SPAIN'S PRODUCTIVITY PERFORMANCE IN INTERNATIONAL PERSPECTIVE

Dirk Pilat, OECD[1]

Paper prepared for OECD Workshop on Productivity, Madrid, 17-19 October 2005

I. Introduction

The promotion of growth and productivity are on the policy agenda in many OECD countries, as governments seek to address problems related to sluggish growth, such as low employment growth, high unemployment or fiscal deficits. This agenda has also affected the work of the OECD. A comprehensive study of growth performance in the OECD area, including a set of policy recommendations, was presented to the OECD Ministerial meeting in May 2001 (OECD, 2001). Further empirical findings and policy recommendations, focusing on the role of firm dynamics, regulatory factors and information and communications technology (ICT), were released in 2003 and 2004 (OECD, 2003*a*; 2003*b*; 2004*a*), and a policy report with key recommendations to OECD countries was released in 2005 (OECD, 2005*a*).

This paper returns to the findings of these OECD studies and presents further empirical evidence on economic growth and productivity at the aggregate, industry and firm level. It particularly focuses on the different growth experience of the main OECD regions, notably Europe, the United States and Japan, and pays special attention to the position of Spain. The next section discusses aggregate growth patterns in the OECD area, examining the main factors affecting growth as well as some of the policies that may help strengthen growth. It also examines the position of countries in terms of income and productivity levels, as relatively low levels of income and productivity may point to a remaining potential for growth. The third section focuses on multi-factor productivity (MFP) growth, or the overall efficiency of labour and capital, and some of the factors that may have influenced the pick-up in MFP growth in certain OECD countries, such as investment in R&D and more rapid innovation, as well as the impacts of ICT use and firm turnover. The final section draws some conclusions and points to some factors that may be of particular importance for further improvements in Spain's growth and productivity performance.

II. Growth patterns in the OECD area

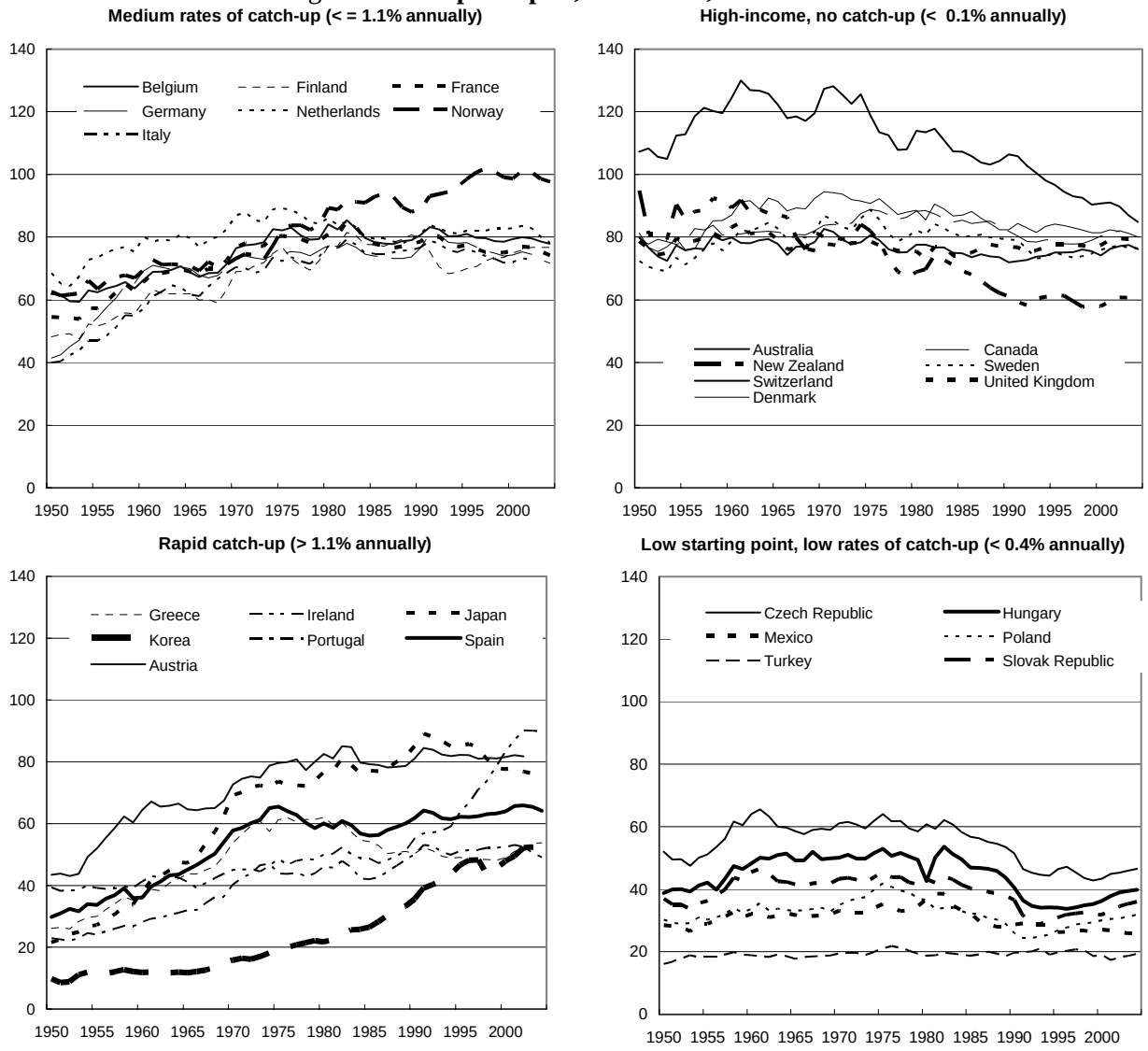
II.1 Growth diverged in the OECD area

The interest of many OECD countries in economic growth over the past years was partly linked to the strong performance of the United States over the second half of the 1990s and the reversal of the catch-up pattern that had characterised the OECD area over the 1950s and the 1960s. During much of the early post-war period, most OECD countries grew rapidly as they recovered from the war and applied US technology and knowledge to upgrade their economies. For most OECD countries, this catch-up period came to a halt

1. Senior Economist, Economic Analysis and Statistics Division, Directorate for Science, Technology and Industry. This paper reflects the views of the author and not necessarily those of the organisation or its member countries. The findings of this paper draw on work of many colleagues at the OECD, as cited in the bibliography; their contributions are gratefully acknowledged; errors or misinterpretations in reflecting their work in this paper are my responsibility. Contact: dirk.pilat@oecd.org

in the 1970s; average growth rates of GDP per capita over the 1973-92 period for much of the OECD area were only half that of the preceding period, and many OECD countries no longer grew faster than the United States (Maddison, 2001; Figure 1).

Figure 1: **GDP per capita, 1950-2004, United States = 100**



Source: OECD, Annual National Accounts Database and Maddison (2001).

During the 1990s, a different pattern emerged. Even though the United States already had the highest level of GDP per capita in the OECD area at the beginning of the decade, it expanded its lead on many of the other major OECD countries during the second half of the 1990s. A few other OECD countries, including Australia, Canada, Finland, Greece, Ireland, Portugal, Spain and Sweden, also registered markedly stronger growth of GDP per capita over the 1995-2004 period compared with the 1980-1995 period (OECD, 2003a; De Serres, 2003). Some of these countries continued to catch up with the United States in the second half of the 1990s. In contrast, the increase in GDP per capita in several other OECD countries, including Japan, Germany and Italy, slowed sharply over the second half of the 1990s, leading to a divergence with the United States. Spain was among the countries where performance improved from 1995 onwards; Spain's relative position has therefore improved compared to many of its European competitors, many of which experienced slower growth.

Even though US growth performance is no longer considered to be as exceptional as was claimed during the "new economy" hype, its strong performance over the second half of the 1990s has increased interest in the analysis of economic growth and the sources of growth differentials across countries. The OECD work suggests that the divergence in growth performance in the OECD area is not due to only one cause, but that it reflects a wide range of factors. Some of these are discussed below in more detail. Differences in the measurement of growth and productivity might also be contributing to the observed variation in performance. A recent OECD study (Ahmad, *et al*, 2003) suggest that such differences do play a role, but that they probably only account for a small part of the variation in growth performance. To reduce the uncertainty of empirical analysis related to the choice of data, OECD has developed its Productivity Database, which is used in this paper.[2]

II.2 Improving labour utilisation remains important for many EU countries

The first factor affecting growth differences concerns labour utilisation (Figure 2). In the first half of the 1990s, most OECD countries, in particular many European countries were characterised by a combination of high labour productivity growth and declining labour utilisation. The high productivity growth of these EU countries may thus have been achieved by a greater use of capital or by dismissing (or not employing) low-productivity workers. In the second half of the 1990s, many European countries, improved their performance in terms of labour utilisation, as unemployment rates fell and labour participation increased. Spain stands out as one of the countries with the largest increase in labour utilisation, together with Ireland. However, the growth in labour utilisation was accompanied by a sharp decline in labour productivity growth in many European countries. In contrast, some other OECD countries, such as Canada and Ireland experienced a pick-up in both labour utilisation and labour productivity growth from 1990-95 to 1995-2003, showing that there need not be a trade-off between labour productivity growth and increased use of labour.[3]

Achieving a combination of labour productivity growth and growing labour utilisation requires well-functioning labour markets that permit and enable reallocation of workers. This is particularly important during times of rapid technological change. Labour market institutions have to ensure that affected workers are given the support and the incentives they need to find new jobs and possibly to retrain. In many countries, institutions and regulations hinder the mobility of workers and prevent the rapid and efficient reallocation of labour resources (OECD, 1999). In most of the countries characterised by a combination of increased labour utilisation and labour productivity, reforms over the 1980s and 1990s improved the functioning of labour markets, effectively enabling more rapid growth.

