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**COMMUNICATION FROM THE COMMISSION
TO THE COUNCIL AND THE EUROPEAN PARLIAMENT**

Productivity: The Key to Competitiveness of European Economies and Enterprises

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1. INTRODUCTION

This Communication, which is based on two recent Commission reports¹, aims to alert policy makers to the recent under-performance of the EU in labour productivity growth, its causes and its implications for the goals set by the European Council in Lisbon in March 2000 – the Lisbon strategy. It reviews productivity growth against a background of policies that are already in place. It points to the political determination that will be required if the objectives of the Lisbon strategy are to be met.

The Communication does not cover the entire set of factors that contribute to productivity growth. Consistent with recent Competitiveness Reports, its focus is narrower: it reviews the particular role of new technologies and of innovation and central issues related to these. The Communication constitutes a supplementary reflection on the productivity circumstances that underpin the Lisbon strategy. It is also intended to provide an opportunity for the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions, as well as the stakeholders, to express their opinion on and debate the EU's productivity performance and prospects, and the policies that are required to raise its rate of growth in a sustainable manner.

Recent trends in EU productivity growth are not sufficient to attain the economic, social and environmental objectives set in the Lisbon strategy in the remaining years to 2010. The Member States and the Commission must take the political initiative to ensure that the structural reforms needed to correct this situation are now carried out rapidly. These reforms have already been identified. Unless this happens, the Lisbon goal will be missed.

The Communication discusses factors determining productivity growth within the framework of the Lisbon strategy and provides the grounds to raise some central questions. The rapid technological developments being experienced by the EU require economic life to be organised in new ways to exploit the emerging opportunities. Although steps within the Lisbon strategy have already been taken, it is crucial to ask whether these steps are sufficient and whether they are being implemented with the necessary urgency. Without them, the new technological environment will not emerge and producers and consumers will not be able to take advantage of their benefits. Piecemeal implementation of the Lisbon strategy will not raise productivity and economic growth sufficiently. Only a comprehensive approach, where all steps are implemented in a co-ordinated fashion, will succeed.

Economic growth depends on the accumulation of human and physical capital, the growth of the active labour force and on the efficiency with which they are used. The ability to obtain more output from given inputs of labour and capital corresponds to

¹ The reports in question are the *European Competitiveness Report 2001*, Commission Staff Working Paper, SEC(2001) 1705, 29.10.2001 and the *European Competitiveness Report 2002*, Commission Staff Working Paper, forthcoming. These reports are narrower in focus and inevitably do not examine other crucially important aspects of economic growth in the EU such as the role of economic policies, of skills, of R&D, of specific employment initiatives such as labour mobility or of the role of education. A review of the Commission's activities in these important areas deserves clearly more than just the reference made here.

growth in productivity. Productivity growth depends on the quality of physical capital, improvements in the skills of the labour force, technological advances and new ways of organising these inputs. Historically, productivity growth has been the principal source of economic growth. It has made possible an expansion of output, not just without concomitant increases in inputs, but with important reductions in hours worked over the medium term. In doing so, it has made a sustained rise in real incomes possible.

The recent slowdown in productivity growth in the EU is synonymous with deteriorating competitiveness². Enterprises will be competitive when they can achieve sustainable growth in labour and total factor productivity that permit them to beat the costs per unit of output, and the non-cost characteristics, of other firms. This is so both on the domestic and on the international level. Such productivity growth may make it possible to finance a firm's expansion plans. But it also offers the possibility to a firm to sustain real wage increases. Similarly, the standard of living of a country rises when it achieves sustained productivity growth.

By strengthening the competitive position of innovative firms, productivity gains can not only reduce costs per unit of output, but also expand the market for their products. Citizens benefit through better products at lower product prices and, in the medium term, through increased employment. Even if productivity gains are initially restricted to specific sectors of an economy, ultimately they are diffused beyond these sectors through changes in relative prices and associated increases in real incomes. In general, a country that realises strong and sustained productivity growth also sees its standards of living rising rapidly³. Europe's golden age of growth and convergence in the years following World War II, until at least the first oil shock, demonstrates this.

Despite good macroeconomic performance in recent years, labour productivity growth in the EU in the second half of the 1990s failed to measure up to its past record. This can only be seen as a particularly adverse development. With employment growth traditionally weak, income growth in the EU depends crucially on growth in labour productivity. The failure in recent years of labour productivity to grow even at its historical pace means that growth in national incomes and in standards of living cannot be sustained.

Productivity growth is determined by a variety of factors. The central message of this Communication is that a key determinant of Europe's recent under-performance in

² Competitiveness is understood to mean a sustained increase in real incomes and in the standards of living of regions or nations, with jobs available for all those who wish to find employment. This is the definition used, for example, in the *European Competitiveness Report 2001*, op. cit. This concept, which is different from the narrower concept applying to the competitiveness of enterprises, implies that domestic factors are the dominant determinants of competitiveness; see P. Krugman (1994): "Competitiveness: A Dangerous Obsession", *Foreign Affairs*, March/April for a discussion of these concepts.

