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THEME 9 – 3/1999

R&D STATISTICS

Contents

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R&D expenditure and personnel in Europe

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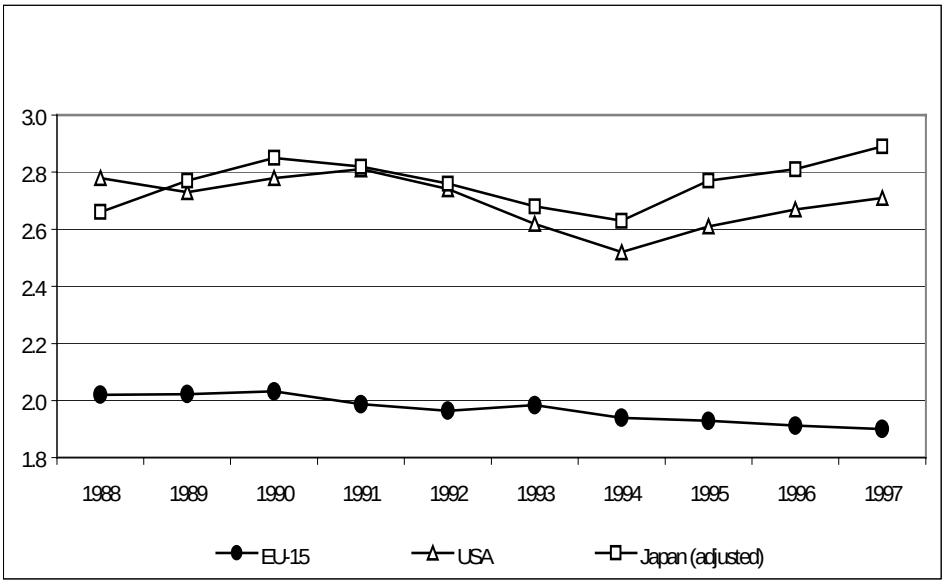


Figure 1: Trends in R&D expenditure by the Triad (as a percentage of GDP)

The EU spent more than ECU135 bn on R&D in 1997

Gross domestic expenditure on research and development (GERD) in the European Union amounted to just over ECU135 billion in 1997, an increase of 4.6% over 1996. At current prices, Europe's expenditure on R&D lay midway between that of Japan (ECU107 bn) and the United States (ECU168 bn). While R&D expenditure in volume terms went up by about 6% in the United States in 1997, the increase was 2% in the European Union and 4% in Japan. EU expenditure on R&D rose by 14% in real terms over a ten-year period, while the USA's spending went up by 21% and Japan's by about 35%.

Expenditure on R&D as a proportion of GDP dropped continuously in the European Union, the United States and Japan in the last few years up to 1994. There was then a resumption of growth in the United States (2.71% in 1997) and Japan (2.89% in 1997), but the downward trend has continued in the EU, with R&D expenditure accounting for only 1.90% of GDP in 1997 (compared to 1.94% in 1994 and 2.03% in 1990).

At 3.8%, Sweden spends more on R&D than any other European country as a proportion of GDP

In volume terms, expenditure on R&D in the European Union has remained more or less constant over time. However, as a proportion of GDP expenditure has been slipping (from 2.02% in 1988 to 1.90% in 1997). The four biggest EU countries account for three-quarters of EU R&D expenditure, with the most recent figures showing that France, Germany, Italy and the United Kingdom together accounted for 74.8% of EU R&D spending in real terms. This proportion has remained stable over time. The four biggest countries alone spent about ECU98 billion on R&D in 1996 (at current prices).

While R&D spending by the big countries as a proportion of their GDP has remained on a downward path since the early 1990s, small countries like Denmark, Ireland, Finland and Sweden have increased their expenditure. In 1997, Sweden spent more than any other EU country on R&D as a proportion of GDP (3.8%), followed by Finland (2.8%) and Denmark (2.1%).