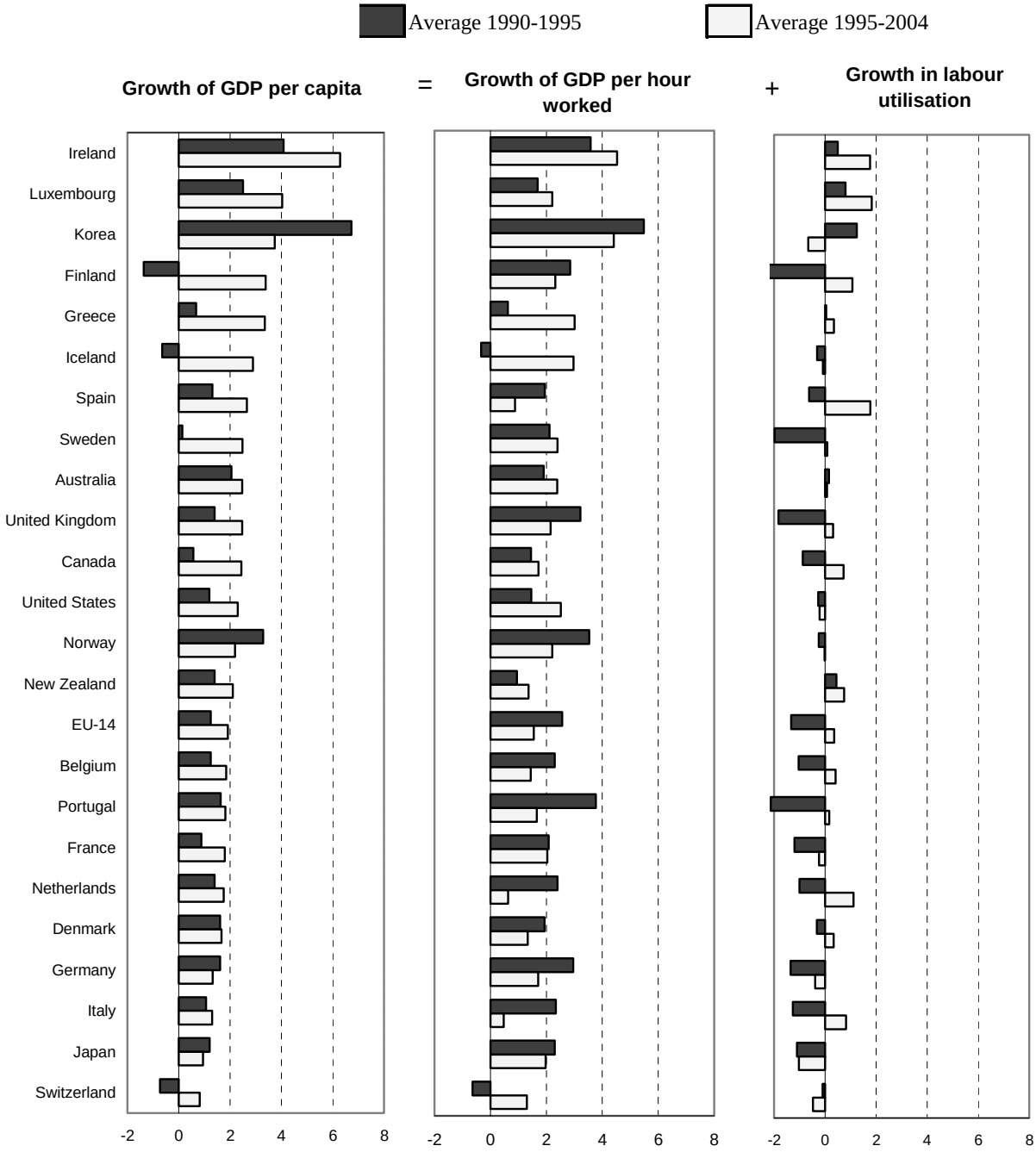
Despite the progress in enhancing labour utilisation that has been made in many OECD countries over the 1990s, further improvements will be needed, in particular as the population in many OECD countries is ageing rapidly. For several OECD countries, notably many European countries, there is still a large scope for improvement in labour utilisation, as it accounts for the bulk of the gap in GDP per capita with the United States (OECD, 2005a; Figure 3). The gap in labour utilisation is particularly large for Belgium and France, but also affects many other European countries. For Spain, low labour utilisation accounts for about one-third of the gap in GDP per capita with the United States, but low levels of labour productivity are even more important, accounting for two-thirds of the gap in income levels.

---

2 . The Productivity Database is available at http://www.oecd.org/statistics/productivity/. It should be emphasised that the OECD Productivity Database aims to provide a set of internationally comparable estimates of productivity. The best possible estimates of productivity growth for a country are produced by statistical offices, using all information available at the national level. Moreover, the OECD productivity estimates refer to the total economy, whereas those by some statistical offices refer to the business sector.

3 . The estimates shown in Figure 2 are not adjusted for the business cycle. Trend-adjusted estimates prepared by the OECD Economics Department broadly confirm the findings of Figure 2 (De Serres, 2003).

Figure 2: **Changes in labour utilisation contribute to growth in GDP per capita**
Percentage change at annual rates, 1990-95 and 1995-2004

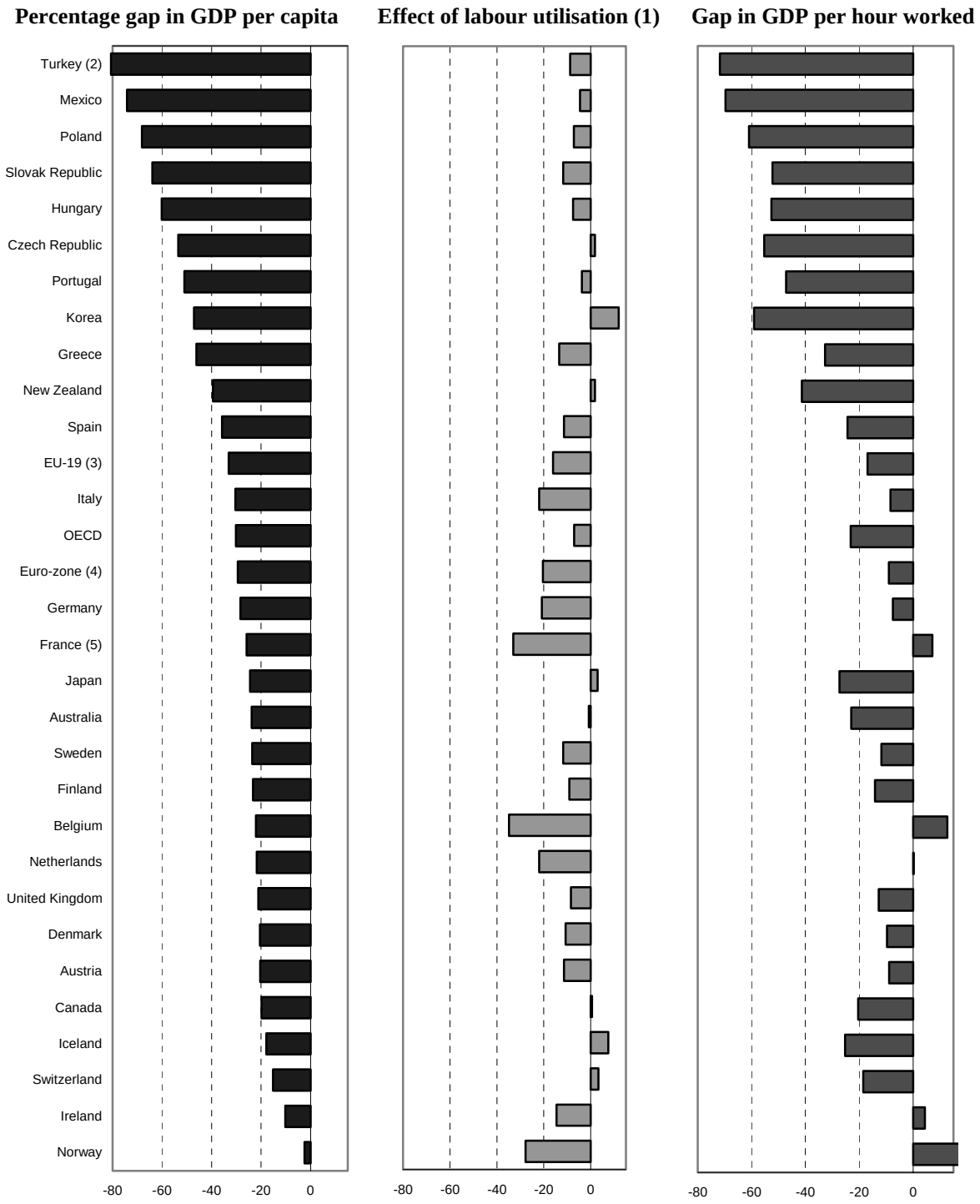


EU-14: Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.
Source: OECD, Productivity Database, July 2005, see De Serres (2003) for cyclically adjusted estimates.

Strengthening Spain's growth performance will therefore require a combination of further improvements in labour utilisation, as there is clearly further scope for progress in this area (Figure 3), and improvements in labour productivity. This paper points to a few areas where such progress could possibly come from, and to some of the policies that could be effective in fostering stronger growth performance.

Recent OECD studies (OECD, 2005a, 2005b) have made several policy recommendations in this respect, most of which remain valid today.

Figure 3: **Differences in GDP per capita and its components**
Percentage point differences in GDP per capita with the United States, 2004

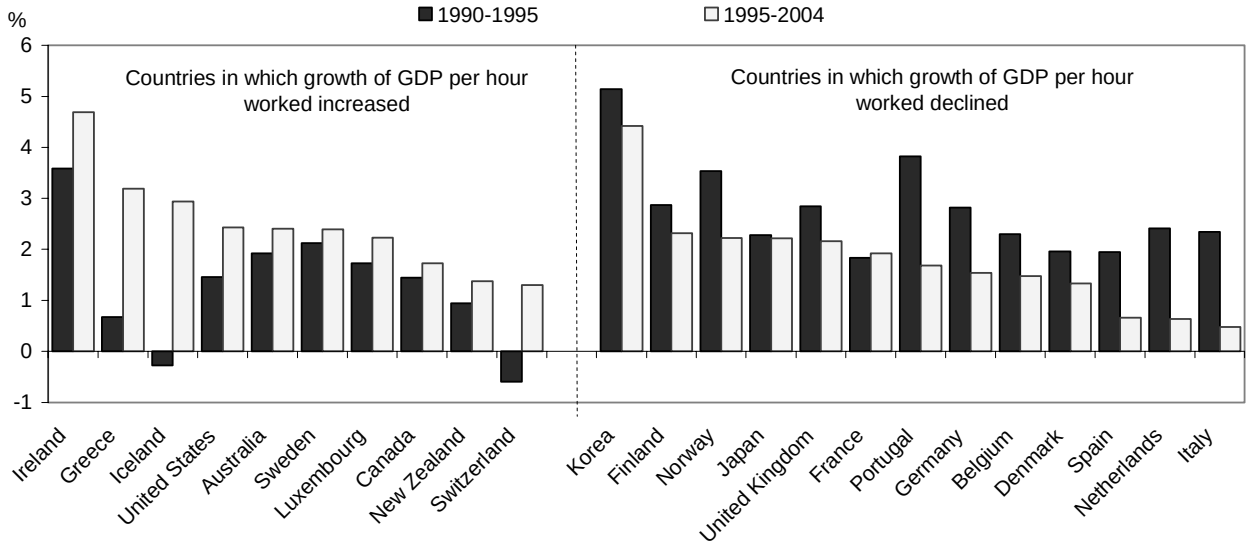


Notes: 1) Based on total hours worked per capita. 2) GDP for Turkey is based on the 1968 System of National Accounts; 3) Members of the European Union that are also members of the OECD; 4) Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain; 5) Includes overseas departments.
Source: OECD, Productivity Database, July 2005, see www.oecd.org/statistics/productivity for further detail.

