Statistics in focus

RESEARCH AND DEVELOPMENT

THEME 9 – 1/1999

R&D STATISTICS

Contents

eurostat

Manuscript completed on: 01.02.1999
ISSN 1024-7971
Catalogue number: CA-NS-99-001-EN-I

Regional Employment in High Technology

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16 million persons working in high technology sectors in the EU

Nearly 16 million persons worked in a high technology sector in 1997 in the EU, i.e. approximately 10.6% of total employment, with 27.5% of these people (4.4 million) working in a high tech service sector.

The main EU employers in terms of high technology are Germany with 27.5% followed by United Kingdom (19.9%), France (15.1%) and Italy (11.7%). These four countries account for nearly three quarters of total EU employment in high technology sectors (74.2% accurately) and for 69.4% of total EU employment (all sectors included).

For manufacturing high tech, Germany is the dominant country, whereas for high tech services, the UK tends to stand out.

Highest regional concentration in Germany

According to the share of employment in all high technology sectors, Germany records 10 regions in the top 15, France two, and Italy, Sweden and the United Kingdom one each. Stuttgart (D) comes first with 23.3%, followed by Karlsruhe (D) with 21.1%.

Table 1: Top 15 regions, % of total employment in all high tech manufacturing and services, NUTS 2 (1997) i.e. NACE 24, 29 to 35, 64, 72, 73

	Share of high tech sectors in total employment
Stuttgart (D)	23.3
Karlsruhe (D)	21.1
Rheinhessen-Pfalz (D)	20.1
Franche-Comté (F)	19.2
Braunschweig (D)	18.4
Mittelfranken (D)	18.3
Tübingen (D)	18.0
Unterfranken (D)	17.7
Darmstadt (D)	17.4
Piemonte (I)	17.2
Oberbayern (D)	17.2
Bedford-, Hertfordshire (UK)	16.0
Alsace (F)	15.9
Östra Mellansverige (S)	15.5
Freiburg (D)	15.4

Background to the study

Throughout the course of this century, the structure of employment has changed radically from agriculture to manufacturing and now to services. Almost three quarters of employment is now in services. As we move towards the so-called knowledge-based society, the impact of technology becomes widespread and far-reaching. One way to analyse the effect of technology is to look at employment in high technology sectors, i.e. the number of people whose employment is dependent on the production or use of high technology.

Following on from the last edition of Human Resources in High Technology, which looked at employment in high technology (high tech) manufacturing sectors, this edition of Eurostat's Statistics in Focus attempts to include high tech service sectors also. This paper explains what we mean by high technology, the sectors concerned, and examines the regional distribution of employment in high tech sectors throughout the EU.

Selecting high technology sectors

This selection is at the 2-digit level of the NACE classification (NACE is the statistical classification of economic activities in the European Community). The high tech and higher tech manufacturing industries will be taken from the latest OECD classification[1]. No calculation of R&D intensity has been made. The selection of high tech services is thus based upon choosing the sectors which seem to have the closest links with the high tech industries.

In manufacturing, eight NACE sectors are regarded as high technology (higher and medium-high), of which two are higher tech. For services, we have decided to consider 3 sectors as high(er)-tech.

higher tech manufacturing sectors:
NACE 30: office machinery and computers
NACE 32: radio, television and communication equipment and apparatus

medium-high tech manufacturing sectors:
NACE 24: chemicals and chemical products
NACE 29: machinery and equipment n.e.c.
NACE 31: electrical machinery and apparatus n.e.c.
NACE 33: medical, precision and optical instruments, watches and clocks
NACE 34: motor vehicles, trailers and semi-trailers
NACE 35: other transport equipment

high(er)-tech service sectors:
NACE 64: Post and telecommunications
NACE 72: Computer and related activities
NACE 73: Research and development

[1] *"Revision of the high technology sector and product classification", STI Working Papers. 1997/2, OSTI, OECD.*

Employment in high technology industries – 7.6% of the working population

In the EU, in 1997, 11.5 million persons were working in a high tech industry (NACE 24 and 29-35), representing 7.6% of the total working population. 1.3 million persons were working in higher tech industries (NACE 30 and 32), corresponding to 11.2% of total high tech manufacturing employment.

