP. However, hand in hand with these countries' comparatively low per capita income, ICT spending per capita is still significantly trailing that of the leading countries. Also, as calculations by Daveri show (Gros 2001: 15)⁷, even if one assumes the EU average growth rate of ICT spending as a percentage of GDP over the last decade (in Daveri's example 12%) to persist, it would take almost 30 years for the EU to reach the level of US ICT spending, assuming that the US share of ICT spending in GDP does not increase further. Thus, it becomes clear that the lagging countries have to step up their efforts even more to reach (at least) the US level soon.

The regional gap between the Nordic countries on the one hand and the Southern European region on the other also becomes apparent when looking at PC and internet penetration and the quality of the infrastructure from country to country. With respect to PC penetration (Figure 4) the Scandinavian countries are almost as well equipped as the US, where 60% of the population own a PC. By contrast, in Southern Europe roughly 10% of the population own a PC; only in Italy does the ratio come to 20%.

⁷ Gros refers to Daveri (2000) *La New Economy in Europa*, IGIER Bocconi, mimeo.

Figure 4: PCs (% of population)

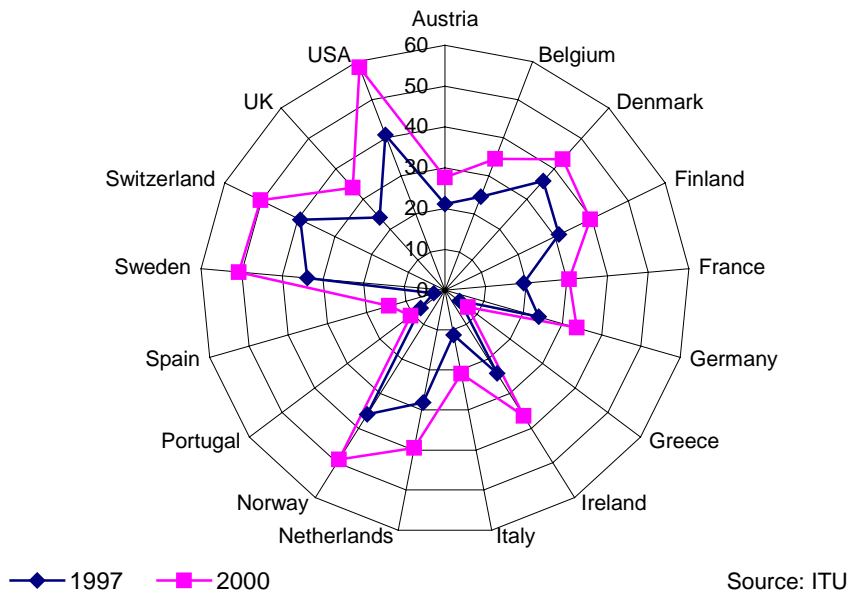
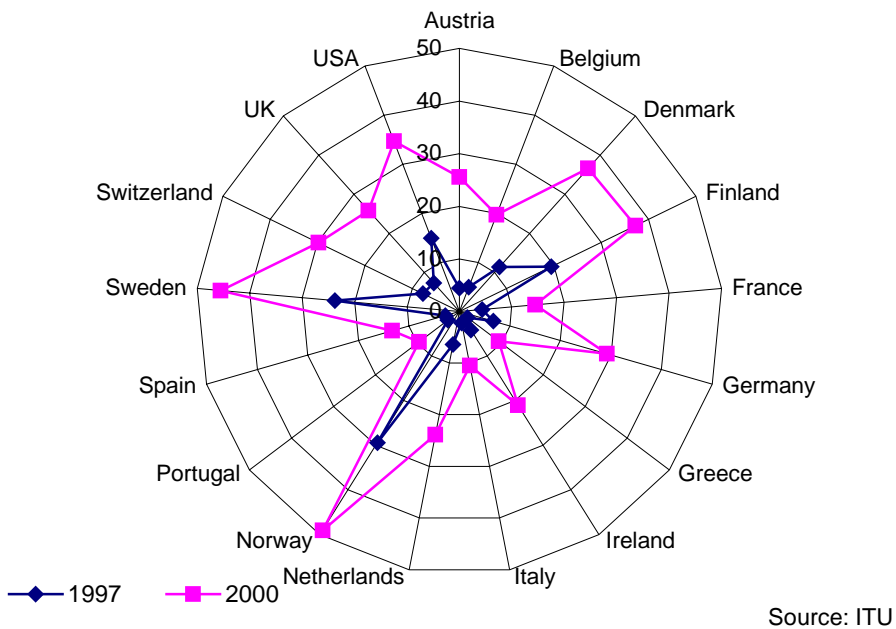