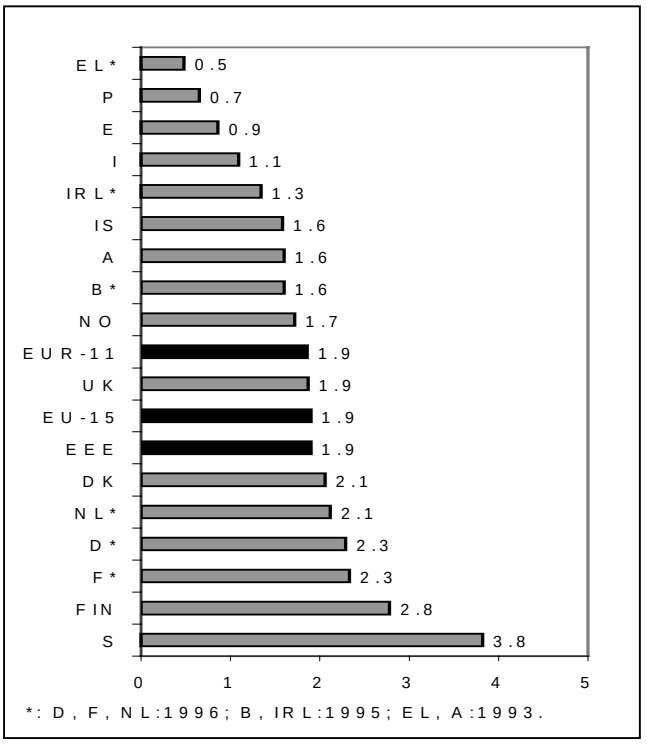


Figure 2: GERD as a percentage of GDP in the EEA countries (1997)