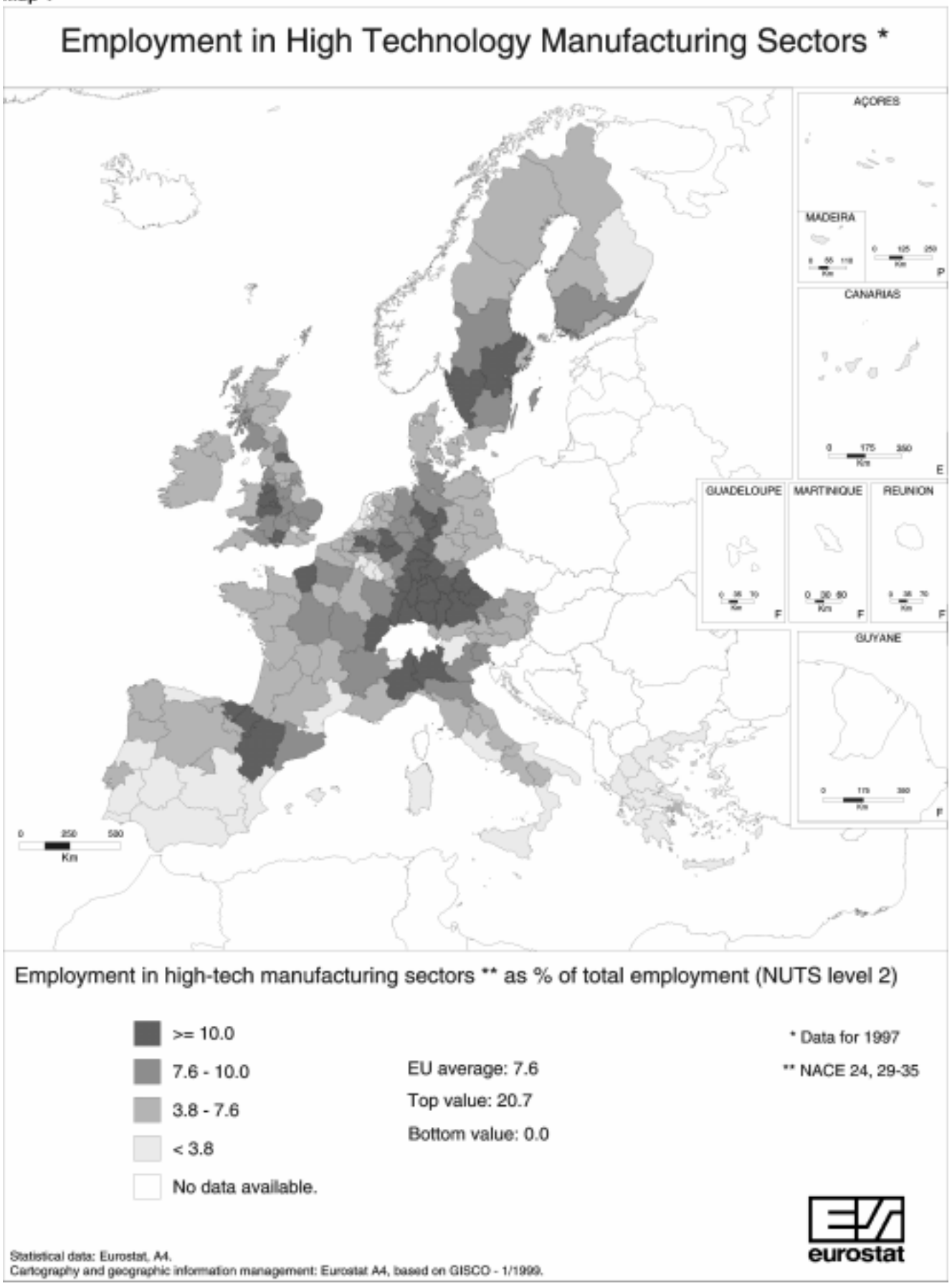
The high tech manufacturing industry that employs the most persons is NACE 29 (machinery and equipment) with 27.6% of total high tech industrial employment in 1997. Chemicals (NACE 24) and motor vehicles (NACE 34) account for 17.7% and 17.3% respectively. Computing (NACE 30) perhaps surprisingly only accounts for 3.9%. The main employer in high tech manufacturing is Germany where one third of total employment is located. Then come the United Kingdom, France and Italy with 17.8%, 13.7% and 12.6% respectively. In terms of EU employment, these four countries account for 77.5% of employment in high tech industries, 76.5% in higher tech manufacturing, and 69.4% of total employment.