Figure 5: Internet users (% of population)



Although Europeans do not use the internet as extensively on average as Americans the number of users is growing quite uniformly and very fast across all European regions (Figure 5). Sweden and Norway even surpassed the USA's penetration rate in 2000 at around 45% of the population. By contrast, in Italy and Spain only about 10-15% of the population were online that year. Germany, Switzerland as well as the UK were at midfield, with a share of around 30%. The same picture holds true for the number of internet hosts: Northern European countries have on average 10 hosts per 100 inhabitants, versus less than 1.5 in the Southern European countries and 2.5-3 in Germany or the UK.

Europe as a whole is evidently trailing the US with respect to the structural change induced by the internet on the micro-level. Moreover, there is a divide within Europe with respect to the penetration and use of ICT. The Nordic countries appear to be best equipped and have reached or even exceeded the US level, whereas the Southern European countries lag behind. Although it can be noted that some of these countries have increased ICT investment substantially, it will take years until they have reached the penetration level of the top group. The macroeconomic new economy effects in Europe should as a consequence not only diverge substantially from those in the US, but productivity-enhancing effects should also be different within Europe depending on the level and diffusion of ICT investment. Thus, micro- and macro-analysis of new-economy phenomena on an aggregated European level are misleading. Regional data should be used instead.

V. Macroeconomic new economy effects: now or later?

This section presents some findings of recent studies on productivity growth in Europe. We set investigations into aggregated data – which find very limited influence of ICT spending on labour productivity or total factor productivity – against findings for single countries.

The European Commission (European Commission 2000) estimates that labour productivity growth has actually slowed to 1.5% p.a. in the period 1995-1999 compared with 2% in 1991-1995 (Table 1). The main factor of influence for this slowdown is the rise in employment in the European countries in the second half of the 1990s which resulted in a substantial substitution of labour for capital. Another important factor is a reduction in the contribution of non-IT capital (from 0.3-0.4 to 0.1-0.3 pp). The contribution of IT capital to labour productivity (capital deepening), by contrast, increased slightly. At the same time total factor productivity growth in the IT sectors – defined as the computer and semiconductor industries – increased only marginally in the second half of the 1990s (from 0.1% to 0.2%). However, overall TFP growth stagnated as TFP growth in the other sectors of the economy actually decreased, thus cancelling out the small rise in TFP growth in the ICT sector. Consequently, the study by the Commission does not give any hard evidence for the existence of a "new economy" in Europe on an aggregated level.

Table 1:
Growth sources in the EU and contribution of ICT sector

	1991 - 95	1995 - 99	Change
Labour productivity growth	2.0	1.5	-0.5
Capital deepening	1.0	0.5	-0.5
- ICT capital	0.2-0.3	0.3-0.5	0.1-0.2
- capital/labour substitution	0.4	-0.1	-0.5
- other capital	0.3-0.4	0.1-0.3	-0.1- -0.2
TFP growth	1.0	1.0	0
- ICT sector	0.1	0.2	0.1
- other sectors	0.9	0.8	-0.1
Memo ICT share	0.3-0.4	0.5-0.7	0.2-0.3

Source: European Commission

However, the Commission's study suffers from several shortcomings. First, it does not include software when analysing the effects of capital deepening – a component which is of significant importance in the US (Gros 2001: 12).

Second, labour productivity is measured on the basis of individuals, not hours worked.⁸ Against the backdrop of the shortening of the work week in numerous European countries over the past years and the rising importance of part-time work calculations on the basis of the number of employees lead to an underestimation of labour productivity and thus TFP growth.