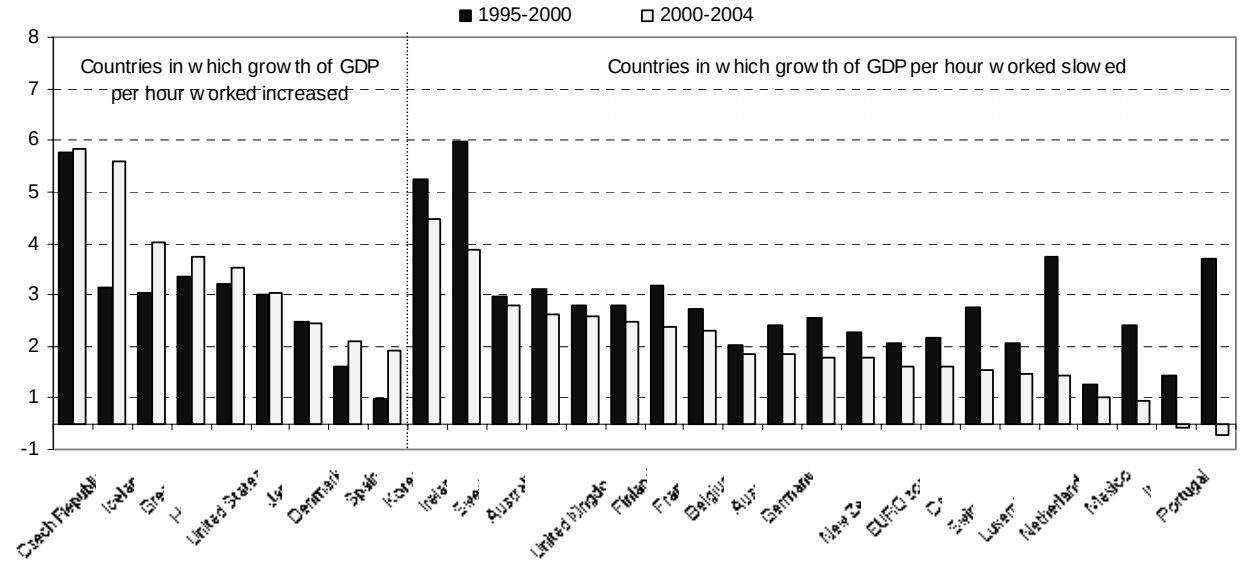
II.3 Labour productivity growth improved only in some OECD countries

Together with labour utilisation, labour productivity is the other key component of GDP per capita shown in Figure 2 and 3. It is also the main determinant of the gap in income levels between the United States and other OECD countries, such as Spain. As shown above, labour productivity growth accelerated in a number of OECD countries in the second half of the 1990s; including Australia, Canada, Greece, Ireland and the United States (Figure 4*a*). In contrast, it declined in a large number of other OECD countries, including Spain. With the slowdown of the world economy since 2000, most OECD countries experienced a marked slowdown in labour productivity growth, the United States and some European countries being the main exceptions. In Spain, labour productivity growth has picked up in recent years, however, with substantially stronger growth from 2000-2004 than from 1995-2000 (Figure 4*b*).

Figure 4: **Growth in GDP per hour worked**
(annual compound growth rates, in per cent)
a) 1990-95 and 1995-2004



b) 1995-2000 and 2000-2004



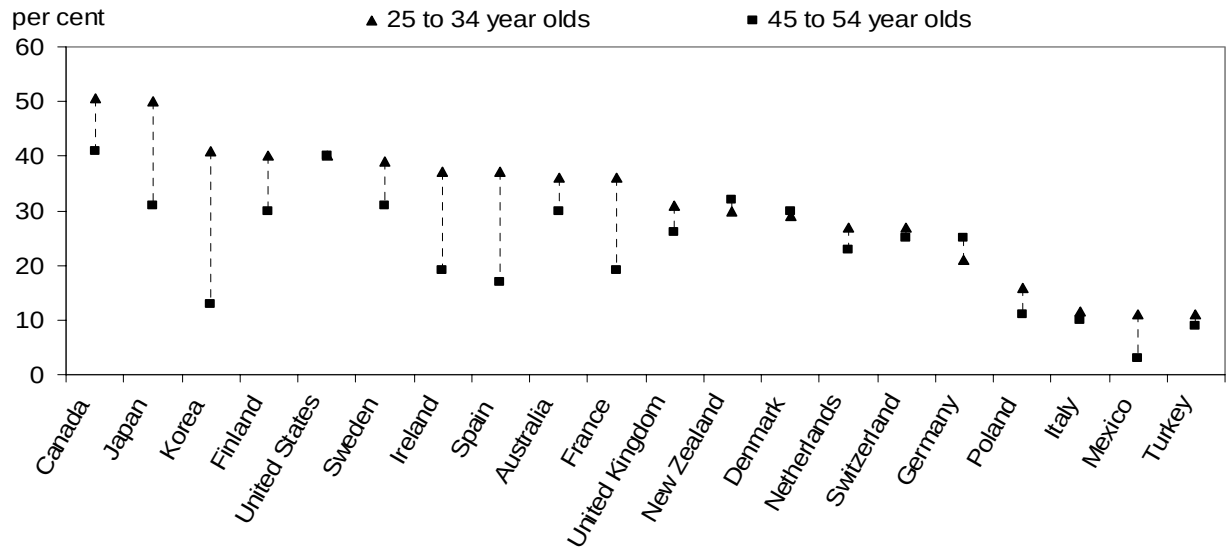
Source: OECD, Productivity Database, July 2005.

II.4 The impact of human capital

Labour productivity growth can be increased in several ways: by improving the composition of labour used in the production process, increasing the use of capital and improving its quality, and attaining higher multi factor productivity (MFP). The composition of the labour force is the first of these, and plays a key role in labour productivity growth. This is partly because in all OECD countries, educational policies have ensured that young entrants on the jobs market are better educated and trained on average than those who are retiring from it. For example, in most OECD countries, and with Spain in a relatively strong position, more 25-34 year olds have attained tertiary education than 45 to 54 year olds (Figure 5).

The available empirical evidence suggests that improvements in the composition of labour have directly contributed to labour productivity growth in virtually all OECD countries (Bassanini and Scarpetta, 2001; Jorgenson, 2003). The OECD Productivity Database does not yet include estimates of labour composition, although their inclusion is planned for the near future. Estimates of labour composition for the G7 countries are included in a recent study by Prof. Dale Jorgenson, however (Jorgenson, 2003) and point to contributions of 0.2-0.4% to GDP growth for the G7 countries. These estimates also suggest that the contribution of labour composition to labour productivity growth has slowed in most G7 countries over the second half of the 1990s, Italy being the only exception. This is typically attributed to the large number of low-skilled workers that were integrated in the labour force in many OECD countries over the second half of the 1990s. Moreover, the contribution of labour composition may also decline over time if the gap in education levels between cohorts of new and retiring workers becomes smaller over time. Growth accounting estimates typically only take account of changes in educational attainment, however; increases in the level of post-educational skills are also important, but few hard measures are available.

Figure 5: **Percentage of the population that has attained tertiary level education, 2002**
(percentage points)



Source: OECD, Education at a Glance, 2004.

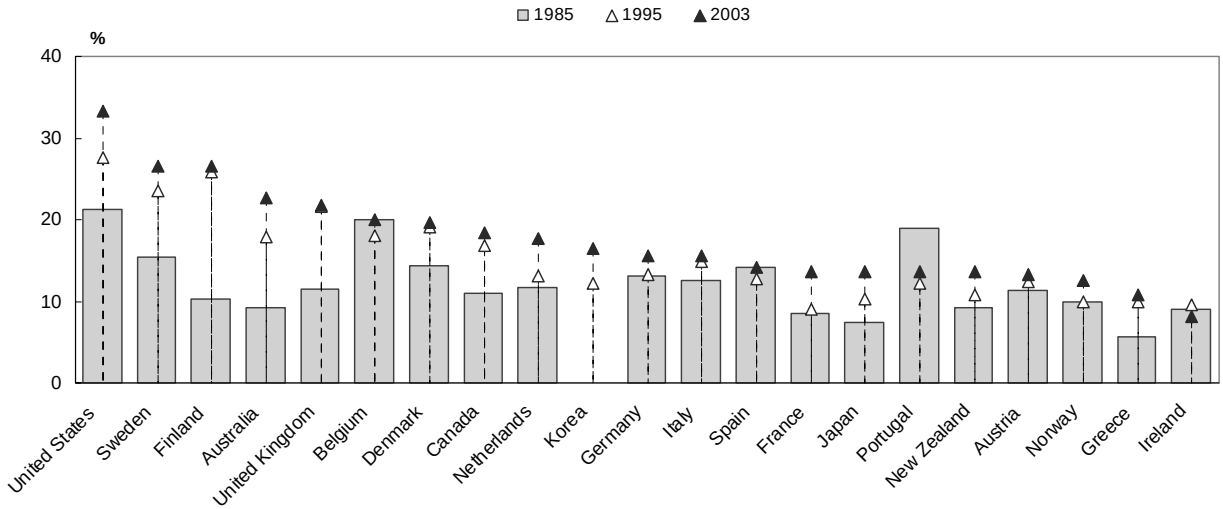
II.5 The role of investment in fixed capital

Investment in physical capital is the second factor that plays an important role in labour productivity growth. Capital deepening expands and renews the existing capital stock and enables new technologies to enter the production process. While some countries have experienced an overall increase in the contribution of capital to growth over the past decade, ICT has typically been the most dynamic area of

investment. This reflects rapid technological progress and strong competitive pressure in the production of ICT goods and services and a consequent steep decline in prices. This fall, together with the growing scope for application of ICT, has encouraged investment in ICT, at times shifting investment away from other assets. The available data show that ICT investment rose from 10 to 20 per cent of total non-residential investment in the business sector in the mid-1980s, to between 15 and 30 per cent in 2003 (OECD, 2003*b*; Figure 6). In Spain, the share of ICT investment in 2002 was about the same as that of Germany, Italy, France and Japan, but substantially lower than in the United States, the United Kingdom or Australia.

While ICT investment accelerated in most OECD countries, the pace of that investment and its impact on growth differed widely. For the G7 countries and Spain, the use of ICT capital accounted for between 0.35 and 0.8 percentage points of growth in GDP per capita over the 1995-2003 period (Table 1).[4] The United States received the largest boost of ICT; Canada, Japan, Spain and the United Kingdom a sizeable one; and Germany, France and Italy a much smaller one.

Figure 6. **ICT investment in selected OECD countries, 1985-2003**
(As a percentage of non-residential gross fixed capital formation, total economy)



* 2002 for Australia, France, Japan, New Zealand, Norway and Spain, 2001 for Italy.
Note: Estimates of ICT investment are not yet fully standardised across countries, mainly due to differences in the capitalisation of software in different countries. See Ahmad (2003).
Source: OECD, Productivity Database, July 2005.

In some OECD countries, *e.g.* France, Germany, Japan, the United Kingdom and also Spain, the growing contribution of ICT capital has been accompanied by a decline in the contribution of non-ICT capital (Table 1). In these countries, ICT investment partly substituted for investment in other assets. In Australia and the United States, on the other hand, capital deepening in the 1990s was a broad phenomenon as the contribution of non-ICT capital increased together with that of ICT capital. For France, Germany and Japan, the declining contribution of non-ICT capital has been attributed to weaknesses in domestic demand (Jorgenson, 2003).

4 . These estimates are based on data on ICT investment from individual countries' national accounts. They are based on a harmonised deflator for ICT investment, which adjusts for cross-country differences in the measurement of ICT prices (see Schreyer, *et al.* 2003). Methodological differences in the measurement of software investment may affect the results, however (Ahmad, 2003), and are particularly likely to affect the results for Japan (Jorgenson and Motohashi, 2004).

