

Box 6

SECTORAL PATTERNS OF TOTAL FACTOR PRODUCTIVITY GROWTH IN THE EURO AREA COUNTRIES

Productivity gains are the prime engine of economic growth in industrialised countries. Improvements in aggregate labour productivity can generally be attributed to the amount of machinery or capital used per unit of labour, changes in the quality of labour and a third factor, often termed total factor productivity (TFP).¹ The latter captures changes in total output which do not result from variations in inputs. It is a measure of “disembodied” technical progress or other efficiency gains in the production process, such as managerial or organisational improvements. In practice, TFP growth is computed as the residual output or value added growth remaining after improvements attributable to changes in labour and capital inputs have been taken into account.

In view of the recent release of the EU KLEMS Growth and Productivity Accounts database,² this box discusses the main patterns of TFP developments in a number of euro area countries since the mid-1990s. The EU KLEMS database represents a valuable source of information at an industry level, allowing a deeper analysis of the structure, breadth and composition of TFP growth in euro area economies to be carried out. This box focuses on productivity growth in the market economy since the measurement of TFP is subject to a number of caveats which apply more acutely to non-market services.³ The EU KLEMS dataset has not yet been fully endorsed by national statistical institutes, which suggests that some caution should be used when drawing conclusions.

According to the EU KLEMS database, TFP growth in the euro area declined from an average annual growth rate of 0.9% during the period 1980-1995 to 0.5% in 1996-2004.⁴ The slowdown appears particularly striking in comparison with the United States – where TFP growth increased from 0.7% to 1.6% in the same periods. The decline of aggregate TFP growth occurred in almost all euro area countries included in the dataset, with the only exceptions being Finland and the Netherlands (see the table below). For several countries, including some of the bigger euro area countries, the decline in TFP was not only substantially more pronounced than the average, but has also led to a negative average growth rate since the mid-1990s.

The deceleration of euro area TFP growth mainly stemmed from the manufacturing industries (excluding electrical industries) and the other production sector, followed by distribution

1 For a discussion of aggregate labour productivity developments in the euro area, see the March 2005 issue of the Monthly Bulletin (Box 9) and the article entitled “Labour productivity developments in the euro area: aggregate trends and sectoral patterns” in the July 2004 Monthly Bulletin.

2 EU KLEMS (European level (EU) analysis of capital (K), labour (L), energy (E), materials (M) and service (S) inputs) is a statistical and analytical research project financed by the European Commission.

3 Non-market services include public administration, education, health and social work, and real estate activities.

4 The euro area aggregate consists of Germany, Spain, France, Italy, the Netherlands, Austria and Finland. Alternative estimates of TFP have been provided by the European Commission and the OECD. Although precise figures on TFP may vary significantly across datasets as a result of different definitions of capital and labour inputs, they all show that TFP growth in the euro area has decelerated since the mid-1990s.

Sectoral contributions to change in TFP growth¹⁾

	Average TFP growth		Change in TFP growth	Sectoral contributions to change in TFP growth					
	1980-1995	1996-2004		Electrical machinery, post and communication services	Total manufacturing, excluding electrical	Other production ²⁾	Distribution	Finance and business, except real estate services	Personal services
Belgium	0.51	0.33	-0.17	0.11	-0.32	0.00	-0.04	0.15	-0.10
Germany	1.09	0.36	-0.73	0.20	-0.02	0.14	-0.03	-0.99	-0.08
Spain	0.68	-0.92	-1.60	-0.16	-0.48	-0.78	-0.35	0.30	-0.11
France	1.04	0.67	-0.37	0.17	0.05	-0.29	-0.42	-0.11	0.20
Italy	0.51	-0.65	-1.15	0.06	-0.82	0.02	-0.59	0.24	-0.03
Luxembourg	3.18	-0.48	-3.66	0.39	-0.76	-0.02	-0.92	-2.65	-0.10
The Netherlands	0.26	1.05	0.79	0.14	-0.08	-0.17	0.44	0.17	0.32
Austria	1.36	1.19	-0.17	-0.06	0.14	0.24	-0.09	-0.48	0.04
Finland	1.47	2.61	1.14	0.91	-0.01	-0.07	0.32	0.07	-0.01
Euro area	0.85	0.46	-0.39	0.14	-0.20	-0.19	-0.11	-0.08	0.04
United States	0.65	1.61	0.96	0.17	0.01	0.09	0.30	0.32	0.01

Source: ECB computation based on EU KLEMS data.