However, much of this is determined by the size of the country. A more comparable way to examine the level of high technology within a country is to consider this as a proportion of the total work force.

Therefore, when we express the share of high tech manufacturing employment out of total employment, Germany comes first with 10.8% in 1997. Sweden follows with 8.6% and then the United Kingdom with 7.7%, the EU average being 7.6%. The same ranking for higher-tech industries shows Ireland to be first with 2.0% of total employment, followed by Finland and Sweden, both with 1.3%, the EU average amounting to 0.9%.

Finally, if we look at the share of higher-tech industrial employment in total high tech industrial employment, again Ireland stands out with a 27.2% share in 1997, whereas Germany with 9.3% is below the EU average (11.2%).

Map 1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MADEIRA
CANARIAS
GUADELOUPE
MARTINIQUE
REUNION
GUYANE
Km
Employment in high-tech manufacturing sectors ** as % of total employment (NUTS level 2)
>= 10.0
7.6 - 10.0
3.8 - 7.6
< 3.8
No data available.
EU average: 7.6
Top value: 20.7
Bottom value: 0.0
* Data for 1997
** NACE 24, 29-35
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Statistical data: Eurostat, A4.
Cartography and geographic information management: Eurostat A4, based on GISCO - 1/1999.

at the regional level ...

The ranking of the regions (at NUTS 2 level) according to employment in high tech manufacturing as a share of total employment shows three German regions in the first three places. Moreover, amongst the first 15 regions, which account for 11.5% of total EU employment in high tech industries, 11 are German (see table 2).

Table 2: Top 15 regions, % of total employment in high tech manufacturing, NUTS 2 (1997)

	% of total employment
Stuttgart (D)	20.7
Karlsruhe (D)	17.3
Rheinhessen-Pfalz (D)	16.8
Franche-Comté (F)	16.7
Tübingen (D)	15.6
Braunschweig (D)	15.1
Unterfranken (D)	14.9
Mittelfranken (D)	14.9
Piemonte (I)	14.3
Niederbayern (D)	13.6
Darmstadt (D)	13.2
Schwaben (D)	13.1
Oberbayern (D)	13.0
Alsace (F)	12.9
Limburg (B)	12.9

high tech manufacturing sectors:
NACE 24: Chemicals and chemical products
NACE 29: Machinery and equipment n.e.c.
NACE 30: Office machinery and computers
NACE 31 Electrical machinery and apparatus n.e.c.
NACE 32: Radio, television and communication
NACE 33: Medical, precision and optical
NACE 34: Motor vehicles, trailers and semi-trailers
NACE 35: Other transport equipment

and highER technology industries

If we isolate solely those which are higher tech industries, i.e. NACE 30 and 32, then a completely different picture will emerge. The first 15 regions only account for 9.3% of total industrial high tech employment but for 20.2% of total higher tech manufacturing employment.

The spread of the 15 first regions through the EU regarding the higher tech industries is greater than for high technology industries as a whole. 6 of the top 15 are located in the UK, the region with the highest proportion found in Scotland.