One important difference between OECD countries is thus the extent to which countries have invested in ICT (Figure 6). A range of indicators on ICT use show that the highest rate of uptake of ICT can typically be observed in the United States, Canada, New Zealand, Australia, the Nordic countries and the Netherlands (OECD, 2003*c*). The question that follows concerns the reason why the diffusion of ICT is so different across OECD countries. A number of reasons can be noted. In the first place, firms in countries with higher levels of income and productivity typically have greater incentives to invest in efficiency-enhancing technologies than countries at lower levels of income, since they are typically faced with higher labour costs. Moreover, the structure of economies may affect overall investment in ICT; countries with a larger service sector or with a large average firm size are likely to have greater investment in ICT, factors which both may have had some impact on the overall intensity of ICT investment in Spain.

Table 1: **Contributions to GDP growth, total economy, 1990-95 and 1995-2003[1]**
In percentage points, based on cost shares and harmonised ICT price indices

	Spain	Canada	France	Germany	Italy	Japan	United Kingdom	United States
1990-95[1]								
Labour input	-0.32%	0.20%	-0.55%	-0.72%	-0.77%	-0.55%	-0.84%	0.77%
ICT capital, of which	0.31%	0.40%	0.18%	0.34%	0.19%	0.37%	0.49%	0.52%
ICT hardware	*0.15%*	*0.19%*	*0.09%*	*0.18%*	*0.09%*	*0.23%*	*0.27%*	*0.26%*
Software	*0.08%*	*0.15%*	*0.05%*	*0.10%*	*0.03%*	*0.09%*	*0.18%*	*0.18%*
Communications equipment	*0.08%*	*0.06%*	*0.04%*	*0.06%*	*0.07%*	*0.05%*	*0.04%*	*0.08%*
Non-ICT capital	0.86%	0.63%	0.66%	0.61%	0.55%	0.94%	0.54%	0.21%
MFP	0.63%	0.47%	0.77%	1.06%	1.29%	0.74%	1.47%	0.95%
GDP growth	1.50%	1.70%	1.06%	1.29%	1.26%	1.50%	1.65%	2.45%
1995-2003[2]								
Labour input	2.16%	1.16%	0.21%	-0.24%	0.74%	-0.70%	0.49%	0.65%
ICT capital, of which	0.52%	0.59%	0.36%	0.38%	0.46%	0.57%	0.65%	0.80%
ICT hardware	*0.22%*	*0.35%*	*0.16%*	*0.23%*	*0.22%*	*0.36%*	*0.43%*	*0.42%*
Software	*0.15%*	*0.15%*	*0.13%*	*0.10%*	*0.11%*	*0.12%*	*0.13%*	*0.24%*
Communications equipment	*0.15%*	*0.10%*	*0.07%*	*0.05%*	*0.13%*	*0.08%*	*0.09%*	*0.14%*
Non-ICT capital	0.78%	0.63%	0.43%	0.43%	0.61%	0.57%	0.36%	0.29%
MFP	0.14%	1.05%	1.35%	0.64%	0.07%	0.56%	1.23%	1.50%
GDP growth	3.60%	3.43%	2.35%	1.22%	1.88%	1.00%	2.73%	3.24%

(1) 1991-95 for Germany; 2) Or latest available year, i.e. 2001 for Italy; 2002 for France, Japan and Spain.
Source: OECD, Productivity Database, September 2005.

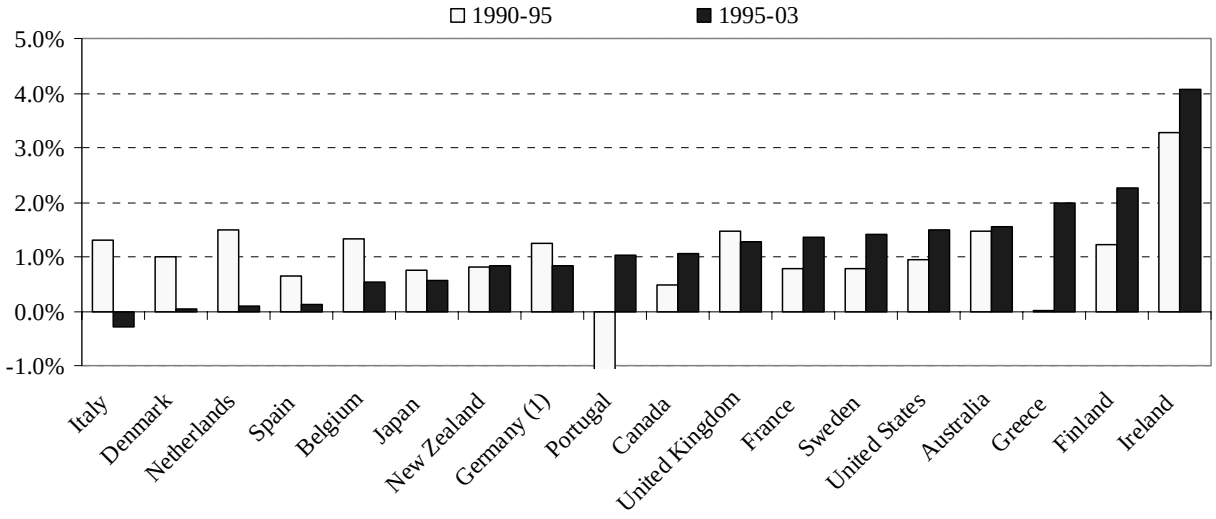
More specifically, the decision of a firm to adopt ICT depends on the balance of costs and benefits that may be associated with the technology. There is a large range of factors that affect this decision (OECD, 2004*a*). This includes the direct costs of ICT, *e.g.* the costs of ICT equipment, telecommunications or the installation of an e-commerce system. Considerable differences in the costs of ICT persist across OECD countries, despite strong international trade and the liberalisation of the telecommunications industry in OECD countries. Moreover, costs and implementation barriers related to the ability of the firm to absorb new technologies are also important. This includes the availability of know-how and qualified personnel, the scope for organisational change and the capability of a firm to innovate. In addition, a competitive environment is more likely to lead a firm to invest in ICT, as a way to strengthen performance and survive, than a more sheltered environment. Moreover, excessive regulation in product and labour markets may make it difficult for firms to draw benefits from investment in ICT and may thus hold back such spending. These issues will be further discussed below, as they also affect the returns to ICT that have thus far become visible in ICT-using industries.

III. Strengthening MFP growth

The final component that accounts for some of the pick-up in labour productivity growth in the 1990s in certain OECD countries is the acceleration in multi factor productivity (MFP) growth (Figure 7). MFP

growth rose particularly in Canada, Finland, France, Greece, Ireland, Portugal, Sweden and the United States. In other countries, including Germany, Italy, Japan, the United Kingdom, Belgium, Denmark, the Netherlands and Spain, MFP growth slowed down over the 1990s.[5]

Figure 7: **MFP growth, 1990-95 and 1995-2003**[2]
Total economy, in percentage points



1. 1992-1995 instead of 1990-95.
2. Or latest available year, i.e. 2002 for Australia, France, Japan, New Zealand and Spain.
Source: OECD Productivity Database, September 2005.

The improvement in MFP in some countries reflects a break with slow MFP growth in the 1970s and 1980s and may be due to several sources. Better skills and better technology may have caused the blend of labour and capital to produce more efficiently, organisational and managerial changes may have helped to improve operations, and innovation may have led to more valuable output being produced with a given combination of capital and labour. MFP growth is measured as a residual, however, and it is difficult to provide evidence on such factors. Some is available, though, and is discussed below.

III.1 Production of ICT – a boon to MFP growth in some countries

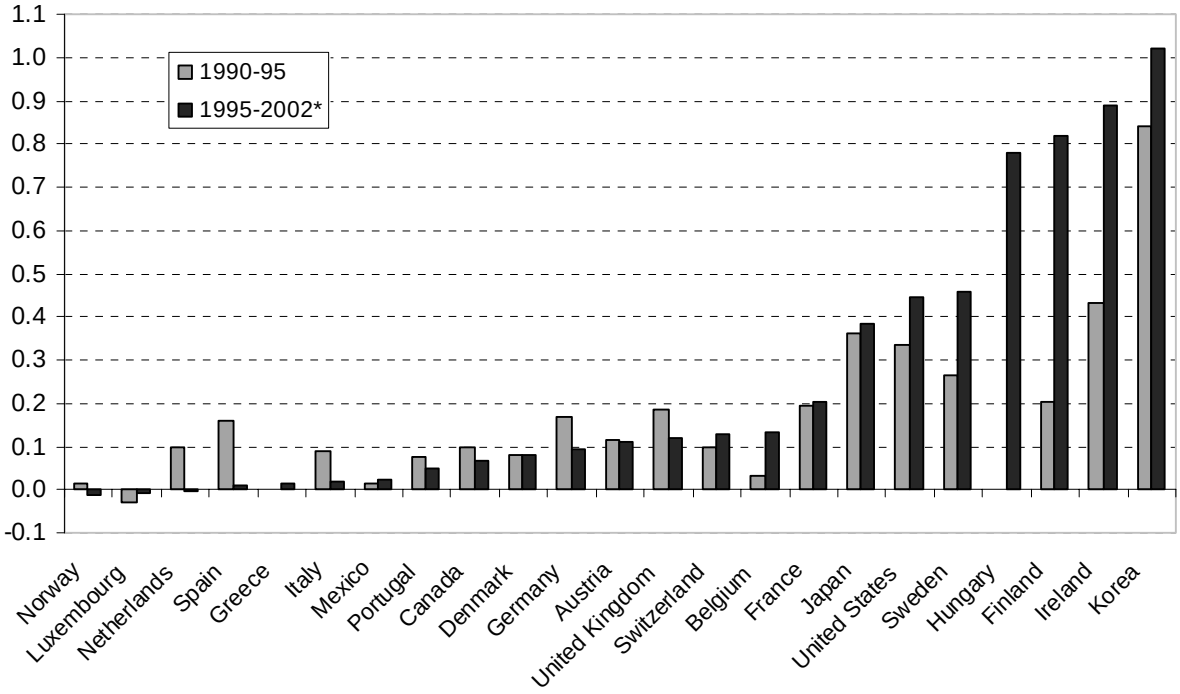
First, in some OECD countries, MFP reflects rapid technological progress in the production of ICT. Technological progress at Intel, for instance, has enabled the amount of transistors packed on a microprocessor to double every 18 months since 1965, and even more rapidly between 1995 and 1999. While the ICT manufacturing sector is relatively small in most OECD countries, it can make a large contribution to growth if it expands much more rapidly than other sectors. Some OECD countries, such as Finland, Hungary, Ireland, Japan, Korea and the United States, benefited from rapid productivity growth in the ICT-producing sector in the 1990s (Pilat and Wölfl, 2004; Figure 8).[6] In Spain and many other OECD countries, ICT manufacturing is of little importance for aggregate productivity growth, however.

5 . The MFP estimates in Figure 7 are not adjusted for labour composition (see Colecchia, forthcoming). Moreover, for some countries, software investment may be underestimated (Ahmad, 2003). Adjusting for both factors would lead to a smaller contribution of MFP to total GDP growth.

6 . Figure 8 shows the contribution of these sectors to labour productivity growth, since data for capital input by industry are only available for some OECD countries. However, the contribution of the ICT-producing sector to MFP growth is considerable in some countries where data are available, *e.g.* Finland, Japan and the United States (Pilat and Wölfl, 2004).