The business enterprise sector accounts for about 63% of R&D spending in the EU

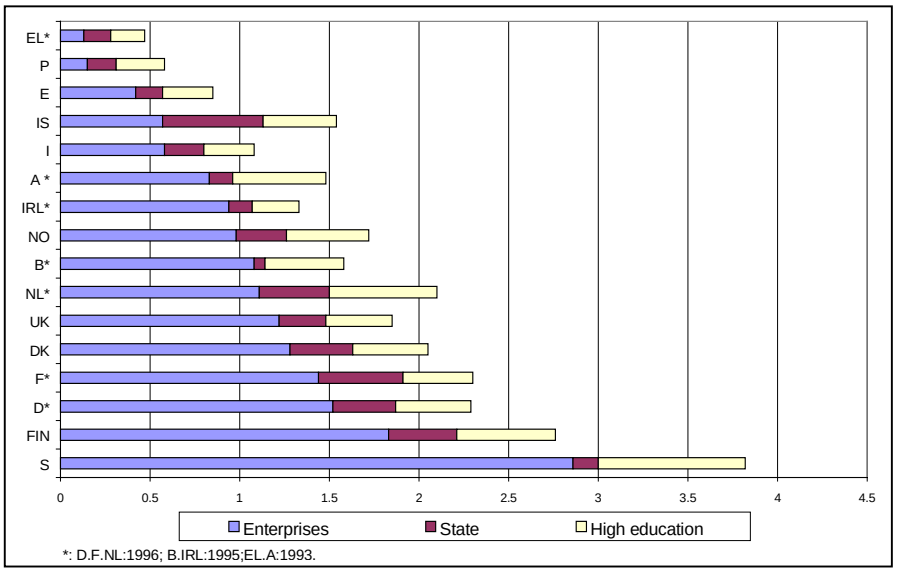


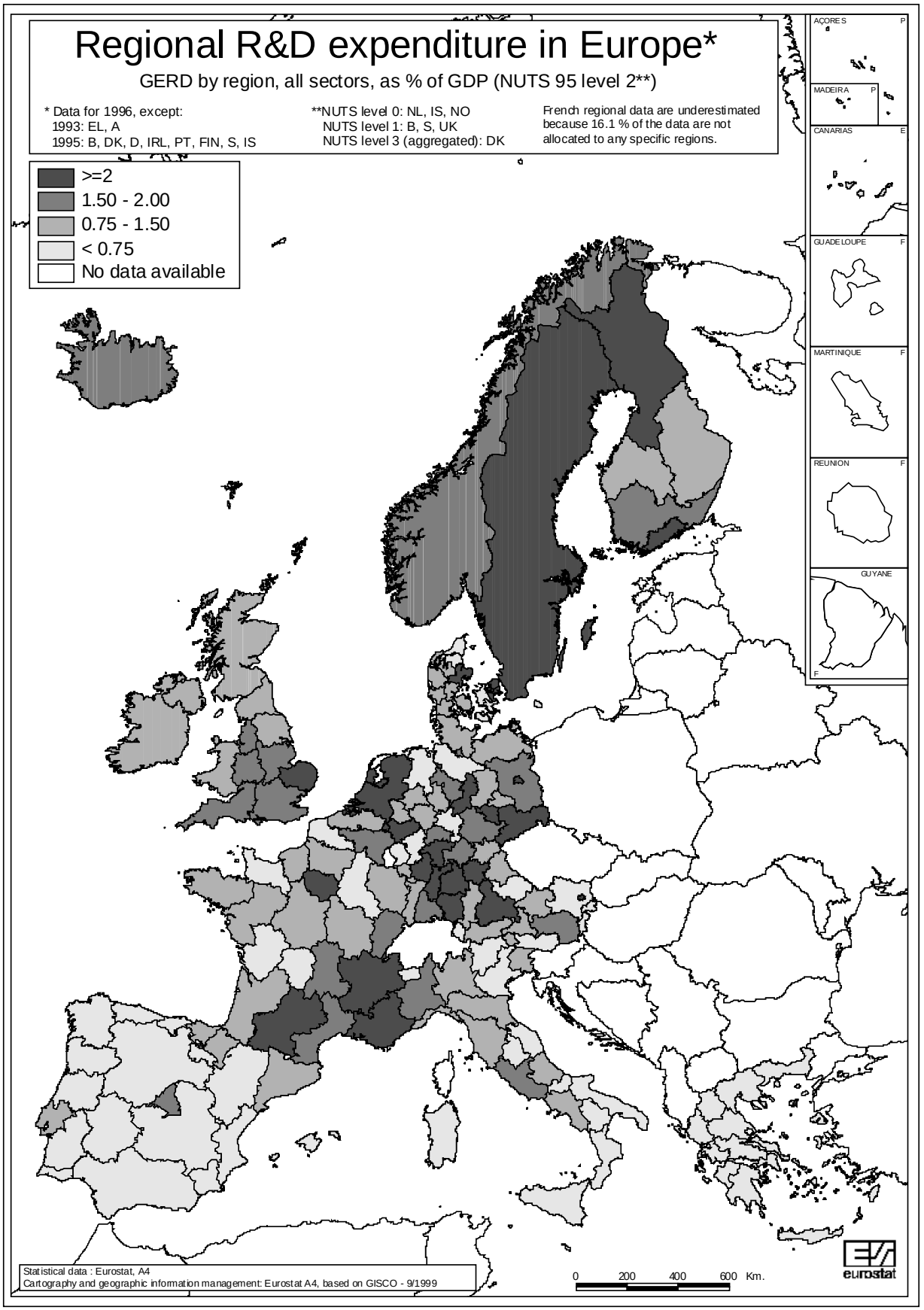
Figure 3: GERD as a percentage of GDP by sector (1997)

The business enterprise sector has accounted for a fairly constant proportion of GERD since the early 1990s. It was responsible for 63% of the European Union's R&D expenditure at current prices in 1997 (approximately ECU85.3 bn), about half a percentage point higher than in 1996. Sweden is the country where businesses account for the highest proportion of R&D spending (75%), while Portugal is at the opposite end of the scale at just 22%.

Higher education is the second most important sector in terms of expenditure on R&D. Expenditure by this sector remained more or less the same in 1997 as in 1996, at around one-fifth of all EU investment in R&D (slightly under 20.7% in 1997). The proportions of R&D expenditure accounted for by the higher education sector vary from country to country: according to the latest available figures they range from a high of 41% in Portugal to a low of 20% in Finland in 1997.

The third largest investor in R&D is the government sector. In 1997 its share in total expenditure stabilised at just over 15.6% for the Union as a whole. The latest available figures (for 1997) show that the proportions varied from 4% for Sweden to more than 24% for Portugal (35% for Iceland). Finally, the private non-profit sector accounts for a negligible share of R&D spending (and is often incorporated into expenditure by another sector).