1) Slovenia has not been incorporated due to missing data for the period 1980-1995. Data are not available for Greece, Ireland and Portugal.

2) This sector includes mining and quarrying; electricity, gas and water supply; construction; and agriculture, hunting, forestry and fishing.

(i.e. wholesale and retail trade, transport and storage) and the financial and business services sector. The manufacturing sector (other than electronics) and the other production sector each accounted for -0.2 percentage point, largely as a result of developments in Spain and Italy in the case of the former sector and Spain and France in the case of the latter sector. Activity in the distribution sector and the financial and business services sector had a substantially smaller impact. The four biggest euro area countries showed a significant decline in at least one of these major sectors. This decline was partly offset by the positive contribution of the electronics and telecommunications sector, which showed an increase in average TFP growth in almost all countries. These dynamics result, with minor exceptions in some countries, from changes in TFP growth rather than a shift in the sectoral composition of value added.

A detailed picture of the structure of TFP productivity growth is illustrated below by means of so-called Harberger diagrams, which depict the cumulative contribution of sectors to TFP growth together with their cumulative value added shares for the period 1996-2004.⁵ Sectors are ordered according to their TFP growth rates so as to distinguish the fastest growing ones (closer to the origin) from those with negative growth (at the end of the distribution), thereby making it possible to identify whether TFP growth is broad-based or concentrated in specific sectors. A situation in which all sectors contribute positively, and to the same extent, to aggregate TFP growth would correspond to a sectoral distribution of TFP gains along a straight, upward sloping line. If not all industries show positive TFP growth, the Harberger diagram is a hump-shaped curve.

Significant differences emerge in the underlying sectoral basis across euro area countries. On the one hand, in Finland, Slovenia and, to a lesser extent, the Netherlands, TFP growth appears

5 Harberger, A.C., (1998), "A Vision of the Growth Process", *American Economic Review*, Vol. 88, No 1, pp. 1-32.

to be fairly equally distributed and broad-based across sectors, which is similar to the situation in the United States. On the other hand, there is a cluster of countries, including Belgium, Spain, Italy and Luxembourg, with localised TFP growth. In countries with negative aggregate TFP growth rates, the share of value added represented by the sectors contributing positively to TFP growth amounts to no more than one-fourth of the market economy. In the case of Germany, France and Austria, which fall between the group with an equal distribution and the group with a localised growth pattern, TFP growth is fairly broad-based but the negative contribution of specific sectors – such as, for example, the business services sector in Germany – lead to a hump-shaped pattern of distribution.

In most countries, information and communications technology (ICT) producing sectors, such as the communications and electrical equipment sectors, are among the fastest growing sectors. In some countries, this could be related to the deregulation of the communications sector in the 1990s. The electricity, gas and water supply sector, which has been partly deregulated in some countries in recent years, also made a positive contribution to TFP growth.⁶ Notwithstanding this broad similarity, the group of countries with very localised sectoral growth is marked by weak or negative TFP growth in sectors which are typically identified as not being very ICT-intensive, as well as in ICT-intensive sectors such as the financial intermediation or business services sectors.⁷ For the countries falling between the group with an equal distribution and the group with a localised growth pattern, on average the more ICT-intensive sectors have been the main source of negative TFP growth since the mid-1990s.

The deceleration and low level of TFP growth, and the very localised sectoral basis of TFP growth apparent from the EU KLEMS data reflect the challenge that a number of euro area countries face in raising trend productivity gains. This may be particularly demanding in countries where the expansion of employment in recent years has been associated with the inclusion of some low-skilled segments of the labour force. In the context of the Lisbon process, a number of policy areas have been identified where further reform is needed to raise trend productivity gains. In particular, the updated Integrated Guidelines⁸ emphasise the need to achieve higher productivity growth through more market competition, especially in the services sector; labour market flexibility to allow firms to better adjust to changing market conditions; raising the skill level of the workforce, as well as improving the quality of education systems and their responsiveness to labour market needs; and, finally, stronger action to foster innovation – including more decisive efforts to meet the Lisbon target of raising research and development expenditure to 3% of GDP by 2010 – are seen to be essential.