Figure 8: **Contribution of ICT manufacturing to aggregate labour productivity growth**

(Total economy, value added per person employed, contribution in percentage points)



Note: 1991-1995 for Germany; 1992-95 for France and Italy and 1993-1995 for Korea; 1995-99 for Korea and Portugal, 1995-2000 for Ireland, Spain and Switzerland, 1995-2001 for France, Germany, Hungary, Japan, Mexico, the Netherlands, Norway, Sweden, the United Kingdom and the United States.

Source: Estimates on the basis of the OECD STAN database, September 2004. See Pilat and Wölfl (2004) for details.

The ICT-producing services sector, notably the telecommunications sector, also made an important contribution to aggregate productivity growth in certain OECD countries over the second half of the 1990s (Pilat and Wölfl, 2004). Partly, this is linked to the liberalisation of telecommunications markets and the high speed of technological change in this market. Some of the growth in ICT-producing services is also due to the emergence of the computer services industry, which has accompanied the diffusion of ICT in OECD countries. The ICT-producing sector has made a positive and growing contribution to labour productivity in Spain over the past decade, primarily due to strong performance in the communications industry (Pilat and Wölfl, 2004).

III.2 A high level of firm dynamics can boost productivity growth

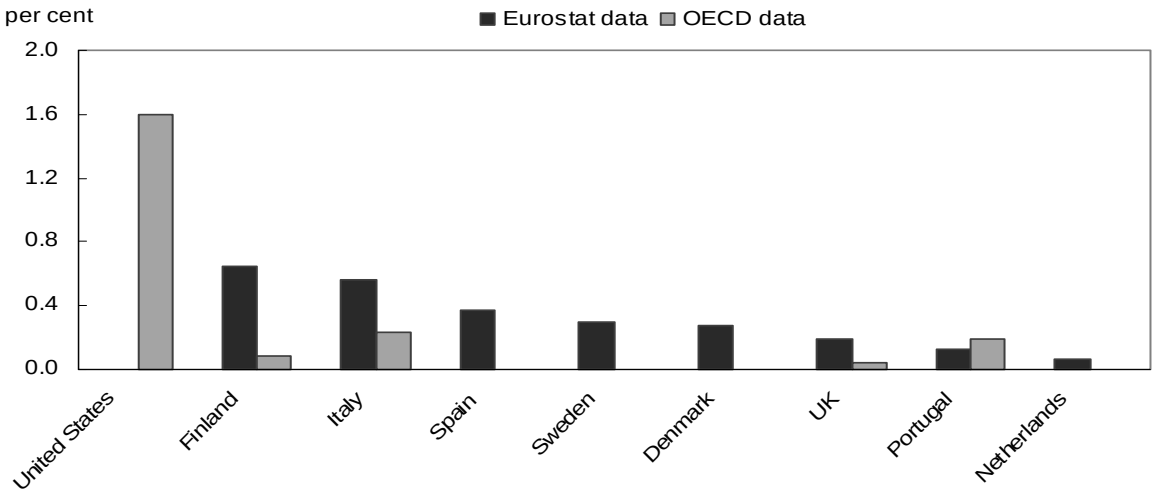
MFP also reflects the effects of competition. Analysis of productivity growth at the firm level shows that the impacts of competition, such as the entry and exit of firms and changes in market shares are important drivers of productivity growth (OECD, 2003*a*). New firms may use a more efficient mix of labour, capital and technology than existing firms, which in the long term has a positive effect on MFP growth. This is particularly true of industries that have grown rapidly in response to the new technological opportunities, such as the ICT sector, where new firms play a key role (Brandt, 2004). In contrast, growth in mature industries is typically driven by productivity growth within existing firms or by the exit of obsolete firms.

This factor might potentially also help explain low MFP growth in certain OECD countries. Some evidence is available on this issue, both from previous OECD work (OECD, 2003*a*), from more recent OECD work, based on a new dataset from Eurostat (Brandt, 2004), and from a recent study by Bartelsman

and De Groot (2004). The first two studies suggest that rates of firm creation and destruction in OECD countries are fairly similar, in particular after they have been adjusted for differences in the composition of the economy. Moreover, the available estimates show that the entry and exit of firms made a sizeable contribution to MFP growth in the early 1990s (OECD, 2003*a*).

While firm creation as such does not appear to be a problem for MFP growth in many OECD countries, the growth of firms once they have been created appears problematic in many European countries. Compared with the European Union, including Spain, the United States appears to be characterised by: *i*) a smaller (relative to the industry average) size of entering firms; *ii*) a lower labour productivity level of entrants relative to the average incumbent; and *iii*) a much stronger (employment) expansion of successful entrants in the initial years which enable them to reach a higher average size (OECD, 2003*a*; Figure 9).

Figure 9. **Two-year employment gains of surviving firms**
OECD and Eurostat estimates



1. The data report net gains as a percentage of initial employment.
2. UK, Dutch and Italian data cover the manufacturing sector only.
3. OECD data are averaged across different cohorts born in the 1990s. Eurostat data cover the cohort born in 1998 only.

Source: Brandt (2004), based on Eurostat and OECD firm-level project, see Bartelsman, *et al.* 2003.

These differences in firms' performance can only partly be explained by statistical factors or differences in the business cycle (OECD, 2003*a*; Brandt, 2004), and seem to indicate a greater degree of experimentation amongst entering firms in the United States. US firms take higher risks in adopting new technology and opt for potentially higher results, whereas European firms take fewer risks and opt for more predictable outcomes. This is likely related to differences in the business environment between the two regions; the US business environment permits greater experimentation partly because barriers to entry and exit are relatively low, in contrast to many European countries. Administrative burdens on start-up firms in Spain remain relatively high (Conway, *et al.* 2005), although they have come down since 1998, suggesting that there may still be scope for progress on this issue (OECD, 2005*b*).

A recent study by the Netherlands Ministry of Economic Affairs (2004), drawing on work by Eric Bartelsman, further adds to this evidence. It finds that the top US performers are not only more productive than equivalent European firms, but also that they account for a larger share of total employment, and thus contribute to a substantial part of the overall productivity difference. This top quartile of US firms also grows faster than other quartiles, and than the top European quartile. Moreover, the United States manufacturing sector is characterised by negative employment growth in the bottom quartile of the

productivity distribution, which implies that its least productive companies are losing resources. In contrast, the EU countries are characterised by positive employment growth in the bottom quartile.

These findings demonstrate that a dynamic business environment, *i.e.* one that fosters firm creation and efficient resource reallocation, is important for good growth performance. A striking feature of the US economy in the 1990s was the large number of new firms that was created. In conditions of rapid technological change, such firms have an advantage in that they can come on to the market with the latest technology and hope to benefit from both the cost advantage that this gives them, and strongly rising demand in the early phases of the product cycle. There are risks as well as benefits, of course, as high entry rates go hand-in-hand with high exit rates. But provided that the barriers to both entry and exit are low, that innovation is rewarded and that displaced human and capital resources can be quickly re-allocated, this continuing process of creative destruction brings strong productivity gains. In turn, this requires an environment in which entrepreneurship is respected and encouraged. The ease and speed with which new firms can be created varies strikingly between OECD countries, while bankruptcy legislation can have an important impact on the speed with which resources can be re-allocated as well as on the willingness of managers to invest in risky but possibly very rewarding projects (OECD, 2001; Brandt, 2004).

III.3 Making innovation more effective

Innovation is the third important driver of MFP growth (Guellec and Van Pottelsberghe, 2001; Donselaar, *et al.*, 2004). Foreign research and development (R&D) is particularly important for most OECD countries, since the bulk of innovation and technological change in small countries is based on R&D that is performed abroad. But domestic R&D, *i.e.* business, government and university research, is also an important driver of MFP growth. It is also the key in tapping into foreign knowledge; countries that invest in their own R&D appear to benefit most from foreign R&D as they are better able to absorb foreign knowledge. OECD countries and regions have had different experiences in the role of R&D over the past decade, however (Figure 9; OECD, 2004*b*). In Spain, R&D intensity has increased over the past decade, although it remains low compared to many other European Union countries. These R&D patterns mainly reflect the development of business R&D; in the United States, government R&D declined over the past decade, mainly due to lower spending on defence R&D, while it increased only slightly in Japan.

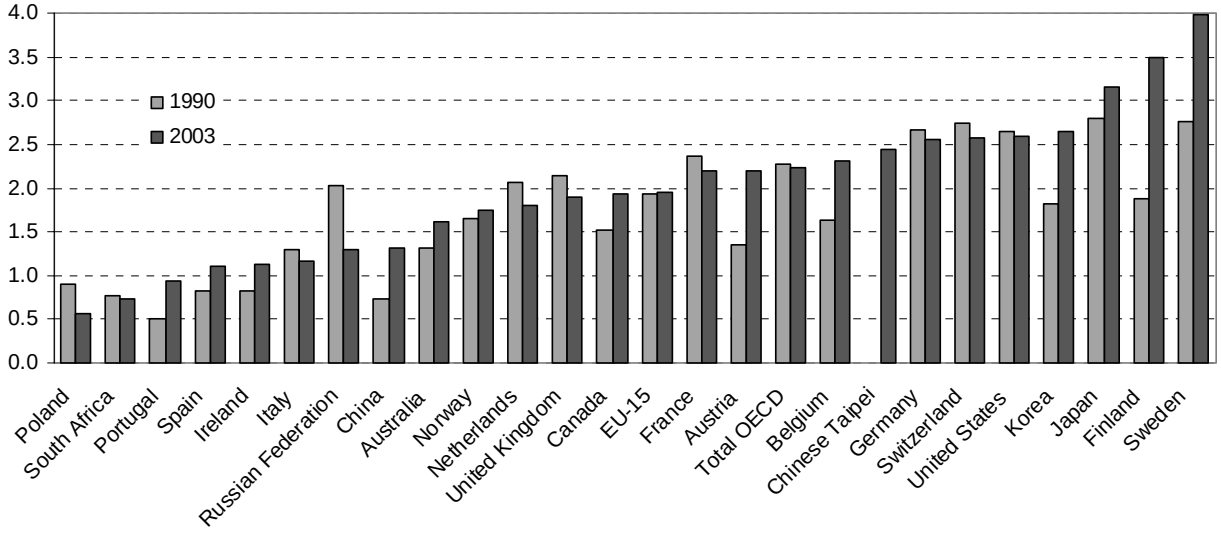
Changes in business R&D are affected by a broad range of factors (Guellec and Ioannides, 1997); including growth in business GDP, changes in interest rates as well changes in government funding of business R&D. Structural factors also play a role for total R&D spending, notably the contribution of high-technology sectors, such as the ICT-producing sector. The average size of firms in different economies also plays a role; in many OECD countries, a limited number of large firms account for the bulk of business R&D. In countries such as France, Germany, Japan, Sweden, the United Kingdom and the United States, firms with over 250 employees account for over 80% of total business R&D; the corresponding share for Spain is under 60 per cent (OECD, 2005*b*). The differences in business R&D of the main regions should therefore be seen in the light of such structural differences and broader economic developments (Sheehan and Wyckoff, 2003).