³ Output growth is, by definition, the sum of growth in the labour input and growth in labour productivity. Productivity growth and growth in the standards of living are closely related because growth of real wages equals the growth in labour productivity. While short-term data might support this weakly, over long periods of time the correlation between the growth of real per capita income and the growth in labour productivity is robust and very high. For the EU as a whole, the correlation between real per capita income growth and labour productivity growth for the period 1980–1985 is 1.00 and remains at this value when observations by five-year intervals are added up to and including 2001.

productivity growth is insufficient innovative activity as well as under-investment in, and weak diffusion of, information and communication technologies (ICT). This has had serious consequences in the comparative performances of the United States and the EU. The surge in productivity growth in the United States has been sustained, even in the midst of the recent economic slowdown. Indeed, the sustained growth of United States labour productivity during 2001, a year of recession, is in sharp contrast to the conventional pro-cyclical pattern of productivity growth⁴. This performance reflects the impact of the gains resulting from investments made in that nation's technological and innovation assets. In the United States, the ICT revolution has stimulated enterprise re-organization and has altered the terms of competition. It has also shifted the demand for labour towards skills suitable for the new technologies. In the EU, knowledge-intensive sectors have been driving employment creation but productivity developments have been far less favourable than in the US.

This highlights a number of characteristics associated with countries or regions that experience strong and sustainable productivity growth. They include technological change, a well-maintained or growing stock of human capital and a vigorous innovation environment. In such an environment, opportunities emerge for new firms to develop and for existing firms to reform their work patterns and to modernise their operations. The competition framework, in turn, is critical for maintaining such an environment, for intensive competition spurs innovation, fosters productivity growth and contributes to competitiveness.

Further, productivity growth is an important part of the broad issue of environmental, social and economic sustainability. For productivity growth determines eco-efficiency, industry's output relative to resource use or pollutant emission. Productivity growth is therefore part of both economic and environmental sustainability.

All these characteristics can be influenced by public policy, which therefore can have an important influence on productivity performance. That is why it is important that the poor productivity performance of the EU is understood, as are its causes and consequences. The chapters that follow seek to contribute to this understanding and to an appreciation of the political issues at stake.

⁴

Productivity growth tends to decline during a recession and to recover during the recovery phase of the economic cycle, a reflection of the fact that firms hoard labour. United States productivity growth has continued at a robust rate despite the slowdown in economic activity during last year. The Bureau of Labour Statistics estimates that non-farm business productivity advanced at 5.2 % (year-on-year) in 2001:Q4, bringing the annual average at 2.0 %. While lower than the average of 2.6 % growth during the 1995–2000 period, it should be stressed that was registered during a year of recession.

2. PRODUCTIVITY AND THE STANDARDS OF LIVING IN THE EU

Since the beginning of the 1970s, the convergence process of the EU towards the United States standards of living, measured by GDP per capita has fluctuated between 65 % and 70 % relative to the United States benchmark. Although during the late 1980s the convergence process appeared to have resumed, this was short lived. By 2001 the ratio of EU to United States GDP per capita was 65 %, the lowest in more than a quarter century. Graph 1 shows trends in the EU and United States GDP per capita since 1970 to the beginning of the new century.

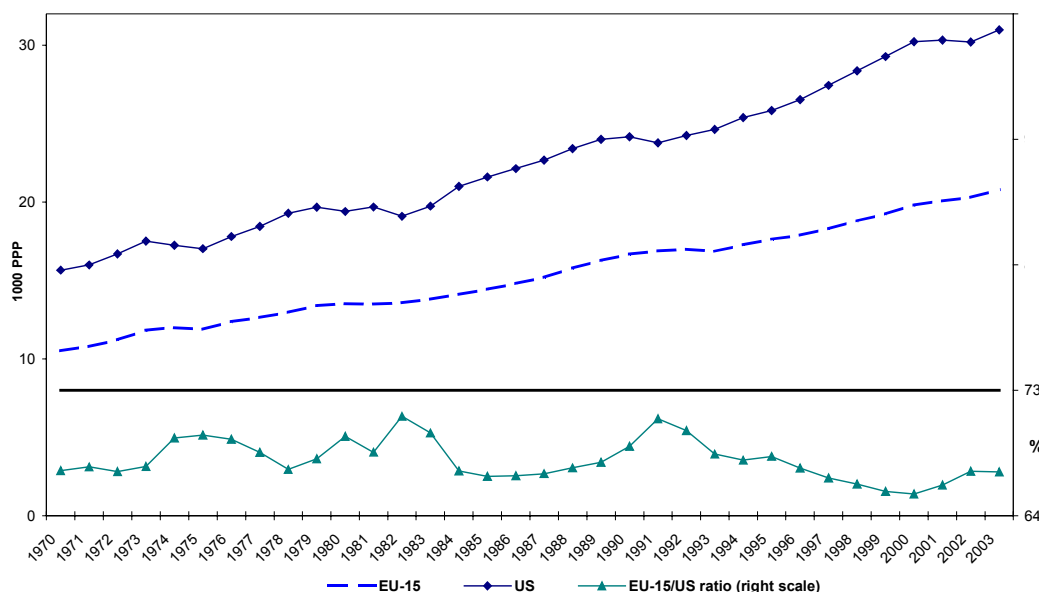
During the second half of the 1990s, and following a period of substantial slowdown, the United States saw an acceleration in both labour productivity growth (from an average of 1.2 % in the period 1990-95 to 1.9 % in the period 1995-2001) and in employment growth (from 0.9 % to 1.3 %). In the EU, growth in labour productivity slowed down (from an average of 1.9 % in the first half of the decade to 1.2 % in the period 1995-2001) but employment growth picked up considerably (from a decline of 0.6 % in the first half of the decade to 1.2 % in the period 1995-2001). Employment expanded by 1.8% in 2000 despite the slowdown in the second half of the year.

The overall EU performance masks important differences across the Member States. Austria, Greece, Finland, Ireland, Luxembourg, Portugal and Sweden have recorded productivity growth in the second half of the 1990s close to or in excess of that of the US, and in the case of Austria, Greece and Ireland, this has continued into 2001. It is possible that this reflects the possibilities offered by the Internal Market, and the consequent increased competition, to smaller Member States that stimulated their commitment to develop strategies for taking advantage of ICT in the wider European market.