Table 3: Top 15 regions, % of total employment in higher tech manufacturing, NUTS 2 (1997)

	% of total employment
Dumfr.&Galloway, Strathclyde (UK)	3.9
Noord-Brabant (NL)	2.8
Gwent, Mid-SW Glamorgan (UK)	2.7
Pohjois-Suomi (FIN)	2.7
Stockholm (S)	2.6
Hampshire, Isle of Wight (UK)	2.4
Stuttgart (D)	2.3
Östra Mellansverige (S)	2.3
Borders-Cent-Fife-Lothian-Tay (UK)	2.3
Berk-, Bucks, Oxfordshire (UK)	2.1
Ireland (IRL)	2.0
Bedford-, Hertfordshire (UK)	2.0
Mittelfranken (D)	1.9
Karlsruhe (D)	1.8
Limburg (NL)	1.8

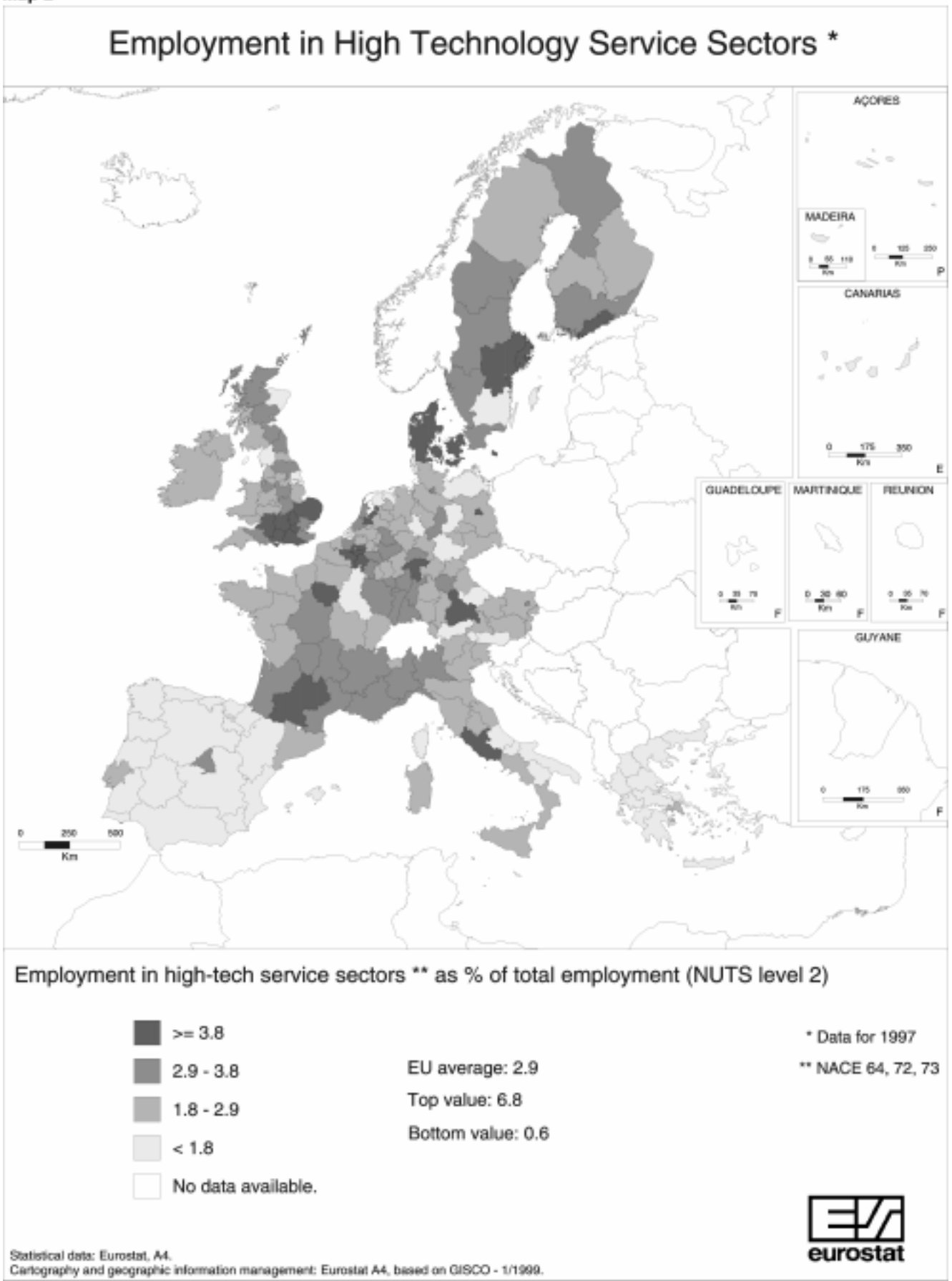
Higher technology:
NACE 30: Office machinery and computers
NACE 32: Radio, television and communication