Map 1


Regional R&D expenditure in Europe*
GERD by region, all sectors, as % of GDP (NUTS 95 level 2**)
* Data for 1996, except:
1993: EL, A
1995: B, DK, D, IRL, PT, FIN, S, IS
**NUTS level 0: NL, IS, NO
NUTS level 1: B, S, UK
NUTS level 3 (aggregated): DK
French regional data are underestimated because 16.1 % of the data are not allocated to any specific regions.
>=2
1.50 - 2.00
0.75 - 1.50
< 0.75
No data available
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Île de France is still the leader in absolute terms ...

If we compare the regions of the Union from the point of view of R&D expenditure at regional level (NUTS 2), Île de France (with 41% of France's GERD) is way out in front in absolute terms (ECU11.4 bn in 1996), followed by a number of regions in Germany, in particular Oberbayern (ECU6.1 bn in 1995) and Stuttgart (ECU4.9 bn in 1995). The top ten regions of Europe (at NUTS 2 level) accounted for about one-third of all EU expenditure (at about ECU42.2 bn). To ensure greater international comparability at this level of detail, derived indicators are required, such as R&D expenditure as a percentage of GDP (or R&D workers as a proportion of the total workforce in the case of personnel comparisons). Map 1 shows that there are major regional disparities in terms of the distribution of R&D expenditure, both from one Member State to another and within the individual Member States).

… but the regions of Germany dominate the ranking in relative terms

If we rank the regions of Europe in terms of R&D expenditure as a proportion of their GDP, seven German regions are among the top ten (Oberbayern spends the most as a proportion of its GDP, at 4.72%). Also in the top ten are the Finnish region of Uusimaa, at 3.6%, and the two main R&D regions of France (Midi-Pyrénées at 3.3% and Île de France at 3.25%). These comparisons do not include data for the United Kingdom because figures for the UK are not available at this level of detail (they are only available at NUTS 1 level).

It should be noted that these comparisons and rankings may be affected by the fact that some 16% of France's R&D spending was not broken down by region in 1996.

	The first 10 European regions (NUTS 2)	GERD as a % of GDP
D	Oberbayern (95)	4.72
D	Braunschweig (95)	4.55
D	Stuttgart (95)	4.47
D	Tübingen (95)	3.98
D	Köln (95)	3.61
FIN	Uusimaa (95)	3.60
D	Berlin (95)	3.36
D	Karlsruhe (95)	3.33
F	Midi-Pyrénées(96)	3.30
F	Île de France (96)	3.25

Table 1: R&D expenditure in the regions of the EU (NUTS 2)

Just over 2.1 million people were employed in R&D in the EU in 1997

In 1997, an estimated 2 122 900 people worked in the R&D field in the European Union. This is equivalent to around 1 601 900 full-time jobs, a rise of about 1.8% over 1996. Although the number of R&D personnel seems to have stabilised in absolute terms in recent years, the number of scientists, researchers and other support staff grew by about 17% overall in the European Union between 1988 and 1997. These figures mask considerable differences between countries: while the number of R&D jobs more than doubled in Ireland and rose by over 40% in Finland and Sweden, there was an overall decrease in R&D jobs in the United Kingdom and Germany (both in terms of absolute numbers and in terms of full-time equivalent jobs).