The crucial challenge for the EU is to achieve such conditions where both strong productivity and employment growth contribute to growth in national incomes and to ensure that this is sustainable over the medium term. The Lisbon strategy has already recognised the significance of raising the employment rate in the EU and, to fulfil this ambition, a wide variety of initiatives have been undertaken or are being pursued (especially through the Luxembourg process) at the level of the EU and in the Member States⁵. But achievement of the Lisbon goals hinges crucially on restoring durable growth in productivity in the EU.

⁵ For a review of progress made along the Lisbon objectives see *The Lisbon Strategy – Making Change Happen*, Communication from the Commission to the Spring European Council in Barcelona, COM(2002) 14 final, 15.1.2002.

Graph 1: GDP at 1995 market prices per head of population
(left scale in 1995 PPP; 2001 est., 2002-2003 forecasts; right scale EU/US ratio)



Source: Commission services (AMECO databank update 25.2.2002)

3. THE ROLE OF ICT AND OF INNOVATION IN PRODUCTIVITY GROWTH

ICT is a core element of the knowledge society and an important complement to R&D activities. ICT can be seen both as innovation *per se* and, due to its general-purpose character, a vehicle for further innovations in various other sectors and fields. Unlike traditional types of capital investment, however, ICT represents general-purpose technology whose contribution to productivity and economic growth is greater than the direct effect of ICT producing sectors. ICT is also a central element in the innovation success of modern economies⁶.

A common characteristic across those Member States that have strong productivity growth comparable to or better than the United States in recent years is the pervasive use of ICT. A consensus has now developed that the resurgence of productivity growth in the second half of the 1990s in the United States and in some EU Member States is closely related to the use and diffusion of ICT that permeate a wide and ever-increasing set of economic activities. This resurgence is confirmed by industry-level data where ICT production and the intensity of ICT use have become key explanations of productivity leadership. In fact, United States data suggest that the productivity revival during the second half of the 1990s has been very broad affecting a large number of industrial classes.

⁶ The performance of the EU and the Member States in innovation is reviewed in a variety of indicators presented in the *European Innovation Scoreboard 2001*, SEC(2001) 1414, 14.9.2001. While these indicators offer a mixed picture concerning the underlying parameters that influence innovation across the Member States (some signalling improvements, others not), the point remains that the EU underperforms, especially when compared to the United States, in the economic and commercial exploitation of innovations and in innovation drive measured, for example, by patenting data.

The productivity gap between the EU and the United States in recent years is in part a reflection of the lower levels of ICT spending here. In the period 1992-99 ICT expenditure amounted to 5.6 % of EU GDP while in the United States it corresponded to 8.1 %. Indeed, in 1999 the ratio of ICT expenditure in the EU relative to ICT expenditure in the United States had declined to 75 % compared to 90 % in 1992⁷.

Empirical estimates suggest that the contribution of ICT to economic growth in the EU during the second half of the 1990s is around 0.4 to 0.5 percentage points but in the United States the estimates range from 0.8 to 1 percentage points. It can be argued that the EU forewent on average between 0.3 to 0.5 percentage points of economic growth during the 1990s due to its lower investment in ICT⁸.

The benefits from ICT production and use materialise through various possibilities and through changes in a variety of business practices. Essentially, the role of ICT in enterprises is one of processing information and, thus, reducing co-ordination costs (for example, inventory management) that are endemic in a decentralised economy. Firms clearly benefit from improvements in the organisation of production and distribution, from better inventory management and from cost reductions associated with substitution of more efficient and powerful computers for certain categories of white-collar labour. Firms can thus respond more effectively to changes in the demand of their products. The use of ICT could also make possible an improvement in competitive conditions, thus increasing efficiency and reducing prices⁹. Finally, the emergence of new industries and sectors has been only possible because of the intensive use of ICT.

Productivity growth in mature economies is determined less by capital accumulation and more by innovation originating in private and public institutions and within firms. Therefore, the conditions that make innovation possible are very important, especially when combined with the conditions facilitating the use of ICT. A good example is the dramatic growth in biotechnology and life sciences in recent years, a growth that would be inconceivable without the diffusion and innovations associated with ICT¹⁰. ICT in biotechnology has been crucial to stimulating and supporting complementary innovations as well as strengthening the growth of this industry¹¹.

⁷ For these estimates, see *European Competitiveness Report 2001*, op. cit., Table III.1 and Graph III.1.

⁸ See *European Competitiveness Report 2001*, op. cit., chapter III, where also some problems with the ICT data are mentioned; note, further, that there is uncertainty about the exact contribution of ICT to productivity growth.

⁹ Although it is possible that it might facilitate price discrimination or product differentiation by providing firms with information about consumer preferences; see “The Microeconomic Impact of Information and Communication Technologies in Europe”, chapter 6 in *The EU Economy: 2001 Review Investing in the Future, European Economy*, no. 73, 2001.

¹⁰ The role of ICT and innovation in the growth of biotechnology and the obstacles encountered is discussed extensively in the *European Competitiveness Report 2001*, op. cit., chapter V and in A. Allansdottir et. al. (2002): *Innovation and Competitiveness in European Biotechnology*, Enterprise Papers No 7, Enterprise DG, European Commission.

¹¹ The importance of biotechnology for Europe’s future has now been widely recognised and the Commission adopted in January 2002 an Action Plan to support it; see *Life Sciences and Biotechnology – A Strategy for Europe*, Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, COM(2002) 27, 23.1.2002.