In their drive to boost innovation, several OECD countries, including the European Union, have introduced formal R&D targets over the past decade (Sheehan and Wyckoff, 2003). While some doubts can be raised about the usefulness of such targets for economic growth, achieving R&D targets typically primarily involves increases in business R&D (Figure 9). Indeed, in most of the countries with high R&D intensity, the business sector is the main source of R&D, with much of this concentrated in a number of high-technology sectors and in a number of large, often multinational, firms. Increasing business R&D thus has close links with broader structural changes in economies, and is thus not an objective that can be achieved in isolation. Moreover, R&D targets have important implications on human resource policies for researchers, as wages account for the bulk of R&D costs. Cultivating, attracting and retaining high-skilled

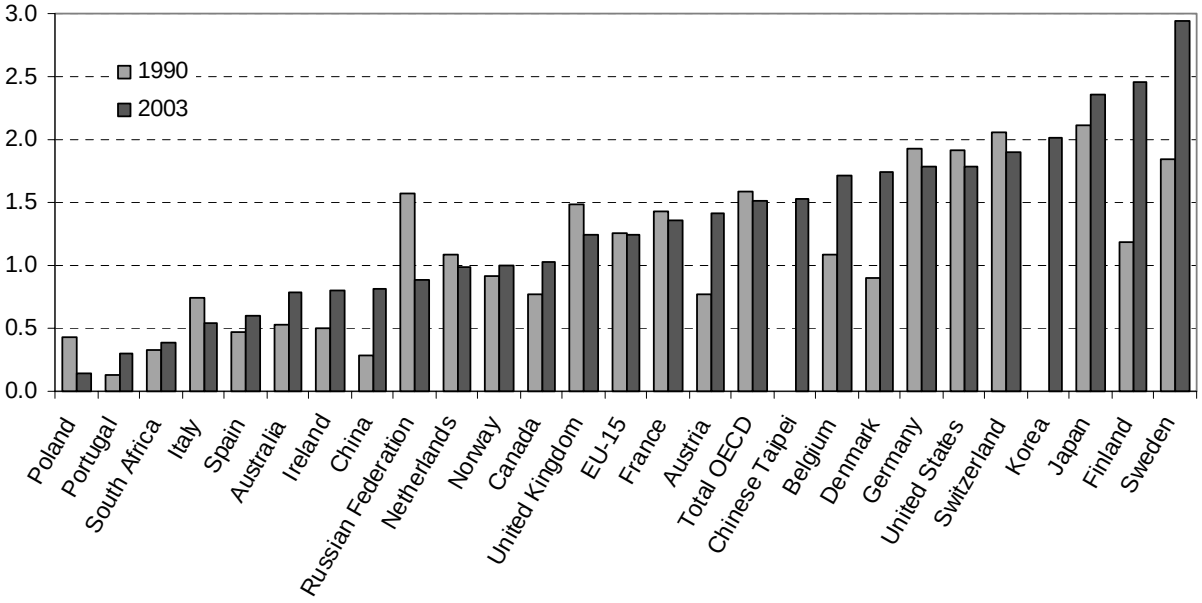
workers is thus important, as are policies to make a country more attractive for investment in innovation and R&D, including foreign direct investment (Sheehan and Wyckoff, 2003). In Spain, for example, R&D by foreign affiliates accounted for over 40% of manufacturing expenditure on R&D (OECD, 2005*b*).

Figure 9: **R&D intensity by country and main OECD region, 1990-2003**[1]

(Gross domestic expenditure on R&D as a % of GDP)



(Business expenditure on R&D as a % of GDP)



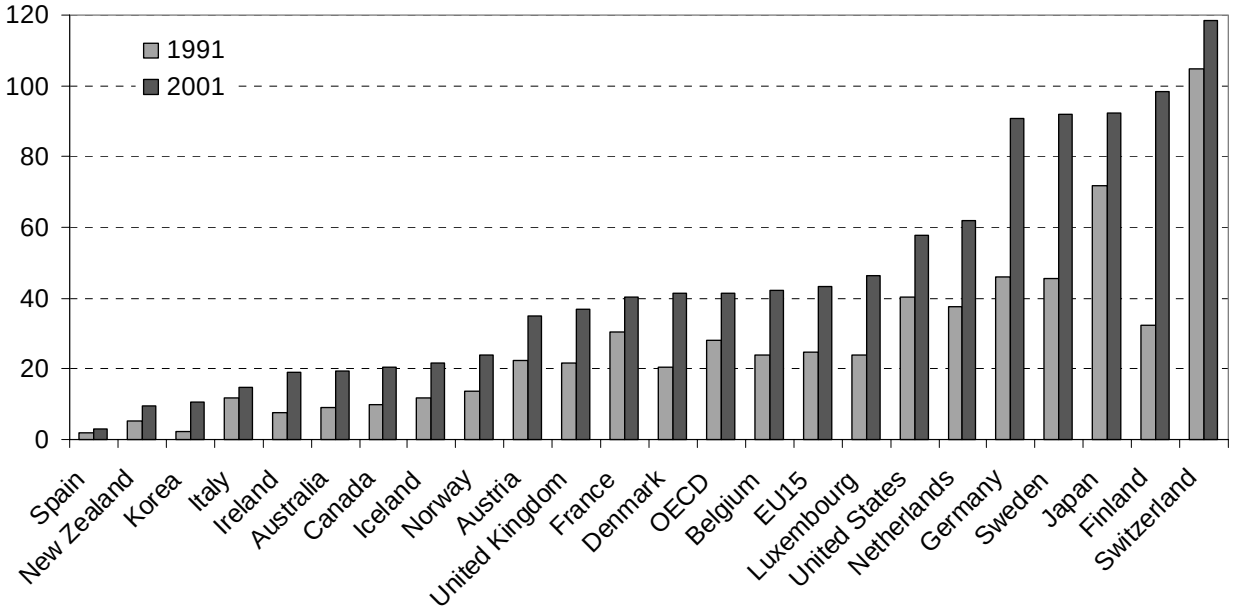
1. Or nearest available year, see source for details.
Source: OECD (2004), *Main Science and Technology Indicators 2005-1*, June 2005.

Expenditure on R&D primarily reflects an input into innovation, however, and is not a measure of innovation output. Figure 10 shows how different OECD countries perform in terms of triadic patents, *i.e.* patents to protect a single invention that are taken in the three main patent offices, notably the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japanese Patent Office (JPO). The graph shows that most OECD countries have experienced a growth in innovation according to this

indicator over the 1990s. Spain ranks relatively low compared to the other 22 leading patenting countries, which suggests that it is not yet very strong in the production of original innovations that have global applications and that it still primarily relies on technology from abroad.

Innovation is not just about R&D and much innovation is of a non-technological nature. Such process innovation is particularly important in the services sector, where lack of innovation can contribute to low MFP growth. For example, turning investment in fixed capital, such as ICT, into more rapid productivity growth is closely associated with innovation in products and processes (OECD, 2003*a*). Regulatory barriers and lack of international trade in services are particularly important constraints for innovation in services, as competition can provide powerful incentives for firms to enhance performance and gain an edge on other firms. Several OECD governments are currently considering whether and how they can broaden their innovation policies to incorporate innovation in services (OECD, 2004*b*).

Figure 10: **Number of triadic patent families[1] per million population**
According to the residence of the inventors, for priority year 2001



1. Triadic patents are patents filed at the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japanese Patent Office to protect the same invention. Patent counts are based on the inventor's country of residence, the earliest priority date and fractional counts. 2001 data are OECD estimates.
Source: OECD Patent Database, March 2005, see www.oecd.org/sti/ipr-statistics

Insufficiently developed links between science and industry are another factor limiting innovation in several OECD countries. Innovation in key sectors such as biotechnology, in particular, is closely linked to advances in basic science. Interaction within the innovation system, notably between science and industry, has grown in recent years. Nevertheless, there are considerable differences among OECD countries in the extent to which innovation draws on science. The growth in science-industry links over the 1990s, as measured by patent citations has been much more rapid in the United States, Canada, the United Kingdom and Australia than in France, Germany or Japan (OECD, 2002). Policy plays a role in explaining these cross-country differences. In the United States, for example, the linkages have been strengthened by initiatives in the 1980s and 1990s, like the extension of patent protection to publicly funded research, and the introduction of co-operative research and development agreements to facilitate technology transfer from the public sector to private industry.

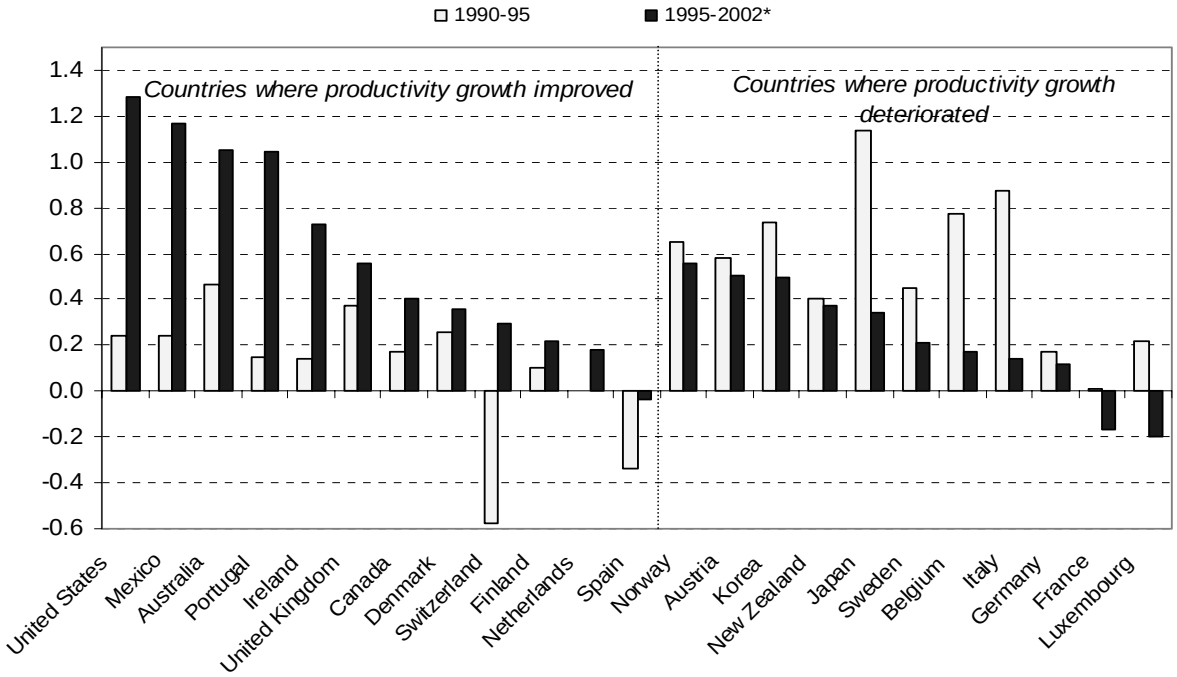
III.4 Seizing greater benefits from the use of ICT

The fourth factor possibly affecting MFP that can be identified is the use of ICT in the production process. This effect can be interpreted in several ways. For example, ICT may help firms gain market share at the cost of less productive firms, which could raise overall productivity. In addition, the use of ICT may help firms to expand their product range, to customise the services offered, to respond better to client demand, or in short, to innovate. Moreover, ICT may help reduce inefficiency in the use of capital and labour, *e.g.* by reducing inventories. The diffusion of ICT may also help establish ICT networks, which can give rise to spill-over effects.