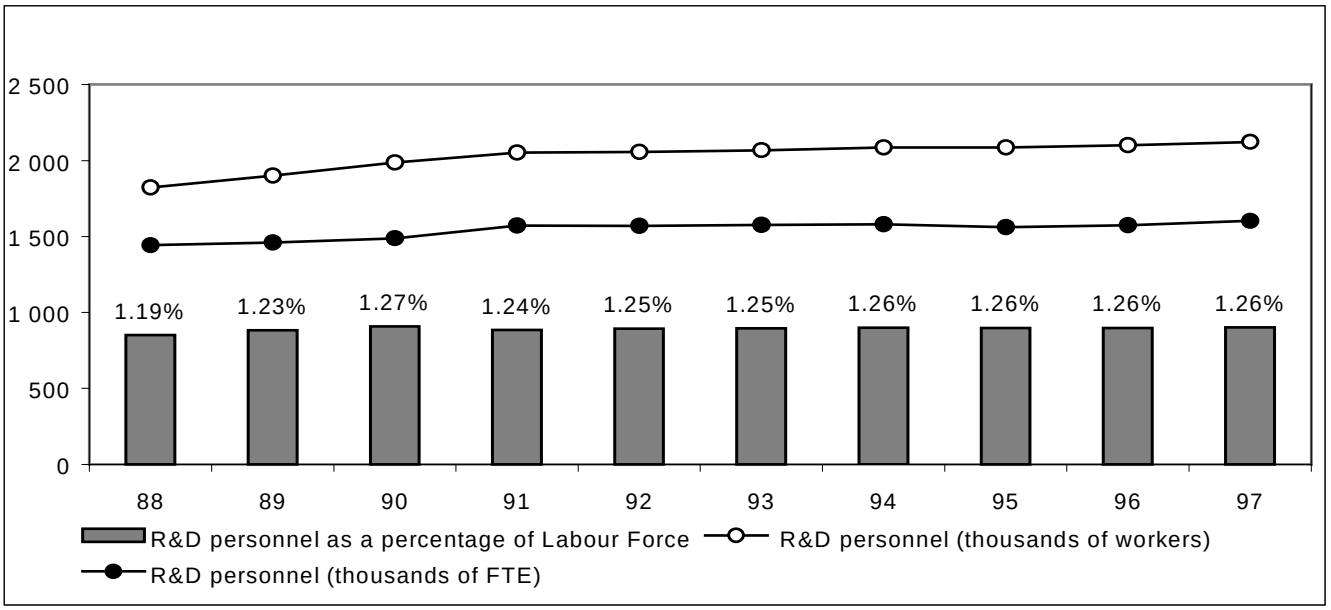

Figure 4: Trends in R&D personnel in the EU from 1988 to 1997

More than two-thirds of R&D workers were employed in the four biggest EU countries …

In 1997, 71% of R&D workers in the EU were employed in Germany, France, Italy and the United Kingdom. Although the number of R&D staff in France has been growing since the end of the 1980s (12% higher in 1996 than in 1988), it should be noted that R&D jobs in Germany fell constantly over the same period (down by around 13%). The number of R&D jobs in Italy and the United Kingdom remained fairly stable during the period in question.

… while the Scandinavian countries had the highest proportion of their workforce employed in R&D.

The most recent figures show that the number of R&D jobs (both in terms of actual jobs and full time equivalent jobs) has continued to grow in all of the Scandinavian countries (especially Denmark, Sweden and Finland) throughout the past ten years. These figures are backed up by the continuous expansion in the proportion of the labour force working in R&D in these countries (close to 2.2% in Sweden and Finland in 1997).

The proportion of R&D personnel in Greece, Portugal and Ireland grew over the same period, but these countries started out from a very low base in absolute terms and they still have not caught up with the other countries.

Around 1.26% of the EU's labour force was employed in R&D in 1997.

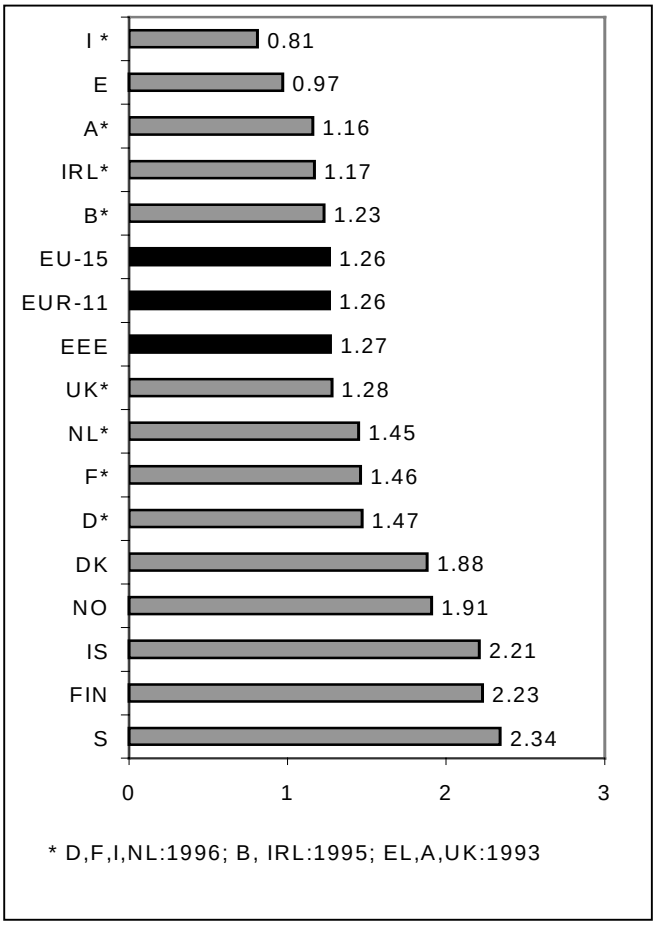

Figure 5: R&D personnel as a percentage of the labour force in the EEA countries (1997)