Table 2:
Decomposition of euro area labour productivity growth*

	1991 - 95	1996 - 99
	absolute contribution to growth (percentage points)	
ICT capital deepening	0.26	0.39
- inform. equipment	0.10	0.14
- software	0.10	0.21
- communications equipment	0.06	0.04
Other capital deepening	0.73	0.28
TFP	1.41	0.61
	ann. aver. percentage growth	
Labour productivity	2.4	1.3

Source: ECB

* Euro area estimate based on France, Germany, Italy and the Netherlands, which together account for around 77% of euro area nominal gross value added

A study by the European Central Bank (ECB) (ECB 2001: 37) eliminates the problem described above by calculating euro area productivity growth on the basis of hours worked. Taking into account that average hours worked per capita decreased 0.37% in the period 1990-2000, the ECB study still calculates a slight downward bias in productivity growth in Euroland as a whole over the past decade. However, the decline in the labour productivity growth rate is

⁸ The EU Commission acknowledges that there is a sizeable difference between the two concepts for the EU whereas it is negligible for the US (European Commission 2000: 100).

much less pronounced than the Commission's analysis suggests. By contrast, taking only the four big EU countries (France, Germany, Italy and the Netherlands) labour productivity growth (per hour worked) decreased much faster (from 2.4% in 1991-1995 to 1.3% in 1996-1999) (Table 2). The determinants of this development are a decreasing contribution of other capital than ICT to growth and a declining growth rate of total factor productivity compared with the first half of the 1990s. By contrast, an increase in the rate of ICT capital deepening is observable in the second half of the 1990s. Both software and hardware play a major role in capital deepening whereas the contribution of communication equipment is negligible.

Although a more detailed analysis of the sectoral development of ICT spending does not take account of the change in working hours and uses the simpler approach on the basis of employees, it sheds some important light on the contributions to productivity growth by ICT-producing and using sectors. The sector analysis is based on aggregated figures for Germany, France, Italy and Finland (Table 3, Appendix). It is apparent that – comparable to the development in the United States – the highest growth in labour productivity is observable in the ICT-producing sectors (manufacturing). Labour productivity grew 14.2% in the period 1995-98 compared with 12.9% in 1991-98. Growth in the second half of the 1990s was obviously more dynamic, thus also mirroring the US trend. In the US the figures were 19.2% and 21.3%, respectively (Table 4, Appendix). In contrast to the US data, in the four euro-area countries labour productivity growth was also highly dynamic in the services-producing ICT sectors, picking up substantially in the second half of the 1990s. As for the ICT-using sectors, the results are ambiguous both for the US and the EU aggregate. The ECB thus concludes that "... the absence of stronger dynamics in the ICT using sectors than on average in the manufacturing and the business services sectors suggests that, over the period examined, positive spillover effects from the use of ICT have only been limited if present at all" (ECB 2001: 42). However, the sector study by the ECB also suggests that spillover effects for

the US were fairly limited and occurred if at all only in the ICT-using services sectors which record an increase in labour productivity growth.

The aggregation of data for different EU countries is certainly justified to get an adequate picture for the region as a whole when assessing "new economy" effects. This is of major importance for the reaction of monetary policy to a potentially higher "speed limit" on the growth of the euro-area economy. However the aggregation of figures might actually blur the results because of significantly different ICT spending levels and productivity developments within Europe. The Commission states that "the aggregate picture masks considerable differences across EU Member States" (EU Commission 2000: 102).⁹ One could make the case that European countries with a significantly higher share of ICT investment as a percentage of GDP and higher penetration rates, e.g. of PCs and internet, might actually be in a better position to experience new economy effects similar to those in the US. While only some of the countries in question are euro-area participants – and the results are thus of limited interest to the ECB – the results are nevertheless of importance to get a better understanding of the effects caused by higher ICT spending.

A detailed study of labour productivity in the OECD countries by the Federal Reserve (Gust, Marquez 2000) shows that next to the US, Switzerland was the only European country which experienced an acceleration in labour productivity growth in the second half of the 1990s compared with the first (Table 5, Appendix). In most larger European countries (Germany, France) labour productivity growth clearly decelerated, while in some smaller countries with an average share of ICT spending in GDP labour productivity growth rates remained on an elevated level during the 1990s (Finland, Ireland). By contrast, Italy (a clear laggard with respect to ICT spending), but also the Netherlands and Spain, saw labour productivity growth collapse.¹⁰

⁹ See also Daveri (2000) for results on four large EU countries.

¹⁰ These countries have employed extensive labour market policy tools in recent years.

