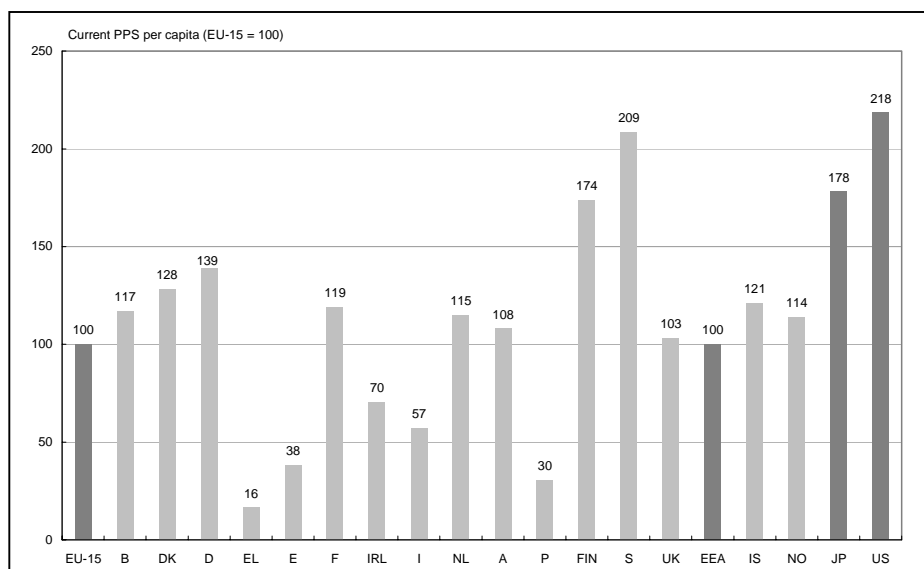


# R&D expenditure and personnel in Europe in 1999 and 2000

## Europe stabilizes, Nordic countries on a par with Japan and the US

*Ibrahim Laafia*

Figure 1: Intramural R&D expenditure per capita in current PPS (EU-15 = 100) for all sectors EEA countries, Japan and the US — 1999



Sources: Eurostat, OECD (JP, US).

**Methodological notes:**

Exceptions to the 1999 reference year — NL: 1998; IRL and EL: 1997.

- R&D expenditure per capita in the EU is about 400 current PPS, but the figures vary a lot amongst the European countries. Highest performances are experienced in Finland and Sweden which are at the same level as Japan and the US.
- In the EU-15, 161 billion ECU/EUR at current prices were spent on R&D in 2000. The increase compared to 1999 is about 5 %.
- R&D expenditure as a share of GDP was slightly down to 1.90 % in 2000 after a significant rise in 1999 (1.92 %).
- R&D personnel in the EU increased slightly in 2000 (+ 0.9 %): 1.7 million people in full time equivalent or 2.3 million in head count were engaged in R&D activities.
- In the European Union, more than half of the R&D personnel are researchers. The ratio is the biggest in the higher education sector.

## Statistics in focus

### SCIENCE AND TECHNOLOGY

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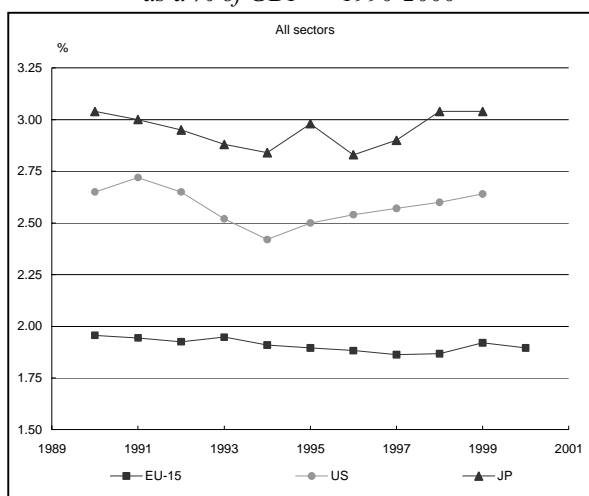
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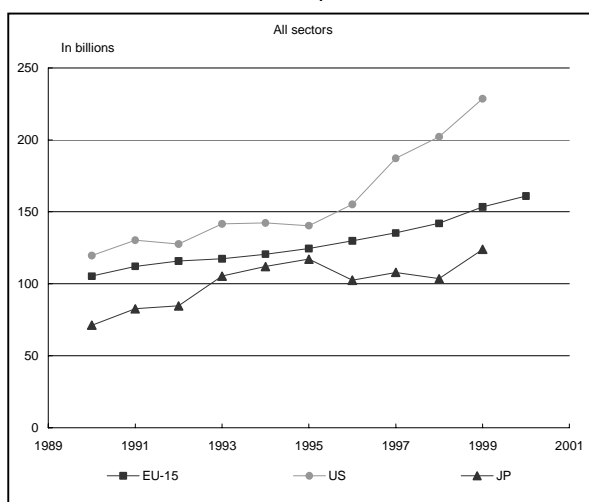
## R&D expenditure and personnel in the EU, Japan and the US