In recent years more evidence has emerged that ICT use can indeed help raise MFP growth. First, certain ICT-intensive services, such as wholesale and retail trade and finance, have experienced an above-average pick-up in labour productivity growth in recent years, *e.g.* in Australia and the United States (Pilat and Wölfl, 2004; Figure 11). Second, there is growing evidence at the firm level from a wide range of studies in many OECD countries that ICT can help to improve the overall efficiency of capital and labour (OECD, 2004). Third, there is evidence for a few countries, notably Australia and the United States that certain ICT-using industries have also experienced a strong improvement in MFP growth in recent years (Gretton, *et al.*, 2004; Bosworth and Triplett, 2003).

Figure 11: **Contribution of ICT-using services to aggregate labour productivity growth, 1990-95 and 1996-2002**

(Total economy, value added per person employed, contributions in percentage points)



Note: ICT-using services are defined as the combination of wholesale and retail trade (ISIC 50-52), financial intermediation (ISIC 65-67) and business services (ISIC 71-74). See Figure 8 for period coverage. Data for Australia are for 1995-2001.
Source: Estimates on the basis of the OECD STAN database, September 2004. See Pilat and Wölfl (2004) for detail.

For many other OECD countries, firm-level studies have shown that ICT use can have positive effects on productivity (OECD, 2004*a*). However, in most of these countries, these benefits are not yet very visible at the sectoral level, which suggests that some of the conditions for this investment to become effective in improving aggregate productivity growth may not yet have been fully established. For example, ICT networks in many OECD countries may not yet have been sufficiently diffused, or for a

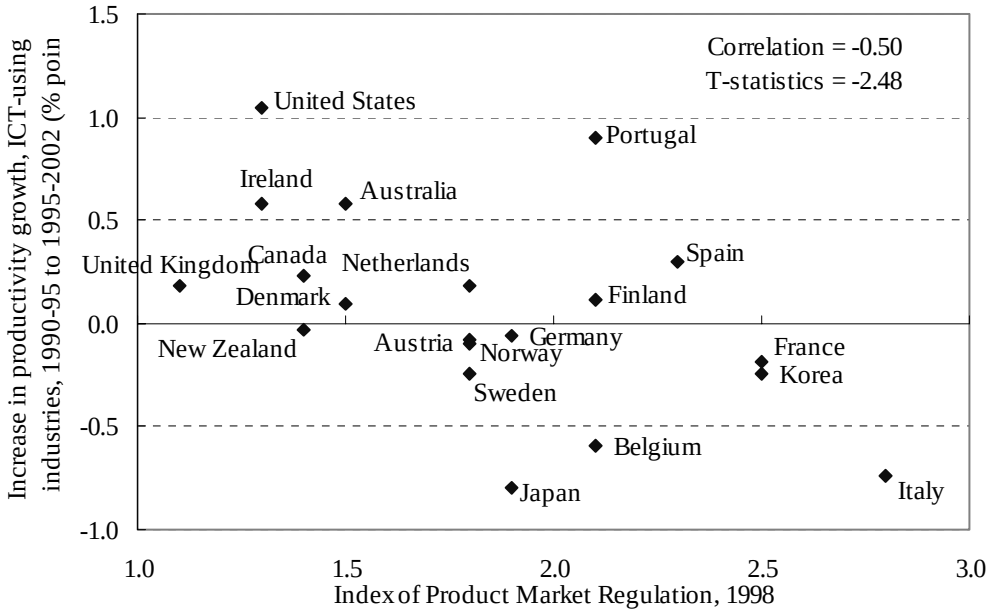
sufficiently long period, and companies may therefore not yet have been able to achieve large productivity returns from their investments. Given the relatively high rate of diffusion of ICT networks at this time (see OECD, 2003*c*); this explanation would imply that the returns of ICT investment on productivity might still emerge in the near future.

However, this is not the only possible explanation. There is some evidence from cross-country comparisons of the productivity impacts of ICT that the firm-level impacts of ICT may be smaller in European countries such as Germany, than in the United States (Haltiwanger, *et al.*, 2003). Productivity gains in ICT-using services might be smaller since the necessary complementary investments, e.g. in organisational change, skills and innovation, have not occurred to a sufficient degree. The lack of such changes in many OECD countries could be due to difficulties in changing organisational set-ups linked to relatively strict employment protection legislation, in particular for regular employment (De Serres, 2003). Another factor limiting the gains from ICT, already discussed above, may be lack of complementary process innovation in the service sector (OECD, 2003*b*). Innovation is important since users of ICT often help make their investments more valuable through their own experimentation and innovation, *e.g.* the introduction of new processes, products and applications. Without this process of "co-invention", which often has a slower pace than technological innovation, the economic impact of ICT could be more limited.

The aggregate impacts of ICT might also be smaller in Europe if firms that succeed in increasing productivity thanks to their investment in ICT do not grow sufficiently to gain market share. The US-Germany comparison highlighted above suggested that US firms had much greater variation in their productivity outcomes than German firms with some US firms experiencing very strong productivity gains from ICT (Haltiwanger, *et al.*, 2003). This may be because US firms engage in much more experimentation than their German counterparts; they take greater risks and opt for potentially higher outcomes. Lack of competition and lack of new firm creation in ICT-using services may also play a role. Competition is important in spurring ICT investment as it forces firms to seek ways to strengthen performance relative to competitors. In addition, newly created firms are often the first to take up new technologies; a lack of new firm creation and a lack of subsequent growth of these firms may therefore also be linked to poor performance in turning ICT investment into productivity gains.

Product market regulations may also play a role as they can limit firms in the ways that they can extract benefits from their use of ICT and reduce the incentives for firms to innovate and develop new ICT applications. For example, product market regulations may limit firms' ability to extend beyond traditional industry boundaries. The impact of product market regulations on ICT investment is confirmed by several studies. For example, OECD countries that had a high level of regulation in 1998 have had lower shares of investment in ICT than countries with low degrees of product market regulation (Gust and Marquez, 2002; OECD, 2003*b*). Moreover, countries with a high degree or product market regulation have not seen the same pick-up in productivity growth in ICT-using services than countries with low levels of regulation (Figure 12).

Figure 12. **Relationship between growth in the contribution of ICT-using services to aggregate productivity growth and the state of product market regulation**



Source: Productivity growth in ICT-using services from Figure 11, product market regulation from Conway, *et al.*, 2005.

Seizing the benefits from ICT therefore crucially depends on complementary investments in organisational change, skills and innovation (OECD, 2003b). These investments and changes, in turn, require a business environment that is sufficient flexible for firms to make the necessary changes. Many OECD countries still require further reform of product and labour markets to foster such an environment.

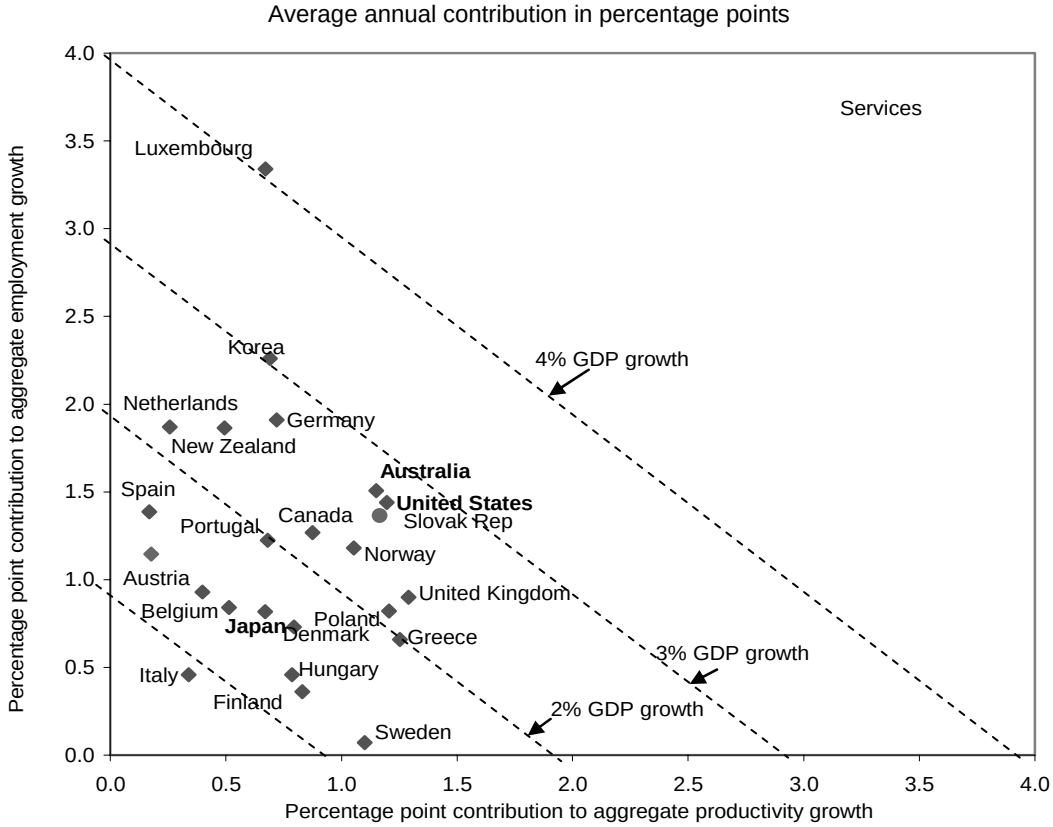
III.5 The role of services

More attention has recently also focused on the contribution of services to productivity growth, primarily because of the growing weight of this sector in OECD economies. Spain takes an intermediate position in OECD countries as regards the contribution of services to productivity and employment growth (Figure 13; Wölfl, 2005). In certain countries, such as Korea, New Zealand, the Netherlands and Spain, services have made an important contribution to employment growth over the past decade, but a relatively small contribution to productivity growth. In a few others, such as Greece, Poland and the United Kingdom, the contribution of services to productivity growth has been larger than their contribution to employment growth. In yet another group of countries, including Australia, Canada, the Slovak Republic and the United States, services have made important contributions to both employment and productivity growth.[7]

Over time, the contribution of services will have to grow in many OECD countries, as the manufacturing sector will decline and manufacturing firms will slowly be turned into services firms. Moreover, a productive and competitive services sector is also important to underpin the performance of the manufacturing sector. The growing importance of services makes it important to implement policies that take account of the growing contribution of this sector to aggregate performance. Regulatory reform and openness to trade and foreign direct investment in services are of great importance in this regard, as the services sector is traditionally less exposed to competitive pressure than the manufacturing sector.

7. The contribution of services to employment growth may reflect different starting points; for example, Finland and Sweden already have a considerable part of the population employed in the services sector.

Figure 13. **The contribution of the services sector to aggregate productivity and employment growth, 1990-2002**[1]



Note: 1. Or most recent year available. 2. The diagonal lines in the graph correspond approximately to the contribution to GDP growth that can be attributed to the services sector.
Source: OECD STAN database, June 2005.

Better product market regulation and a more competitive environment can speed up the adoption of new technologies in the services sector and, more generally, the process of innovation and growth. It is also important to consider whether existing policies may have an implicit policy bias against services. For example, government policies for R&D and technology diffusion are often primarily focused on the manufacturing sector and are not always suitable for addressing the specific needs of the services sector.