In all European countries a slowdown in the rate of capital deepening was observable which was particularly pronounced in Spain and the Netherlands.¹¹ However, changes in the rate of multi-factor productivity growth were generally of higher importance to changes in labour productivity than capital deepening. Gust and Marquez thus conclude that “[c]hanges in multifactor productivity growth rates thus appear to have played the pre-eminent role in accounting for divergences in the movements of growth in U.S. and foreign [European] labor productivity” (Gust, Marquez 2000: 672). However, this observation does not imply that TFP growth strongly correlates with countries’ per capita ICT spending. While such a case could be made for Switzerland and Sweden (positive correlation) on the one hand and for Italy and Spain (negative correlation) on the other, Norway saw a deceleration in TFP growth even though it is among those countries recording the highest ICT spending per capita in a European comparison. The same is true for Denmark. However, one has to acknowledge that Norway, Sweden and Finland report above-average TFP growth rates in Europe.

The results obtained by the European Commission sketch a similar picture. The Commission finds that there are some countries in which TFP growth has risen significantly in the 1990s compared with the 1980s, e.g. in Ireland, Finland and Sweden. With the exception of Ireland, however, TFP growth slowed in the second half of the 1990s, although these countries maintained far above-average growth rates. For most bigger European countries a slowdown can be observed – with the exception of Belgium and France, where TFP growth improved on very low levels.

Summing up, most EU countries clearly experienced a decline in labour productivity and total factor productivity growth during the second half of the 1990s compared with the first half. New economy effects, i.e. spill-over effects of increasing ICT spending, can thus not be observed for the EU as a whole. However, the analysis of country-specific data suggests a slightly different

¹¹ Employment growth likely plays a role in this context as Gust and Marquez measure labour productivity per employee.

picture. Those countries with high ICT spending per capita in most cases also experience TFP growth on a higher level, although in most cases it does not accelerate (with the exception of Switzerland). While thus a case can be made for not using aggregate European data when analysing so-called new economy effects as the inhomogenous development of productivity within Europe might lead to misleading results, hard evidence for spill-over effects remains fairly weak. This is also the case because detailed data on the contribution of ICT to TFP growth are not available.

Two broad sets of open questions remain. The first deals with the reasons for decreasing labour productivity growth in Europe versus an acceleration in the US. In this context differences in how prices are measured¹² (methodology) and cyclical arguments¹³ are mentioned frequently. The second is actually a subset of the first and deals with the determinants of TFP growth as the analysis of ICT spending has remained insufficient. We concentrate on the latter.

VI. What is determining TFP growth in Europe?

Changes in labour quality and spill-over effects of a relatively large ICT-producing sector – as observed in the US – might be factors affecting TFP growth. The first argument essentially captures the adverse effects labour-market policies in Europe might have on TFP growth and explains differences on a country level within Europe as well as differences versus the US.

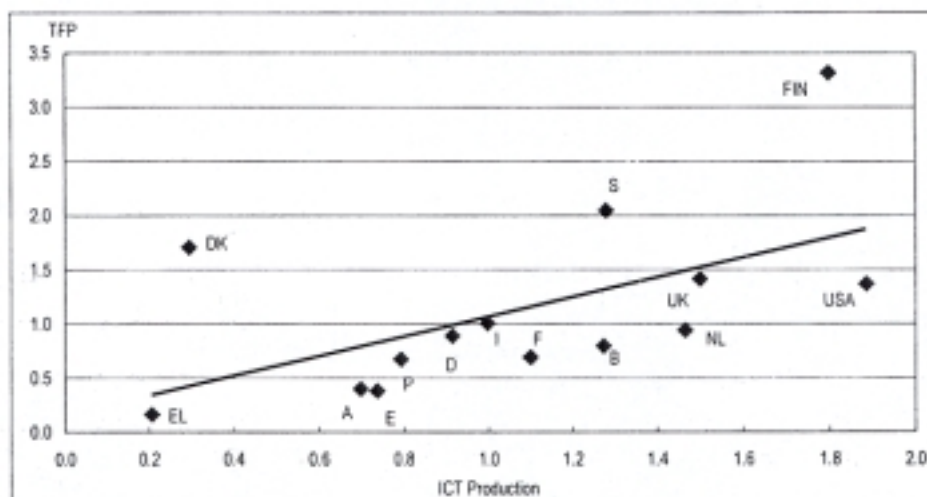
¹² This argument refers to hedonic price measures in the US as opposed to conventional price measurement in most European countries. The hedonic method allows the deflation of nominal variables by taking into account qualitative differences in goods. These differences in measurement have a substantial effect on productivity in an international comparison (Gräf 2001).

¹³ A second aspect relates to a structural versus a cyclical improvement in productivity. Both the US and Europe experienced an improvement in their cyclical position during the 1990s. It could thus well be that the acceleration in productivity in the US is predominantly a cyclical phenomenon which is more pronounced than the improvement observed in Europe.