With ICT now playing a crucial role in the modernisation of our economies and in fostering innovation, it is essential to create conditions so that its diffusion is the widest possible. Some of these conditions, to some extent, have already been addressed in the Lisbon strategy, others have not. In particular, the issue of the Community patent has yet to be resolved. In addition, barriers to firm creation remain, industry/science relations in the Member States do not stimulate enough innovation, skilled labour shortages become acute at crucial stages of technological modernisation and the transition from the conception of an innovation to its commercial exploitation is often very difficult. These obstacles should be of particular concern in those Member States where productivity and employment growth has been notably weak in recent years. Clearly, much can be learned from the experience of the smaller EU Member States that have performed admirably well through the 1990s.

4. PRODUCTIVITY GROWTH IN EUROPEAN MANUFACTURING IN RECENT YEARS

Both in the EU and in the United States, productivity growth in manufacturing is highly correlated with those variables that reflect the firms' capabilities, their use and exploitation of knowledge inputs, their use of ICT and their engagement in R&D activities. These factors are, of course, closely intertwined with the forces that manifest themselves in the process of innovation. In general, the evidence from EU and United States data indicates that high R&D intensity is never associated with low productivity growth while low research intensity is usually associated with low productivity growth¹².

During the 1990s, and in contrast to the second half of the 1980s, productivity growth in manufacturing in the EU was lower than that in the United States. Furthermore, the acceleration in productivity growth in manufacturing between the first and the second half of the 1990s to 3.2 % was only 0.1 percentage points while in the United States, at 5.5 %, it was 2.3 percentage points. Thus, the pattern observed for the economy as a whole is also confirmed in the manufacturing sector.

In the 1990s in the EU, technology-driven industries (pharmaceuticals, chemical products, office machinery and computers, electronic and TV and radio transmitters, medical equipment, etc.) saw the highest productivity growth, followed by capital-intensive industries (textile fibers, pulp and paper, man-made fibers, iron and steel, non-ferrous metals, etc.). The latter, however, experienced the highest productivity growth during the first half of the decade.

At the same time, in the United States, technology-driven industries have taken the lead in productivity growth throughout the decade. These industries have had a higher share in total manufacturing in the United States compared to the EU throughout the period since 1985 and this divergence has risen considerably over time. By 1998, for example, technology-driven industries represented around 35 % of manufacturing value added in the United States compared to around 24 % in the EU. The United States share has risen by almost 9 percentage points over the period 1985–1998 while the EU share has increased by only 1.5 percentage points.

¹²

See *European Competitiveness Report 2001*, op. cit., chapter IV.

Clearly, the low share in technology-driven industries in the EU is symptomatic of some potentially serious problems. It is not simply that these industries invariably lead in innovation and industrial efficiency but also that, by having a larger presence in value added, they contribute correspondingly more to aggregate productivity and real incomes growth in an economy. Furthermore, as vehicles for applied new technologies, these industries contribute to the wider diffusion of new technologies and to technological modernisation. Finally, the size of the technology-driven industry in an economy plays an important role in the transmission and adoption of technological advances across borders. The evidence from EU data suggests that, while the relationship between R&D and economic performance is weak within Member States, it is in fact substantially stronger across Member States, implying that there are significant international technology spillovers. These, of course, are dependent upon the size of the sector that propagates these spillovers but also due to the openness of the economies to trade.

Partly as a result of such international technology and innovation spillovers, the pattern of productivity growth in manufacturing across countries has become more similar over time. There has been an increasing convergence across industries in the EU and the United States in productivity growth in recent years, unlike in the 1980s when United States productivity growth across industries was significantly different from the pattern in the EU. Nonetheless, the low share of technology-driven industries in the EU is a worrying feature at the background of the weak productivity and innovation record of recent years.

The Lisbon Council emphasised the importance of new technologies and, in particular, ICT and innovation as well as the role of R&D in building Europe's future. The Barcelona Council endorsed a target of 3 % of GDP in private and public R&D spending by the end of the decade, two thirds of which should be private R&D¹³.

5. PRODUCTIVITY GROWTH IN THE EUROPEAN SERVICE SECTOR IN RECENT YEARS

The problem of weak productivity growth in the EU in recent years is particularly acute in the service sector. However, productivity in this sector is more difficult to estimate and, despite the fact that many ICT applications have been introduced vigorously in services, this apparently has not contributed to rapid measured productivity growth, or its acceleration, here. Indeed, the slowdown in aggregate productivity growth in the EU during the second half of the 1990s compared to earlier years, and the small acceleration in productivity growth in the manufacturing sector, suggest that the service sector will have seen a notable slowdown in labour productivity growth during this period. The problem is, of course, compounded by the fact that the share of services in EU GDP has been rising over time even though it remains considerably lower than in the United States economy¹⁴.

¹³ See Presidency Conclusions – Barcelona European Council, 15 and 16 March 2002, point 47.

¹⁴ Data on the service sector is not available on a comparable basis across the Member States and the EU. For those where such data exist, the share of the non-agricultural business sector services in GDP in 1999 was 51.3 % (excluding real estate 41.2 %) in the United States and between 42.6 % (31.1 %) in Denmark and 49.0 % (39.1 %) in the United Kingdom; see *European Competitiveness Report 2002*, op. cit.

Productivity growth in business sector services in the United States accelerated from an average of 1.3 % in the period 1990–95 to an average of 3.1 % in the period 1995–99. In contrast, with the exception of two (France and the United Kingdom) of the seven Member States for which comparable data are available, service sector productivity growth in fact declined during the second half of the decade, and where it rose it did so by a modest 0.1 to 0.3 percentage points¹⁵. At the same time, while the United States saw a parallel increase in employment growth in the service sector, the general weakness in service sector productivity growth in the EU has been accompanied by an acceleration in employment growth.