Employment in high technology services – 4.4% of the working population

In 1997, 4.4 million persons were employed in a high tech service sector (NACE 64, 72 and 73), that is to say 2.9% of total employment and 4.0% of total service employment. These persons are split into 2.6 million working in the post and telecommunications service, 1.2 million in the computing service and 0.6 million in the specific R&D service.

Amongst the EU countries, these are distributed primarily between Germany (22.7%), the United Kingdom (21.5%), France (17.9%) and Italy (11.9%). In terms of employment, Sweden has the highest share of high tech service in total economy with 4.0%. Then comes Denmark 3.9%, United Kingdom and France (both 3.6%). The countries less specialised in high tech services are Spain (1.7%), Portugal (1.5%) and Greece (1.4%).

Map 2


Employment in High Technology Service Sectors *
AÇORES
MADEIRA
CANARIAS
GUADELOUPE
MARTINIQUE
REUNION
GUYANE
Km
Employment in high-tech service sectors ** as % of total employment (NUTS level 2)
>= 3.8
2.9 - 3.8
1.8 - 2.9
< 1.8
No data available.
EU average: 2.9
Top value: 6.8
Bottom value: 0.6
* Data for 1997
** NACE 64, 72, 73
eurostat
Statistical data: Eurostat, A4.
Cartography and geographic information management: Eurostat A4, based on GISCO - 1/1999.

at the regional level ...

The first 15 regions according to the share of employment in high tech services in total employment amounts to 0.93 million persons and 21.3% of EU employment in high tech services. Stockholm (S) comes first with a 6.8% share of total employment, followed by Berkshire, Buckinghamshire, Oxfordshire (UK) with 6.7%, one of 6 British regions in the top 15. France, the United Kingdom, Denmark and Germany are the countries the most intensive in employment in high tech services. It also seems that the capital regions are relatively more intensive in high tech services in terms of employment (see table 4).

Table 4: Top 15 regions, % of total employment in high technology services, NUTS 2 (1997)

	% of total employment
Stockholm (S)	6,8
Berk-, Bucks, Oxfordshire (UK)	6,7
Bedford-, Hertfordshire (UK)	6,1
Île de France (F)	5,8
Surrey, E-W Sussex (UK)	5,2
Utrecht (NL)	5,2
Uusimaa (FIN)	5,0
Greater London (UK)	5,0
Vlaams Brabant (B)	5,0
Lazio (I)	4,9
Namur (B)	4,8
Flevoland (NL)	4,8
Avon, Gloucester-, Wilts (UK)	4,7
Hampshire, Isle of Wight (UK)	4,3
Brabant Wallon (B)	4,2

High(er) tech services:
NACE 64: Post and telecommunications
NACE 72: Computer and related activities
NACE 73: Research and development

Combining higher tech sectors

It is also possible to briefly examine those manufacturing sectors which are considered as higher tech sectors in combination with the proposed service sectors. In this instance, the list is dominated largely by those regions which have a high concentration of employment in high tech service sectors.