Figure 2: R&D expenditure as a % of GDP — 1990-2000



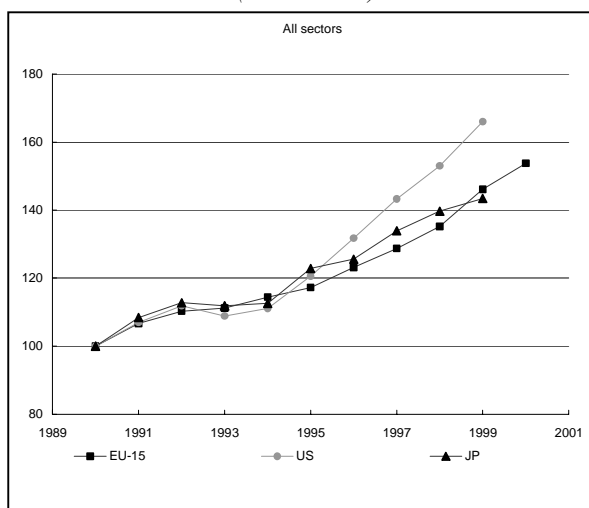
Sources: Eurostat, OECD (JP, US).

Figure 3: R&D expenditure in ECU/EUR at current prices — 1990-2000



Sources: Eurostat, OECD (JP, US).

Figure 4: R&D expenditure in current PPS (1990 = 100) — 1990-2000



Sources: Eurostat, OECD (JP, US).

### EU stabilised its R&D expenditure as a percentage of GDP at around 1.9 % at the end of the nineties

The European Union has displayed an increase of R&D expenditure as a proportion of GDP since 1997, when it recorded the lowest rate of 1.86 % of the 90's (Figure 2). With 1.92 % in 1999, 1994's level was for the first time overtaken. The trend toward 2000 seems stable and is estimated to be 1.90 % of GDP. The gap between US and Japan on one hand and the European Union on the other is still growing. Currently, more than 1.1 and 0.7 percentage points separate Japan and the US respectively from the European level.

In terms of ECU/EUR at current prices, the EU is in second position behind the US (Figure 3). Both increased significantly their R&D expenditures over the last half decade. Nevertheless, the differences between them remain important. With 161 billion EUR in 2000, European R&D expenditure represented 2/3 of that of the US and double that of Japan. Between 1998 and 1999, Japan and the US displayed, with 20 and 13 % annual growth respectively, a strong increase of their R&D expenditure when measured in ECU/EUR at current prices. The expansion of the EU R&D expenditure, 5 % annual growth, is in comparison less important, but remains however steady since 1995.

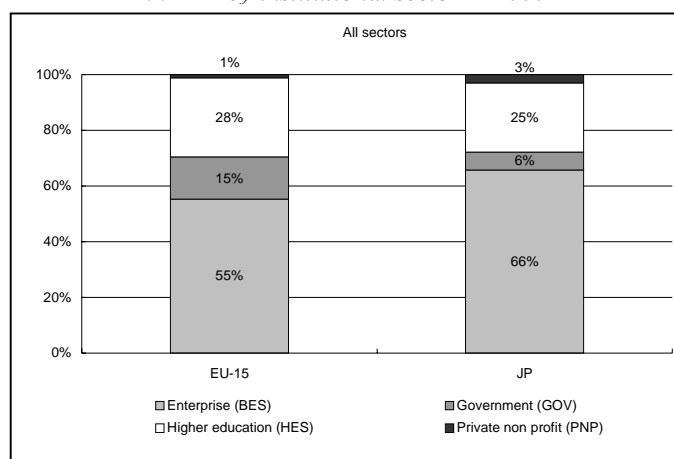
Figure 4 shows the trend in R&D expenditure expressed in PPS <sup>(1)</sup> and taking 1990 as the base year. In 1999 the U.S. registered the highest increase with 166. The figure for the EU is 154 for 2000, which puts it in second place, ahead of Japan, whose 1999 figure is 143.

### A bigger proportion of EU-15 R&D expenditure is performed by the public sector

The breakdown of R&D expenditure by institutional sectors differs across countries. On the one hand, the US and Japan dedicate more than 72 % of the total expenditure (in constant 95 ECU/EUR at 1995 prices) to the business enterprise sector (BES) against around 8 % to the government sector (GOV) and 14 % to the higher education sector (HES). On the other hand, EU privileges more the public sector, devoting 34 % to the GOV and the HES taken together (Table 1).

(1) The purchasing power standard (PPS) is an artificial currency that reflects those differences in the price levels between countries that are not reflected by the exchange rates, and therefore permits better comparability of the data.

Figure 5: R&D personnel in FTE by institutional sector — 1999



Sources: Eurostat, OECD (JP).

## European R&D personnel continues to increase: almost 1.7 million people in full time equivalent (FTE) work in R&D in 2000

In head count (HC), 2.31 million people were R&D personnel in the EU in 2000. R&D personnel in the European Union has increased by 7.5 % in FTE over the last 5 years whereas that of Japan remained stable over the same period.