It is possible that measurement errors conceal the underlying productivity performance of the service sector. Measuring accurately the output of this sector, especially in a period of rapid technological change, is extremely difficult. If the inflation in the service sector is overstated (invariably because of difficulties in accounting for quality improvements following innovations and organisational changes) then the implicit productivity growth is understated. Extended to the economy as a whole, this suggests that European productivity growth may not have been as weak as *prima facie* the data suggest.

Sectoral data indicate that productivity growth in wholesale and retail trade, financial intermediation and in renting and other services in the United States outdid the corresponding EU performance in the second half of the 1990s. The EU, on the other hand, recorded strong productivity growth in transport and storage, in post and telecommunications and in electricity, gas and water supply. The comparatively low GDP share of each of these sectors in the EU tends to reduce their impact on aggregate productivity growth¹⁶.

The service sector is an important user of ICT and, as mentioned earlier, lower levels of ICT expenditure are at the source of the recent slowdown in productivity growth in the EU. However, typically innovations in this sector are introduced through acquired technology – ICT, organisational changes and human capital – rather than through direct R&D spending by service firms themselves. Institutional factors could play a crucial role in this process.

The service sector is generally characterised by below average productivity growth. Yet, because its share in GDP is increasing, the implied greater employment growth has not materialised sufficiently in the EU to make a decisive difference to Europe's employment performance. Because of the rising demand for services as incomes grow, the EU must ensure that the potential employment gains associated with the growth of the service sector are realised. This requires that obstacles to the growth of the service sector be removed.

Recent initiatives already, or to be, undertaken within the Lisbon/Barcelona framework ought to contribute to raising productivity growth and employment growth in the service sector. For example, there is some evidence that those Member

¹⁵ See *European Competitiveness Report 2002*, op. cit.

¹⁶ See for a detailed discussion of sectoral developments *Employment in Europe 2001*, European Commission, 2001, especially chapter 3. In particular, it was argued here that enterprise and competition policies would have the same effect in boosting productivity growth as employment policies since aggregate productivity growth reflected productivity improvements within sectors rather than changes in the sectoral composition of employment; see also the discussion in section 7 below.

States which liberalised and deregulated service sectors early had faster productivity growth than other Member States. For example Finland and the UK experienced higher growth in labour productivity in total business services during 1995-99 than the other EU Member States for which data are available. Thus, market liberalisation measures as well as steps towards a single market in financial services must be pursued vigorously. It is also essential to support incentives for innovation in the service sector. And, finally, the environment determining the performance of the distribution and of the retail sectors, including rules that govern the setting up of new firms should be eased especially without introducing new restrictions on the scale of operations of these outlets.

6. HUMAN CAPITAL AND PRODUCTIVITY GROWTH

A skilled labour force plays a fundamental role in economic and productivity growth. Investment in human capital (as well as the stock of human capital) in an economy is accompanied by significant externalities as the benefits accruing to the economy as a whole exceed the gains accruing to private individuals. These social benefits are associated with the complementarity of skills and knowledge in the development of new technologies, with the rate of innovation and with the creation of further knowledge that expands the range of technological and economic opportunities. It is crucial that the labour force in the EU possesses the skills that are necessary to realise Europe's economic, social and employment ambitions.

Clearly, human capital covers a broad range of skills, from those highly intensive in science and education to those developed through training and upgraded through life-long learning. Productivity growth and economic prosperity clearly depend on skills and competencies that concern the whole of the labour force, and this is why it is essential in the EU that such competencies be developed across all skill categories.

However, special concerns have appeared in recent years. In particular, the modest share of ICT in the EU has coincided with reported shortages of ICT skills in the second half of the 1990s which, in turn, has likely accentuated the problems of rapid ICT diffusion across the EU economies¹⁷, affecting adversely productivity and income growth.

Human capital, especially in technology-driven sectors, contributes to productivity growth both through the accumulation of knowledge and its diffusion and through the smooth matching of the demand for skills and their supply. As noted earlier, technology-driven sectors in the EU have led productivity gains and this is highly correlated with the fact that employment growth in these sectors, undoubtedly more human capital intensive than elsewhere in the economy, has been strong for a number of years now¹⁸. Overall, the demand for labour in the EU in recent years has

¹⁷ This issue was briefly examined in *European Competitiveness Report 2001*, op. cit., Annex III.1. The problem of skill imbalances is particularly worrying since it has occurred in a period of chronically high (albeit declining) unemployment. See also European Central Bank (2002): "Labour Market Mismatches in Euro Area Countries", March, for a more detailed discussion; the ECB finds that educational mismatch, in particular, was worse in 2000 compared to 1992.

¹⁸ See *Employment in Europe 2001*, op. cit., especially chapter 2. The strong employment growth in the technology-driven service and in high-education sectors in recent years (and the robust growth in high-skilled non-manual professionals) is clearly at variance with the weak labour productivity growth registered by the service sector as a whole. This signals the possible presence of the measurement

shifted away from traditional skills towards modern and high-skilled human capital labour and it reflects changes in the content of jobs themselves rather than changes in the sectoral allocation of employment.

Between 1995 and 2000 1.5 million jobs were created in the high-tech sector and 5.5 million in high-education sectors, with high-skill non-manual jobs accounting for over 60 % of them. Job creation in fast-growing, knowledge-intensive, sectors accounted for more than two thirds of new high- and medium-skill jobs, and for practically all the employment growth of low-skilled employees.