The second argument seeks to make a case for TFP growth increasing on account of innovation in the ICT sector itself, thus trying to explain the diverging development of productivity growth versus the United States. Sketching TFP growth and the share of ICT in production for various European countries (Figure 6), a positive correlation is observed suggesting that countries with larger ICT sectors indeed experience higher TFP growth. The share of the ICT-producing sector in the US and Finland was, at 1.8% of nominal value added, more than twice as high as in the European countries under consideration. This might actually explain Finland's extraordinary TFP performance against the backdrop of the country's close to average ICT spending. Regression results calculated by the EU Commission show that the share of ICT production does play a major role in explaining TFP growth for Europe as a whole (European Commission 2000: 106 and 129). This is not really surprising as it tallies with the results obtained for the US that technical progress in ICT production actually plays a major role in the growth of TFP. It also is in line with the results obtained by the ECB.

Figure 6: TFP growth and ICT production share (1992-1998) (%)

(European Commission 2000: 128)

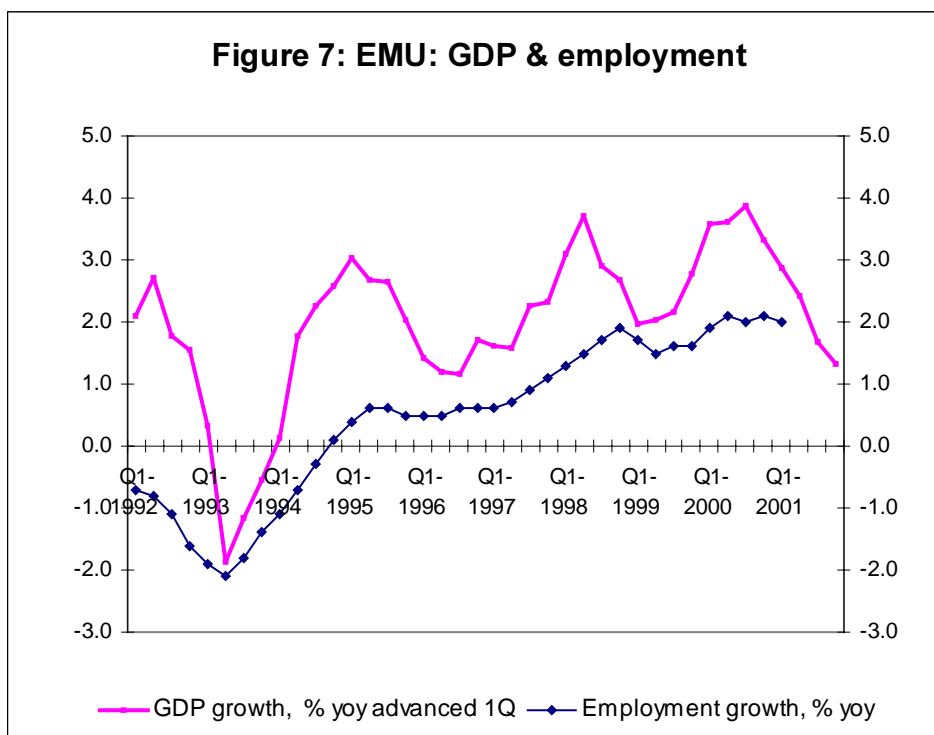


However, detailed calculations of the contribution of the share of ICT production to TFP growth are considerably flawed by the lack of data on TFP growth for the sub-sectors of the economy (European Commission 2000: 219f). Also, according to the above-cited regression results, the Commission finds that this factor does not fully explain the extraordinary performance of the USA, Sweden and Finland in terms of TFP growth. A dummy employed for these countries in the regression – and thus a not fully explainable factor – actually has the largest coefficient. The Commission concludes that the high significance of the dummy "is due more to sector specific developments in these countries, as evidenced by the productivity acceleration in these countries' high tech sector."

The quality of human capital could also be a determinant for the differences in productivity development in Europe versus the US. An OECD study shows that growth of US labour quality was relatively stable between 1981 and 1998 (Scarpetta et al. 2000: 36ff). However, changes in labour quality were of greater importance to changes in labour input in Europe. The EU Commission's calculations show that the substitution of labour for capital affected labour productivity growth negatively in the EU in the 1995-1999 period (-0.1 pp). This is attributable to the substantial employment creation Europe experienced in the last couple of years. Employment growth in the European Economic and Monetary Union, for example, increased from below 1% in 1995 to roughly 2% at the end of 2000 (Figure 7). While the re-integration of jobless persons in the labour market is certainly a positive development in the struggle to combat widespread unemployment, overall labour quality might actually have been negatively affected.