Table 5: Top 15 regions, % of total employment in all higher tech manufacturing and services, NUTS 2 (1997) i.e. NACE 30, 32, 64, 72, 73

	Share of high tech sectors in total employment
Stockholm (S)	9.4
Berk-, Bucks, Oxfordshire (UK)	8.8
Bedford-, Hertfordshire (UK)	8.1
Île de France (F)	6.9
Hampshire, Isle of Wight (UK)	6.6
Uusimaa (FIN)	6.6
Östra Mellansverige (S)	6.5
Pohjois-Suomi (FIN)	6.4
Avon, Gloucester-, Wiltshire (UK)	6.4
Vlaams Brabant (B)	6.3
Surrey, East-West Sussex (UK)	6.3
Dumfr.&Galloway, Strathclyde (UK)	5.9
Borders-Cent-Fife-Lothian-Tay (UK)	5.8
Greater London (UK)	5.7
Oberbayern (D)	5.6

Evolution of employment between 1995 and 1997 at the country level

It would be interesting to see how employment in high tech industries evolves compared to total employment, as high tech sectors are supposed to be dynamic and innovative.

Table 6: Evolution of employment between 1995 and 1997 in the EU

	Annual growth rate (%) of employment in EU (excluding Luxembourg)	
	1996/95	1997/96
Total economy	0.5	0.6
Total manufacturing	-1.4	-0.6
High tech manufacturing (NACE 24 and 29 to 35)	0.3	-0.5
Higher tech manufacturing (NACE 30 and 32)	2.3	0.4
Total services	1.2	1.1
Higher tech services	1.0	2.7
Total higher tech	1.3	2.2

Source: Community Labour Force Survey

The series are too short to make any conclusion; however, we can assert that, between 1995 and 1997, employment grew faster in high tech services than in the whole economy.

As for high tech industries, we can't conclude that they are a positive creator of employment. However, at the European level, employment rose faster in the high tech sectors than in the whole economy. While employment in manufacturing fell, employment in high tech manufacturing remained fairly stable.

Conclusions and future developments

About the observation of employment data in the high tech sectors, we can say in a nutshell that Germany is rather specialised in high tech whereas Ireland is relatively intensive in higher tech in terms of employment in manufacturing. At the NUTS 2 level, high tech employment is rather concentrated in Germany and in Northern Italy while higher tech employment is located in the United Kingdom and Ireland. For services, France and Denmark are rather specialised while employment seems more intensive around the biggest cities.

In the future, it would seem interesting to look at a longer time series in order to observe any relation between high technology and evolution of employment. Moreover, we can ask about the unemployment figures in the high tech sectors. Finally, selecting the sectors at the 3-digit level of the NACE classification would be better as it would allow pharmaceuticals (NACE 24.4), aerospace (NACE 35.3) and telecommunications (NACE 64.2) to be considered separately.

➢ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

Definition of a high technology sector - the OECD approach and the R&D intensity

In order to analyse employment in the high technology sectors in manufacturing and in services, it is first necessary to define what a "high technology sector" is. For that, we will use the definition OECD adopted for manufacturing and will try to expand this to services.

The OECD proposed a definition for high tech manufacturing sectors, based on the calculation of the direct R&D intensity - expressed in percentage terms - which is defined, for a given sector, as the ratio of R&D expenditure to GDP (or value added). The higher the intensity, the more the industry could be considered as high tech.

The OECD expanded this method in order to take account of the technology embodied in purchases of intermediate and capital goods (from which results the calculation of the indirect R&D intensity). This would also apply to the service sectors for they are rather technology users than technology producers. The difficulty to collect the requested data on services is the main reason why the OECD did not go further in this area. This is also the reason why the selection of the service sectors which could be considered as high tech will be subjective, and thus open to comments.

The indirect intensity is calculated by taking into account the R&D expenditure embodied in intermediate and capital goods purchased on the domestic market or imported, and is the result of the multiplication of the direct R&D intensities by the input-output coefficients. The calculations are made under the assumption that, for a given type of input, as well as for all groups of products, the proportions of R&D expenditure embodied in production remains constant.

Some other indicators could better define what a high technology sector is, for example, the qualification of the workforce, but this raises the question of what a high-skilled worker is. Hence, only tracks for defining high tech services have been opened, but no accurate definition has been adopted.

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