However, this increase in the employment of high-skilled labour (and a parallel and widespread decline in low-skilled labour) has not been matched by a corresponding increase in educational attainment. The growth rate of the latter has fallen short of the growth in the former, suggesting that between 1995 and 2000 labour markets in the EU became tighter¹⁹. At the same time, however, there is evidence that the supply of skilled workers in the EU will undoubtedly improve in coming years. In younger age cohorts, in particular, educational attainment is closer to the skill characteristics of the demand for labour than it is in the adult population as a whole. Nevertheless, an uneven distribution of such characteristics across the Member States suggests that policies that support development of human capital are also different across the Member States; clearly, Member States that lag behind ought to catch up. However, in the short term labour mobility is an essential complement of matching demand for and the supply of skilled labour.

Sustained income and productivity growth depends crucially on smooth adjustments in the labour market²⁰. Skill imbalances are invariably very disruptive of this process and preventing them is becoming an important challenge in an environment of rapid technological change associated principally with the expanding diffusion of ICT across industries and economies. During the current period of slow growth, and following the burst of the so-called dot.com bubble, it appears that the problem of skill imbalances may, in the short term, lose some of its urgency. However, given the on-going technological transformation, the skill intensity of our economies will increase. It is essential, therefore, that a network of coherent policies – education, science, training, mobility, etc. – reinforce each other to ensure that the emerging demand for skills is met on a durable basis without obstacles²¹. These issues are central to the Lisbon agenda and the Commission has emphatically stressed the need for the Member States to make progress in the area of human capital development²².

Knowledge (and the capacity to use it effectively) is a key to the competitiveness of our economies. To ensure that the people of Europe have the required knowledge and

problems mentioned earlier. It could also reflect a lag between human capital accumulation and measured productivity growth very much in the same vein as when the initial surge in ICT investment did not translate into measured productivity growth until some years later.

¹⁹ See *European Competitiveness Report 2002*, op. cit. While similar trends occurred in the United States as well, increased immigration provided a partial solution to labour market tightness.

²⁰ See European Central Bank (2002): op. cit., for a discussion of the importance of an efficient matching process in the labour market in the Euro area in particular.

²¹ With particular reference to science and technology, there are already worrying trends concerning the supply of these professionals in coming years; see *Benchmarking National RTD Policies: First Results*, Commission Staff Working Paper, SEC(2002) 129, 31.1.2002, and also European Central Bank (2002): op. cit., section 4 for a discussion of measures aimed at improving the functioning of the labour market.

²² See *The Lisbon Strategy – Making Change Happen*, op. cit.

skills, coherent strategies and practical measures fostering lifelong learning for all are to be developed and implemented²³. New ways of education and training have to be explored, and the use of technology for learning must be reinforced to facilitate access to and to increase quality of learning.

The Commission has also recognised that mobility of researchers and skilled professionals is crucial to enhancing the transfer of knowledge and of technology across different actors in the European research and innovation system, including industry²⁴. Clearly, an extension of European Research Area to the rest of the world, and taking greater account of its international dimension, will undoubtedly benefit EU enterprises and will foster the entrepreneurial propensity of researchers, through the exchange of experiences and knowledge. These will also enrich Europe's research capabilities.

7. ENTERPRISE POLICY, COMPETITION POLICY AND PRODUCTIVITY GROWTH

The complementary nature of enterprise and competition policies is recognised in the EC Treaty.²⁵ They are both cornerstones of the EU policy framework for achieving high and sustainable productivity growth, for that growth depends on a regulatory environment that enables enterprises to access new markets and to turn inventions into innovations. Thus the Lisbon goal calls for policies that establish an environment conducive to enterprise growth and innovation while ensuring that the market players are subject to uniform rules. Enterprise policy focuses on the first objective, while competition policy emphasises the second. But both policies contribute to high and sustainable productivity growth. Effective competition does so by inducing firms to search for efficiency-enhancing solutions that lead to product and process innovation. Enterprise policy does so by correcting market failures and enabling more firms to engage in market transactions, thus increasing the population of potentially innovative firms.

The objective of making the EU a globally competitive knowledge-based economy implies that measures to support economic growth should not lead to centralisation, increased concentration or increasing state aids. Productivity growth is determined by improvements in the quality of inter-firm interaction, by the accumulation of knowledge and by market-based choice of best solutions. Competitive firms are the carriers of change, providing the link between abstract ideas and innovation-driven, growth-generating market evolution. Within this process, technical progress and organisational change are inseparably entwined. Innovative firms prosper in broad knowledge pools from which they draw inputs and into which they in turn contribute new knowledge.

²³ See *Making a European Area of Lifelong Learning a Reality*, Communication from the Commission to the European Parliament and the Council, COM (2001)°678 final, 21.11.2001.

²⁴ See *Mobility Strategy for the European Research Area*, Communication from the Commission, COM(2001) 331 final, June 2001; the Commission's interest in issues of mobility of professionals and researchers is long-standing, with an increasing emphasis in recent years, as can be seen in the various initiatives surrounding the 6th Framework Programme.

²⁵ For a more extended discussion of this issue, see *European Competitiveness Report 2002*, op. cit.

Even though enterprise and competition policies share a basic view of market-led growth and are mutually reinforcing each policy has its own emphasis. They need to be balanced, as the following examples make clear.