Breakdown of R&D personnel by institutional sector

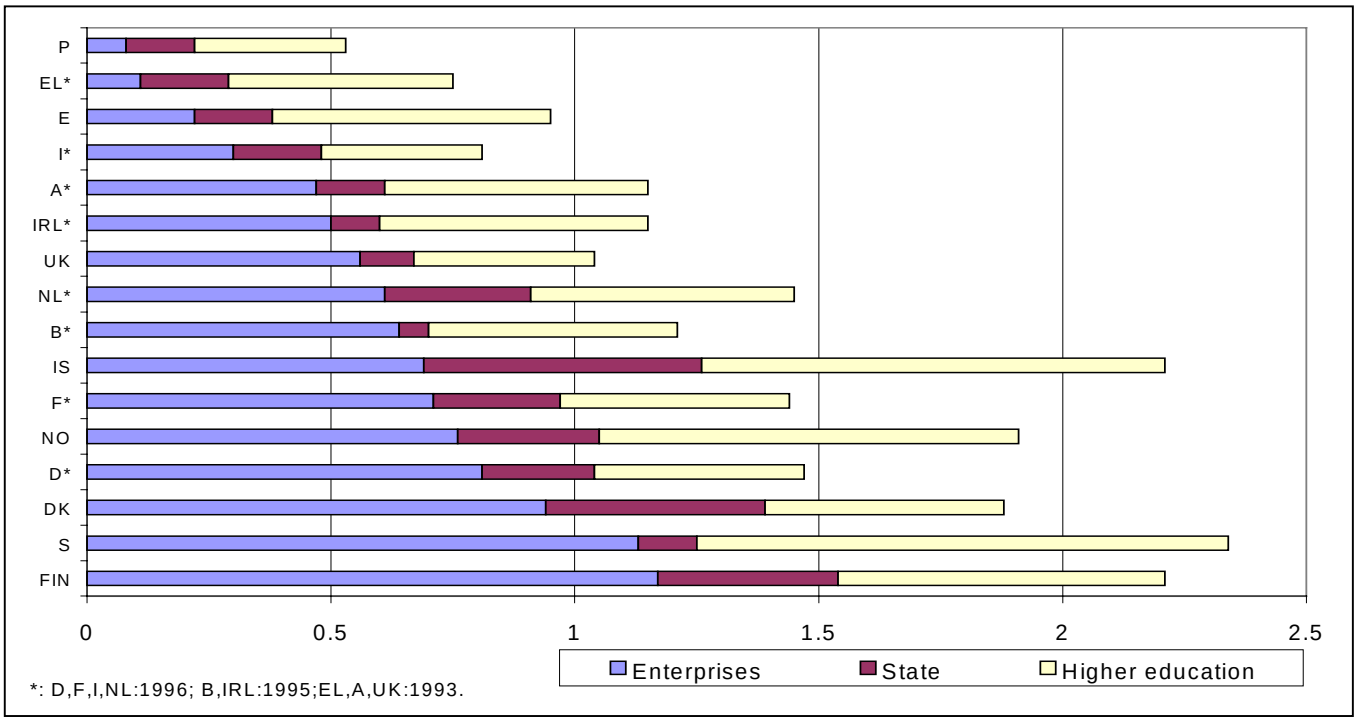

Figure 6: R&D personnel as a percentage of the labour force by sector (1997)

While the business enterprise sector continued to employ the lion's share of R&D workers in the European Union in 1997, this proportion has fallen constantly over the past ten years, but it has been offset by a rise in R&D employment in the higher education sector, from 31% of all R&D jobs in 1988 to about 38% in 1997. R&D jobs in the government sector remained more or less stable during this ten-year period.