The OECD study finds that in some countries corrections for labour quality result in rising total factor productivity growth in the second half of the 1990s compared with the average of the 1990s, whereas without this correction TFP growth actually decreases. This is the case because a deterioration in labour quality leads to an underestimation of labour productivity and thus TFP growth. According to OECD data a deterioration of labour quality can be observed especially in Italy and France and, to a lesser extent, in Sweden. Presumably

the rise in employment of less skilled workers in these countries in the second half of the 1990s affected TFP growth negatively.¹⁴ Unfortunately, no data are available for Spain, Portugal or Greece where similar results could be expected. Evidence from labour market reform supports this hypothesis. A number of governments have stepped up their efforts to improve the employment situation in their respective countries, including France, Italy and the UK where in recent years a high number of unskilled workers entered the job market. As there is no consistent data set for Europe with respect to labour quality changes a general assessment can hardly be made. However, in some countries decreasing labour quality certainly had adverse effects on TFP growth.



VII. Conclusions

So far the "new economy" in Europe is more mirage than reality. Even in the US there are no clear signs of spill-over effects from increased ICT investment on

¹⁴ In the UK deteriorating labour quality can be predominantly observed in the first half of the 1990s whereas the correction is less significant for the second half. Nevertheless, correcting for the effect in labour quality results in a significant pick-up in MFP growth during the 1990s. See also Euroframe (2000) on labour market policies in different European countries.

the efficiency of the economic process. In the US, rising labour productivity growth was observed in the second half of the 1990s, whereas in Europe just the opposite was the case. While for Europe as a whole most studies show capital deepening with respect to ICT, evidence on TFP growth is rather disappointing. TFP growth actually declined during the second half of the 1990s. On an aggregated level, it becomes evident that – as in the USA – growth in labour productivity is most vigorous in the ICT-producing sectors, especially in manufacturing, and to a somewhat less pronounced degree in services. Spill-over effects are hardly visible.

Using aggregated data might lead to misleading results, however. Europe is facing a north-south divide with respect to ICT penetration. Taking into account that a certain tipping point has to be surpassed for ICT to generate productivity-enhancing effects and that these will show up with a time lag only, it is justified to assume that Northern Europe is more likely to experience new economy effects than Southern Europe. However, labour productivity growth also decelerates on a country level. Total factor productivity growth, by contrast, seems to be in most cases higher, although not accelerating, for those countries which invest a large share of GDP in ICT. Moreover, a large ICT-producing sector seems to trigger strong TFP growth. Nevertheless, the observed slowdown in TFP growth for a number of countries cannot fully be explained. A major determinant might be the deterioration of labour quality due to the employment policies pursued in individual European countries over the past few years.

Having classified the internet as a GPT it is likely that the full productivity-enhancing effects will be felt only with a significant time lag. The chances of spill-over effects occurring – measured as rising TFP growth – are probably higher for the Nordic countries, the US and Switzerland. In Italy and France, and probably also in Spain and Portugal, deteriorating labour quality as well as low levels of ICT penetration should prove counterproductive. New economy effects in these countries are likely to emerge farther down the road, if at all.

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Appendix

Table 3:
Sectoral developments in the euro area¹⁾

	Share in nominal value added		Growth in real value added		Growth in employment		Growth in labour productivity	
	1991 %	1998 %	1991-98 %	1995-98 %	1991-98 %	1995-98 %	1991-98 %	1995-98 %
ICT producing sectors, manufacturing	0.9	0.7	6.5	11.5	-5.6	-2.3	12.9	14.2
ICT producing sectors, services	3.6	4.2	5.5	8.1	-0.5	0.1	6.1	7.9
ICT using sectors, manufacturing	4.5	3.9	0.8	1.6	-3.0	-1.1	3.9	2.7
ICT using sectors, services	11.3	12.0	2.4	3.2	2.2	2.9	0.2	0.3
Manufacturing	21.0	18.6	0.7	1.5	-2.5	-0.6	3.3	2.1
Business services	47.9	51.8	2.2	2.7	1.0	1.8	1.2	0.9
Total economy	100	100	1.5	1.9	-0.3	0.4	1.8	1.4

Source: ECB

¹⁾ Euro area estimate based on Germany, France, Italy and Finland, which together account for around 73% of euro area nominal gross value added.