6 A discussion of the evolution of the regulatory framework in network industries can be found in Martin, R., M. Roma and I. Vansteenkiste (2005), “Regulatory Reforms in Selected EU Network Industries”, ECB Occasional Paper Series No 28.

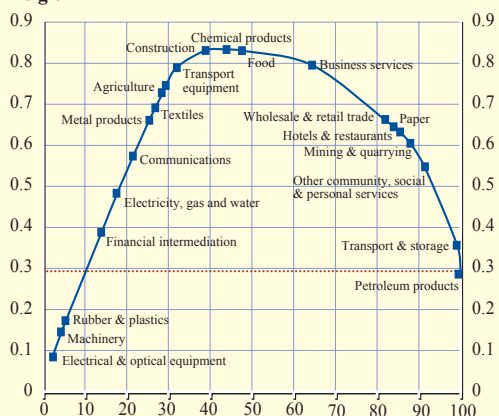
7 A classification of ICT-intensive and non-ICT-intensive sectors can be found in Gomez-Salvador, R., A. Musso, M. Stocker and J. Turunen (2006), “Labour Productivity Developments in the Euro Area”, ECB Occasional Paper Series No 53. This classification is not fully applicable to TFP data in EU KLEMS. In this context, textiles, paper, machinery, transport equipment, furniture, wholesale and retail trade, financial intermediation and business services can be classified as ICT intensive. The non-ICT-intensive sectors include agriculture; mining and quarrying; food; wood; petroleum products; chemicals; rubber and plastics; non-metallic mineral products; metal products; electricity, gas and water; construction; hotels and restaurants; transport and storage; and other community, social and personal services.

8 A discussion of the 2007 update of the Integrated Guidelines for the implementation of the Lisbon strategy for the euro area Member States as a whole is provided in the April 2007 issue of the Monthly Bulletin. Country-specific guidelines address additional issues.

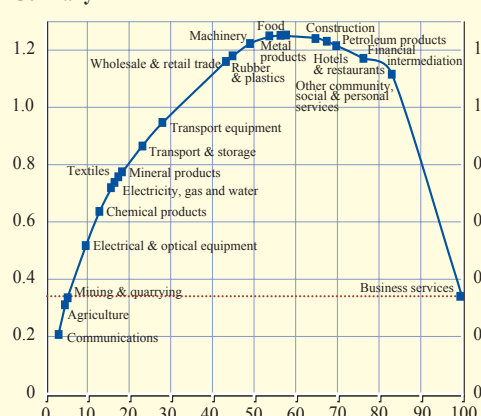
Sectoral contributions to market economy TFP growth, 1996-2004

(percentage points; percentages)