Enhancing the understanding of the services sector is important since the recent experience of countries such as the United States and Australia shows that this sector can be a dynamic source of growth, notably through the effective application of ICT, organisational change and upgrading of skills. Moreover, with the slow decline of the manufacturing sector throughout the OECD area, the services sector becomes increasingly important for aggregate employment and productivity growth. To address these issues, the OECD has recently been engaged in a project on the economic performance of the services sector, and the policies that can help foster growth of employment and productivity. The results of this work were presented to the OECD Ministerial meeting in 2005 (OECD, 2005*c*). A key conclusion of this work concerned the need to open up services markets to domestic and international competition, as a way to drive down costs and foster the development of new services and new employment in this sector. The report also stressed the need for improvements in the functioning of labour markets, to facilitate the structural changes occurring in OECD economies, with a growth of services and a decline of many other sectors. Other areas were policy recommendations were made concerned education and training systems, tax policy, as well as innovation and technology policy, as these can be made more relevant to services firms.

IV. Some implications for Spain

This paper revisited some of the previous OECD work on productivity and economic growth and brought together some further evidence at the aggregate, industry and firm level. It also pointed to some of the factors that have influenced the diversity in growth performance of OECD countries over the past years. One important driving factor may have been the increased level of competition in many OECD countries, due to regulatory reform and greater openness to international trade and investment. This has likely increased the incentives for firms to increase overall efficiency, and may also have facilitated the diffusion of new technologies, including ICT, and knowledge more broadly.

As regards the position of Spain in international growth performance, the paper demonstrates that Spain has been among the strong performers in the OECD area over 1995-2004. While it has not grown quite as fast as top performers such as Australia, Ireland and Finland, it has grown more rapidly than many other OECD countries. In the case of Spain, this strong performance is primarily based on strong employment creation, as labour productivity growth declined over 1995-2004 (although it has picked up in recent years).

Further improvements in labour utilisation seem feasible and may require further reform of labour markets. Recent OECD studies have called for reform of Spain's system of wage bargaining, as this may risk excluding workers in certain groups and regions from the labour market (OECD, 2005*a*). Other labour market reforms are also considered important, notably improvements in active labour market policies and the public employment service, as well as efforts to link unemployment benefits closer to active job search and to foster family-friendly policies that can help increase female participation in the labour market.

More can be done as well to improve labour productivity growth. One important factor is once more the labour market, where the reforms in employment protection legislation for temporary workers have contributed to a dual labour market, with firms having few incentives to provide training to temporary workers, a situation that may have detrimental effects on productivity growth (OECD, 2005*a*, 2005*b*). Reducing the gap in employment protection legislation between regular and temporary workers may help address this problem.

One other factor underpinning Spain's labour productivity growth has been relatively strong capital deepening, in particular in ICT capital. Another factor is Spain's rapidly improving level of human capital. However, despite the progress in this field, further efforts may be needed to improve the education and training system in Spain. For example, early childhood education is limited for very young children and the OECD PISA comparisons of education outcomes have pointing to low quality in compulsory schooling (OECD, 2005*b*). Reform of universities is also important, in order to improve the quality of research and education and to link funding closer to performance.

The paper has also demonstrated that multi-factor productivity growth in Spain has been relatively weak. While it is not possible to quantify with any degree of precision which factors may account for this weakness, some are likely to have played role. First, in contrast to several other OECD countries, the ICT-producing sector has contributed only little to Spain's productivity performance. There are benefits and drawbacks from a strong reliance on such a sector, however, as Spain has also not been as much affected by the heavy turbulence in parts of this sector as the United States or some European countries. Apart from the telecommunications sector, it is unlikely that the ICT sector will be an important source of productivity growth in Spain in the years to come.

More importantly is that Spain, in contrast with several other OECD countries, has not yet benefited from strong MFP growth in ICT-using services. The productivity benefits of ICT in these sectors might still come in the future, although it is also possible that there are some factors that prevent ICT-driven

structural change in Spain. Product market regulations may play a role, such as relatively strong regulations in the retailing sector, and relatively high administrative burdens on start-up firms (Conway, *et al.*, 2005). Relatively strict employment protect legislation may also play a role, as it can limit the scope for organisational change and process innovation that is often needed to seize the benefits from ICT. Improvements in human capital, as pointed out above, will also be important in making ICT work.

Third, as in several other OECD countries, investment in business R&D has increased in Spain over the past decade, which may have positive impacts on future MFP growth. Nevertheless, Spain continues to lag many OECD countries in innovative performance and may have some scope for further catch-up. On the other hand, Spain's investment in R&D is unlikely to catch up with the R&D intensity recorded for some other OECD countries, as it is limited by the structural composition of the economy, *i.e.* without a large high-tech industry, and by a relatively small firm size. Recent OECD studies (OECD, 2005*b*) have pointed to some measures that could be taken to enhance the efficiency of R&D spending in Spain.

Fourth, as pointed out in several studies, firm dynamics can play a very important role in productivity growth. The available international evidence suggests that Spain is similar to many European economies, with relatively high rates of new firm creation, but with limited growth of new firms into important contributors to the Spanish economy. Creating a better environment for entrepreneurship and risk taking thus remains a challenge.

References

Ahmad, Nadim (2003), "Measuring Investment in Software", *STI Working Paper 2003/6*, OECD, Paris.

Ahmad, Nadim, Francois Lequiller, Pascal Marianna, Dirk Pilat, Paul Schreyer and Anita Wölfl (2003), "Comparing Labour Productivity Growth in the OECD Area: The Role of Measurement", *STI Working Papers 2003/14*, OECD, Paris.

Bartelsman, E.J. and H.L.F. de Groot (2004), "Integrating Evidence on the Determinants of Productivity", in: G. Gelauff, L. Klomp, S. Raes and T. Roelandt (eds.), *Fostering Productivity – Patterns, Determinants and Policy Implications*, Elseviers, Chapter 9, pp. 159-183.

Bartelsman, E.J., S. Scarpetta and F. Schivardi (2003), "Comparative Analysis of Firm Demographics and Survival: Micro-Level Evidence for the OECD Countries", *OECD Economics Department Working Paper No. 348*, OECD, Paris.

Bassanini, Andrea and Stefano Scarpetta (2001), "Does human capital matter for growth in OECD Countries? Evidence from pooled mean-group estimates", *OECD Economics Department Working Paper No. 289*, OECD, Paris.

Bosworth, B.P and J.E. Triplett (2003), "Services Productivity in the United States: Griliches' Services Volume Revisited", paper prepared for CRIW Conference in Memory of Zvi Griliches, Brookings Institution, Washington, DC, September.

Brandt, Nicola. (2004), "Business Dynamics in Europe", *STI Working Paper 2001/4*, OECD, Paris.

Colecchia, A. (2005), "A World of Heterogeneous Workers. What Implications for Human Capital and Productivity Comparisons in the G7 Countries", *STI Working Paper*, OECD, Paris, forthcoming.

Conway, P., V. Janod and G. Nicoletti (2005), "Product Market Regulation in OECD Countries: 1998 to 2003", *OECD Economics Department Working Papers 419*, OECD, Paris.

De Serres, Alain (2003), "Structural Policies and Growth: A Non-Technical Overview", *Economics Department Working Paper*, No. 355, OECD, Paris.

Donselaar, P., H. Erken and L. Klomp (2004), "R&D and Innovation: Drivers of Productivity Growth", in: G. Gelauff, L. Klomp, S. Raes and T. Roelandt (eds.), *Fostering Productivity – Patterns, Determinants and Policy Implications*, Elseviers, Chapter 5, pp. 75-91.

Gretton, Paul, Jyothi Gali and Dean Parham (2004), "The Effects of ICTs and Complementary Innovations on Australian Productivity Growth", in: OECD (2004), *The Economic Impact of ICT – Measurement, Evidence and Implications*, OECD, Paris.

Guellec, Dominique and Bruno van Pottelsberghe de la Potterie (2000), "The Impact of public R&D expenditure on business R&D", *STI Working Paper 2000/4*, OECD, Paris.

Guellec, Dominique and Bruno van Pottelsberghe de la Potterie (2001), "R&D and productivity growth: A panel analysis of 16 OECD countries", *STI Working Paper 2001/3*, OECD, Paris.

Guellec, D. and E. Ioannidis (1997), "Causes of Fluctuations in R&D Expenditures: A Quantitative Analysis", *OECD Economic Studies*, Vol. 29, 1997/II, OECD, Paris, pp. 123-138.

Gust, C. and J. Marquez (2002), "International Comparisons of Productivity Growth: The Role of Information Technology and Regulatory Practices", *International Finance Discussion Papers*, No. 727, Board of Governors of the Federal Reserve System, Washington, DC, May.

Haltiwanger, J., R. Jarmin and T. Schank (2003), "Productivity, Investment in ICT and Market Experimentation: Micro Evidence from Germany and the United States", Center for Economic Studies Working Paper CES-03-06, US Bureau of the Census, Washington, D.C.

Jorgenson, D.W. (2003), "Information Technology and the G7 Economies", Harvard University, December, *mimeo*, http://post.economics.harvard.edu/faculty/jorgenson/

Jorgenson, D.W. and K. Motohashi (2004), "Potential Growth of the Japanese and U.S. Economies in the Information Age", *ESRI Discussion Paper Series*, No. 88, Cabinet Office, Tokyo.

Maddison, Angus (2001), *The World Economy: A Millenial Perspective*, OECD, Paris.

Netherlands Ministry of Economic Affairs (2004), "Fostering Excellence: Challenges for Productivity Growth in Europe", draft discussion paper for the Informal Competitiveness Council, Maastricht, 1-3 July.

OECD (1999), *Implementing the OECD Jobs Strategy – Assessing Performance and Policy*, OECD, Paris.

OECD (2001), *The New Economy: Beyond the Hype*, OECD, Paris.

OECD (2002), *Benchmarking Industry-Science Relationships*, OECD, Paris.

OECD (2003*a*), *The Sources of Economic Growth in OECD Countries*, OECD, Paris.

OECD (2003*b*), *ICT and Economic Growth – Evidence from OECD Countries, Industries and Firms*, OECD, Paris.

OECD (2003*c*), *OECD Science, Technology and Industry Scoreboard*, OECD, Paris.

OECD (2004*a*), *The Economic Impact of ICT – Measurement, Evidence and Implications*, OECD, Paris.

OECD (2004*b*), *Science, Technology and Industry Outlook 2004*, OECD, Paris.

OECD (2005*a*), *Economic Policy Reforms – Going for Growth*, OECD, Paris.

OECD (2005*b*), *OECD Economic Surveys – Spain*, OECD, Paris.

OECD (2005*c*), *OECD Science, Technology and Industry Scoreboard 2005*, OECD, Paris.

Pilat, Dirk and Anita Wölfl (2004), "ICT production and ICT use – what role in aggregate productivity growth?", in: OECD (2004), *The Economic Impact of ICT – Measurement, Evidence and Implications*, OECD, Paris.

Schreyer, Paul, Pierre-Emmanuel Bignon and Julien Dupont (2003), "OECD Capital Services Estimates: Methodology and A First Set of Results", *OECD Statistics Working Papers 2003/6*, OECD, Paris.

Sheehan, J. and A. Wyckoff (2003), "Targeting R&D: Economic and Policy Implications of Increasing R&D Spending", *STI Working Paper 2003/8*, OECD, Paris.

Wölfl, A. (2005), "The Service Economy in OECD Countries", *STI Working Paper 2005/3*, OECD.