**Table 4:
Sectoral developments in the United States**

	Share in nominal value added		Growth in real value added		Growth in employment		Growth in labour productivity	
	1991 %	1998 %	1991-98 %	1995-98 %	1991-98 %	1995-98 %	1991-98 %	1995-98 %
ICT producing sectors, manufacturing	1.5	1.8	20.9	25.6	1.4	3.5	19.2	21.3
ICT producing sectors, services	4.0	4.8	6.3	7.8	3.9	5.3	2.3	2.4
ICT using sectors, manufacturing	3.4	3.0	2.4	2.9	-0.9	0.1	3.3	2.7
ICT using sectors, services	10.4	13.1	4.7	7.4	3.4	4.5	1.2	2.7
Manufacturing	17.4	16.4	4.5	4.1	0.3	0.6	4.2	3.5
Business services	48.3	52.7	4.8	6.6	2.6	2.9	2.2	3.7
Total economy	100	100	3.5	4.0	1.8	2.0	1.7	2.0

Source: ECB

**Table 5:
Productivity Estimates 1981 - 99**

Country and productivity Estimate	1981-89	1990-98	1990-95	1996-98	1996-99
France					
Labour productivity	3.41	2.12	2.26	1.86	1.61
Capital deepening	1.10	1.09	1.35	0.57	0.50
TFP	2.26	1.03	0.89	1.31	1.12
Germany					
Labour productivity	n.a.	2.13	2.26	1.96	2.14
Capital deepening	n.a.	1.09	1.22	0.91	1.06
TFP	n.a.	1.03	1.02	1.04	1.07
Italy					
Labour productivity	2.33	2.09	2.72	0.81	0.67
Capital deepening	0.87	1.18	1.36	0.82	0.82
TFP	1.45	0.88	1.32	-0.01	-0.14
United Kingdom					
Labour productivity	3.37	1.72	1.78	1.60	1.47
Capital deepening	0.42	0.53	0.57	0.44	0.54
TFP	2.90	1.20	1.21	1.18	0.95
Belgium					
Labour productivity	2.32	1.90	2.18	1.35	1.05
Capital deepening	0.82	1.06	1.28	0.63	0.60
TFP	1.51	0.83	0.87	0.73	0.46
Denmark					
Labour productivity	2.53	2.67	3.69	0.62	0.86
Capital deepening	n.a.	0.94	1.27	0.27	0.56
TFP	n.a.	1.70	2.37	0.37	0.31
Finland					
Labour productivity	3.85	3.82	3.91	3.66	3.10
Capital deepening	n.a.	n.a.	n.a.	-0.54	-0.53
TFP	n.a.	n.a.	n.a.	4.28	3.70

Table 5, continued

Country and productivity Estimate	1981-89	1990-98	1990-95	1996-98	1996-99
Ireland					
Labour productivity	5.14	4.01	4.10	3.81	3.96
Capital deepening	n.a.	-0.14	0.15	-0.71	-0.39
TFP	n.a.	4.22	4.01	4.62	4.47
Netherlands					
Labour productivity	3.40	2.07	2.98	0.23	0.35
Capital deepening	n.a.	0.49	0.90	-0.33	-0.21
TFP	n.a.	1.51	1.99	0.54	0.55
Norway					
Labour productivity	1.44	2.27	3.18	1.80	1.39
Capital deepening	0.92	0.48	0.66	0.12	0.29
TFP	0.50	2.23	2.48	1.73	1.13
Spain					
Labour productivity	3.89	1.96	2.58	0.70	0.34
Capital deepening	n.a.	1.48	2.01	0.40	0.26
TFP	n.a.	0.45	0.52	0.31	0.08
Sweden					
Labour productivity	1.52	2.06	2.11	1.96	1.73
Capital deepening	0.61	0.81	0.89	0.65	n.a.
TFP	0.92	1.23	1.19	1.32	n.a.
Switzerland					
Labour productivity	n.a.	1.31	0.66	2.38	1.90
Capital deepening	n.a.	1.18	1.21	1.13	1.03
TFP	n.a.	0.10	-0.57	1.20	0.84

Data for 1996-1999 use authors' estimates for labour hours in 1999 for OECD data

Source: Federal Reserve

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