In 1997, the business enterprise sector employed approximately 0.6% of the EU's labour force. The proportion was 0.5% for the higher education sector and about 0.2% for the government sector. While the business enterprise sector is the most important provider of R&D jobs in the majority of northern European countries (Belgium, Germany, France, the Netherlands, the United Kingdom, Finland and Sweden), the higher education sector dominates in southern Europe (Greece, Spain, Italy and Portugal).

Germany still ranks strongly, but a number of Swedish regions have taken the lead

If, having examined the regional concentration of R&D *expenditure*, we now turn our attention to the top European regions in terms of the proportion of their *labour force* employed in R&D, we can see that the rankings are upset. Three Swedish regions now fill the first three slots (Stockholm is first with 3.65% of its workforce employed in R&D in 1997), providing added proof that Sweden is ahead of the other Member States.

It should be pointed out that a significant proportion of French jobs in R&D is not broken down at regional level (nearly 29% in 1996).

	The first 10 regions	R-D workers as a % of the LF
S	Stockholm (97)	3.65
D	Oberbayern (95)	3.41
D	Braunschweig (95)	3.18
S	Östra Mellansverige (97)	2.70
D	Stuttgart (95)	2.65
S	Övre Norrland (97)	2.51
D	Karlsruhe (95)	2.45
D	Köln (95)	2.39
D	Tübingen (95)	2.33
F	Île de France (96)	2.31

Table 2: R&D personnel in the regions of the EU (NUTS 2)

➢ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

THE INPUT INDICATORS FOR RESEARCH AND DEVELOPMENT AT REGIONAL LEVEL (R&D EXPENDITURE AND R&D PERSONNEL)

The definitions of R&D personnel and R&D expenditure are taken from the Frascati Manual and relate to the national level (for further details, see paragraph 279 *et seq*. and paragraph 333 *et seq.* respectively of the Frascati manual). For the purposes of regional statistics, these definitions have been adapted to the geographical unit under consideration, i.e. the region (see Part C of the Regional Manual: Key Indicators, paragraph 132 *et seq.*).

Intramural R&D expenditure (GERD) at regional level (paragraph 134 of the Regional Manual):

Regional intramural expenditure is all expenditure on R&D within a statistical unit or sector of the economy, whatever the source of funds.

R&D personnel at regional level (paragraph 151 of the Regional Manual):

All persons employed directly on R&D should be counted, as well as those providing direct services such as R&D managers, administrators, and clerical staff. Those providing an indirect service, such as canteen and security staff, should be excluded, even though their wages and salaries are included as an overhead cost in the measurement of expenditure.

Full-time equivalent - FTE

One FTE may be thought of as one person-year. For example, a person who normally spends 40% of his time on R&D and the rest of his time on other work (e.g. lecturing, university administration, and guidance), accounts for 0.4 FTE).

Personnel

The number of persons who are mainly or partially employed on R&D. For the purposes of comparisons between regions and over time, this indicator is often used in conjunction with employment or population variables.

INSTITUTIONAL SECTORS

Domestic expenditure and R&D personnel are broken down by the institutional sector in which the R&D is carried out. There are four main sectors: the business enterprise sector, the government sector, the higher education sector and the private non-profit sector. (The "foreign" sector is not taken into consideration here).

The business enterprise sector (paragraph 145 of the Frascati Manual):

- All firms, organisations and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price;
- The private non-profit institutes mainly serving these business enterprises.

The government sector (paragraph 168 of the Frascati Manual):

- All departments, offices and other bodies which furnish but normally do not sell to the community those common services, other than higher education, which cannot otherwise be conveniently and economically provided, and administer the state and the economic and social policy of the community. (Public enterprises are included in the business enterprise sector);
- NPIs controlled and mainly financed by government.

The higher education sector (paragraph 190 of the Frascati Manual):

All universities, colleges of technology, and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher education establishments.

The private non-profit sector (paragraph 178 of the Frascati Manual):

- Non-market, private non-profit institutions serving households (i.e. the general public);
- Individuals or households.

Further information:

➢ Reference publications

R&D: annual statistics 1999 (CA-25-99-407-EN-C, EUR 29.50)
R&D: annual statistics 1999 - CD-ROM (CA-25-99-328-3A-Z, EUR 100)
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