- (1) Proper product and geographic market delineation is crucial for competition decisions. This is so because the assessment of market power requires precisely defined markets. While market definition is not required for enterprise policy, its instruments – such as, the Internal Market legislation, standardisation and benchmarking – affect market structures which then are analysed for competition purposes.
- (2) Co-operation between firms in the field of innovation and the creation of knowledge networks contributes to productivity growth. Such co-operation is mostly unproblematic for competition. However in some cases it can result in foreclosure of markets or prevent innovation by competitors. The challenge to the regulator (for example in the review of the technology transfer block exemption regulation and in modernising antitrust procedures) is to create a regulatory environment that fosters R&D co-operation and innovation while preventing anti-competitive practices that may reduce consumer welfare. In merger cases in innovative sectors, the balance must be struck between the need to reap economies of scale in R&D and the need to preserve sufficient competition between R&D knowledge pools.
- (3) A competitive environment naturally drives firms to restructure or merge in order to gain productive efficiency. Efficient firms compete more vigorously, further reinforcing their competitiveness. This can lead to a virtuous cycle of increasing productivity. Competition policy has recognised this in the Merger Regulation, which offers a one-stop shop to facilitate industrial restructuring. The current Merger Review offers an opportunity to assess whether the existing tools could be improved. In particular, it offers an opportunity to decide whether the Merger Regulation should permit verifiable merger-specific efficiency gains to offset negative effects such as price increases caused by the creation or strengthening of a dominant position.
- (4) Technological development and innovation, the drivers of increased productivity, are by their nature uncertain. Assessing their effects for future market dynamics and for future competitive conditions is a permanent challenge. Competition decisions can take such developments into account to the extent that their consequences are predicted with sufficient certainty.
- (5) The Commission recognises the legitimacy of using state aid to address market failures. Areas such as R&D and access to risk-capital for new and innovative businesses are cases in point. However, the need to close productivity gaps between the EU and its competitors should not detract from the need for overall reduction in the volume of state aid or from the need for continuing administrative simplification.

Balancing enterprise and competition policy objectives is a concern of Commission policy, whose success will contribute to an environment supportive of economic growth.

8. ENTERPRISE POLICY AND SUSTAINABLE DEVELOPMENT IN MANUFACTURING

Enterprises play a key role in generating income and employment, contributing to the economic and social dimensions of sustainable development. At the same time however, in common with other activities, enterprises inevitably exert pressures on the environment. Realising the Lisbon prospect of an EU GDP growth rate of 3 % per annum might therefore at first sight be seen as further increasing environmental pressures. Indeed, the Stockholm European Council recognised that the pursuit of economic growth and environmental protection should advance in parallel.

The experience of the EU manufacturing sector shows that it is possible to combine higher economic growth rates with reducing environmental pressures. The Single Market programme and the progressive deregulation of markets through the Lisbon process have improved the economic performance of manufacturing, allowing the avoidance of a trade-off between economic growth and environmental impact. The additional resources thus provided for environmental protection have made it possible to meet the inevitably greater demands for environmental quality as society becomes richer. Environmental policies have, at the same time, set standards and provided incentives for industry to improve its environmental performance. Manufacturing has thus been able to achieve the phenomenon of the so-called environmental Kuznets curve, that as real output increases, emissions of pollutants at first increase but subsequently peak and begin to decline at higher output levels.

Indeed, perhaps contrary to common belief, on the basis of best knowledge and available statistics, it appears that far from increasing, there has in fact been a decline in some of the environmental pressures from manufacturing over the last twenty years²⁶. In these cases, EU manufacturing industry has therefore largely managed to decouple higher manufacturing growth from increased environmental pressure.

A striking example of the progress made by manufacturing is the substantial reduction over the last twenty years in its emissions of the gases that cause acid rain, such as sulphur dioxide and nitrogen dioxide. Graph 2 shows that, despite over a 30 % rise in manufacturing production over the period 1980-99, emissions of acidifying gases declined by some two-thirds²⁷. Similarly, over the same period, industrial emissions of ozone-precursors have been reduced in absolute terms by a quarter. Production of ozone-depleting gases in the EU has now almost ceased. Meanwhile energy consumption has remained broadly constant since the mid-1980s despite the increase in manufacturing output. This has contributed to the reduction that has occurred in industrial emissions of greenhouse gases since the Kyoto baseline date of 1990.

Between 1990 and 2000 EU manufacturing industry saw a 10,5 % reduction in greenhouse gas emissions, making a major contribution to achieving the Kyoto objective. This progress resulted from a mixture of developments, some of which are unlikely to be repeated, in various sectors²⁸. Recent years have also seen some

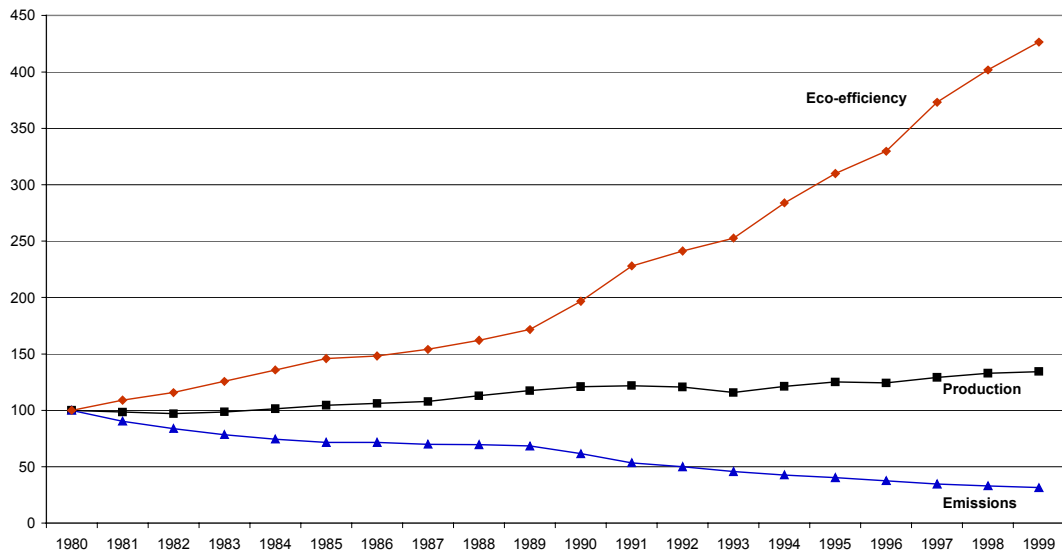
²⁶ These and related issues are discussed in *European Competitiveness Report 2002*, op. cit.