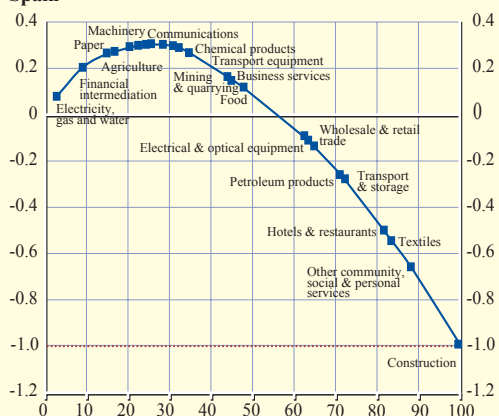
Belgium



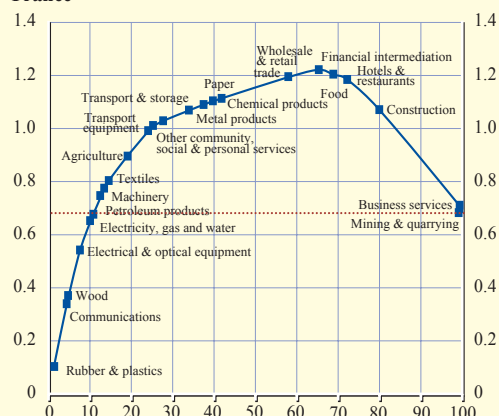
Germany



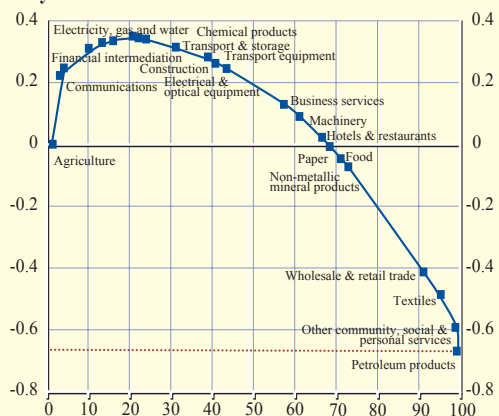
Spain



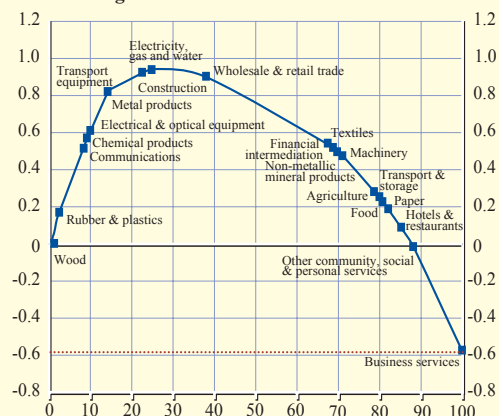
France



Italy



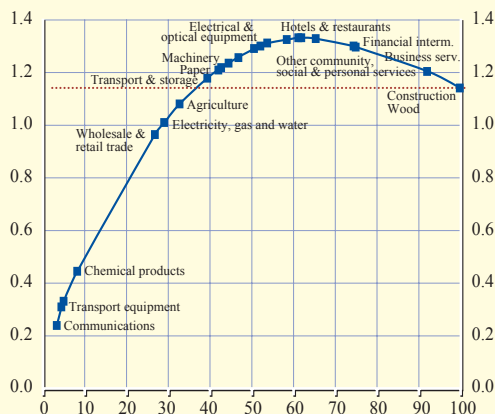
Luxembourg



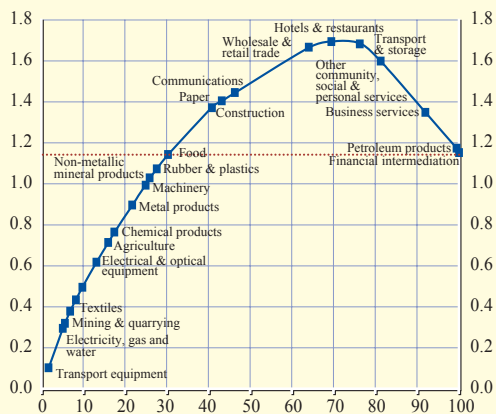
Sectoral contributions to market economy TFP growth, 1996-2004

(percentage points; percentages)

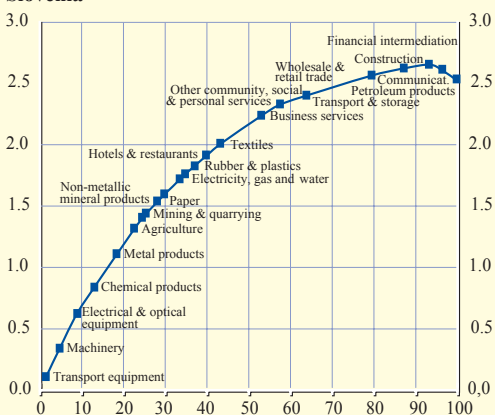
The Netherlands



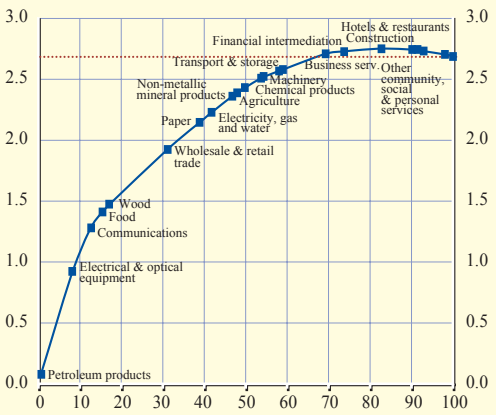
Austria



Slovenia



Finland



Source: ECB computation based on EU KLEMS data.

Note: The horizontal axis shows the cumulative sectoral value added shares and the vertical axis shows the sectoral contribution to aggregate TFP growth. The fastest growing sectors are close to the origin, while those with negative TFP growth are at the end of the distribution. The dotted line indicates the aggregate level of TFP growth for the market economy. Small discrepancies with the figures provided in the table may emerge due to the aggregation procedure.