²⁷ See *European Competitiveness Report 2002*, op. cit., Graph V.8. The figures are adjusted for the one-off effects of German re-unification.

²⁸ The Kyoto objective is an 8 % reduction in greenhouse gas emissions in 2008-2012 compared to 1990. Trends in emission reductions could change swiftly; current estimates suggest that the EU will not meet the Kyoto challenges without greater efforts.

stabilisation in industrial consumption of minerals and ores. Overall, the performance of EU industry compares favourably with that of United States industry. In the extreme case of acidifying emissions, the eco-efficiency of EU industry has increased almost twice as quickly as in the United States.

Graph 2: Eco-efficiency of EU manufacturing industry: Acidifying emissions
(eco-efficiency, production, emissions; index 1980 = 100)



Source: Commission services

The gradual introduction of environmental policies has had a clear role in these developments. For example, the most significant decoupling of acidifying gases from economic growth was the result of staged national reduction programmes under the Large Combustion Plants directive of 1988. Environmental policy also played a key role in the phasing out of CFC ozone-depleters. Gradual policy progress has also been made in other areas. Manufacturing industry has responded to the increased intensification of environmental regulation by developing new technologies, improving its management practices, and greater investment in pollution prevention technologies.

Nevertheless the environmental improvements have come at an important financial cost to manufacturing industry. Environmental expenditures by EU industry stood in 1998 at EUR 32 thousand million, some 0.4 % of GDP or 2 % of industrial value-added. A drift upwards in environmental protection expenditures has occurred since the early 1980s. It is clear that the additional resources made available by increased productivity, resulting from the economic reform process, have been essential for the successful financing of environmental progress combined with continued manufacturing growth.

Further implementation of structural economic reforms and further environmental policies are needed to ensure the continuation of the avoidance of a trade-off between economic growth and environmental progress in manufacturing. Careful attention needs to be paid to the proper balance between further legislative requirements for environmental improvements and their costs to ensure that economic growth and environmental improvements are allowed to progress alongside one another. At the same time, the economic costs of non-action in terms of, for example, reduced public

health or damages to buildings have to be taken into account. To facilitate this, the Commission has committed that all major new proposals be submitted to impact assessments, which take full account of their environmental, economic, and social consequences. Environmental policies should also utilise as far as possible the most efficient market-based instruments, such as emissions trading. Finally, in order to attempt to loosen potential trade-offs between economic growth and environmental pressures, the Commission's Action Plan on Environmental Technology will stimulate the innovation and diffusion of environmental technology. This will increase the benefits of high environmental standards for competitiveness. Indeed, besides imposing costs to industry, environmental policies can also contribute to competitiveness and economic growth by inducing greater production efficiency and by creating new markets. To ensure the attainment of sustainable development in the economy as a whole, the lessons learnt from the good performance of manufacturing industry need to be learnt and replicated in other sectors.

9. CONCLUSIONS

Economic growth in the EU is unlikely to return to a sustainable strong path until productivity growth increases. Employment growth in the EU has traditionally been sluggish and although measures to stimulate its growth are being taken in accordance with the Lisbon agenda, economic growth in the near term will be determined by productivity growth. This means enhancing EU competitiveness.

At Lisbon and subsequent meetings, the European Council has already called for initiatives to enhance EU competitiveness. Selective and ad hoc policies will not do. The set of policies called for under the Lisbon strategy needs to be fully implemented. As the Commission contribution to the spring European Council indicated, much greater commitment to implement the Lisbon strategy is necessary. Without such commitment, the objectives of the strategy will not be realised.

It is difficult to attribute the poor performance of productivity growth to any particular factor. But there is wide consensus that ICT and innovation have played a crucial role in the acceleration of productivity growth in certain Member States and in the US.

It is essential, therefore, to identify the policies that have been responsible for good productivity growth in certain smaller EU economies in recent years. It is also crucial to identify policy and other obstacles that have delayed the adoption and diffusion of ICT, innovation and research and development. This is especially necessary in the service sector as regards the diffusion of electronic commerce and the use of e-business. This will inevitably require reforms in the telecommunications sector that will permit cost reductions and enlarge access across consumers and businesses.

The quality of the labour force and the availability of skilled labour must be improved so that new technologies, innovation and research and development can be more readily exploited. Labour market institutions and policies must meet the needs of new technologies.

The conditions that enable the expansion of the service sector must be completed. Full integration of service markets will encourage investment and strengthen incentives for the adoption of new technologies.

All policies must be implemented in a way that supports a dynamic, knowledge-based society. Competition and enterprise policies, in particular, need to be permanently balanced in all fields of application. Their synergy must be fully exploited to improve the global competitiveness of European enterprises.

Environmental sustainability must be achieved, extending the manufacturing sector's recent environmental performance across other sectors of the economy. These initiatives require co-ordination and consultation across all EU economic policies.

Only the modernisation of our economies will enable the EU to meet the economic, social and environmental goals of the Lisbon strategy. The EU's performance on productivity growth during the period since 1995 will not do. If the Lisbon goal is to be achieved, the pace of modernisation must accelerate.