In 2000, R&D personnel represented 1.34 % of the European labour force, confirming the slight increase that has occurred in Europe over the 5 last years (Table 3).

More R&D personnel work in the public sector in Europe (43 %) than in Japan (31 %). The main difference appears in the GOV whereas the proportion is similar in the HES.

The US does not provide data for total R&D personnel and only figures for researchers (RSE) are available.

## R&D expenditure in the countries of the European Economic Area (EEA)

### Finland and Sweden keep the lead in terms of R&D intensity and also GERD per capita.

In 1999, both Finland and Sweden had a share of R&D expenditure with respect to GDP greater than 3.1 %, which is above that of the US and Japan (Table 1). Germany and France followed with rates of 2.5 and 2.2 %, respectively. Overall, the R&D intensity values have not changed from one year to the next, except for Finland, Belgium and Italy, where increases are noticeable.

Analysed in constant prices, the most important increases compared to the previous year are observed in Finland (15 %), Ireland (10 %) and Belgium (7 %) (Table 2). The EU countries have retained annual average growth rates (AAGR) of between 14 % for Finland and 1 % for France over the last five years. Among the four countries (Germany, the United-Kingdom, France, and Italy) that hold the lead of R&D activities measured in volume, Germany performed best, increasing at an AAGR of 3.5 %.

Table 1: R&D expenditure as a % of GDP by institutional sector — 1995-2000

Sector	EU-15	B	DK	D	EL	E	F	IRL	I	NL	A	P	FIN	S	UK	EEA	IS	NO	JP	US	
Total	2000	1.90 s		2.46 e		0.90 p	2.15 e				1.79 e		1.84 e	3.80	1.84 e	1.89 s			3.04	2.64 jp	
	1999	1.92 s	1.98	2.00 e	2.44 e	0.89	2.19		1.04 e		1.83 e	0.76	3.19	3.80	1.87	1.92 s	1.88	1.70	3.04	2.60 jp	
	1998	1.87 s	1.90	2.02 s	2.31 e	0.90 e	2.17		0.98 s	1.94	1.81 e		2.89	3.75 e	1.83	1.87 s	2.04		2.90	2.57 j	
	1997	1.86 s	1.87	1.94	2.29	0.51	0.82	2.22	1.39 e	0.99 e	2.04	1.69 e	0.62	2.72	3.68	1.83	1.86 s	1.84	1.66	2.83 b	2.54 j
	1996	1.88 s	1.81	1.85 e	2.26 e		0.83 e	2.30	1.40 e	1.01	2.03	1.60 e		2.54	1.91	1.88 s	1.51 e		2.83 b	2.54 j	
	1995	1.90 s	1.72	1.84	2.26	0.49 e	0.81	2.31	1.34 e	1.00	1.99	1.56 e	0.57	2.29	3.46	1.98	1.89 s	1.54	1.71	2.98 l	2.50 j
BES	2000	1.24 s	1.47		1.72 e		0.48 p	1.37 e							1.26	1.23 s			2.15	2.00 jp	
	1999	1.25 s	1.42	1.25 e	1.69 e		0.46	1.38		0.56 e			0.17	2.18	2.86	1.27	1.24 s	0.76	0.95	2.17	1.94 jp
	1998	1.19 s	1.35	1.32	1.57 e		0.47	1.35		0.52	1.05			1.94	2.85 e	1.20	1.19 s	0.75		2.09	1.91 j
	1997	1.19 s	1.34	1.19	1.54	0.13	0.40	1.39	1.01 e	0.52	1.11		0.14	1.79	2.75	1.20	1.18 s	0.75	0.94	2.09	1.91 j
	1996	1.18 s	1.30	1.13 e	1.49 s	0.12	0.40 e	1.41	1.01 e	0.54	1.06			1.68		1.25	1.18 s	0.47 e		2.01 b	1.87 j
	1995	1.19 s	1.23	1.05	1.50	0.14	0.39	1.41	0.96 e	0.53	1.04	0.82 (2)	0.12	1.45	2.57	1.30	1.18 s	0.49	0.97	1.94 l	1.80 j
GOV	2000	0.26 s			0.34 e		0.15 p	0.38 e	0.07 e						0.19	0.26 s			0.30	0.19 hp	
	1999	0.27 s	0.07	0.31	0.34 e	0.15	0.15	0.40	0.07 e	0.22 e			0.21	0.39	0.13	0.20	0.27 s	0.60	0.26	0.28	0.21 h
	1998	0.28 s	0.07	0.29 e	0.34 e		0.15	0.40	0.09 e	0.22	0.36			0.36	0.13 e	0.24	0.28 s	0.76		0.28	0.21 h
	1997	0.28 s	0.06	0.30	0.33	0.12	0.14	0.41	0.10 e	0.20	0.37		0.15	0.37	0.13	0.25	0.28 s	0.55	0.27	0.26	0.21 h
	1996	0.30 s	0.06	0.30 e	0.34		0.15 e	0.47	0.11 e	0.20	0.38			0.40		0.27	0.30 s	0.62 e		0.27	0.22 h
	1995	0.31 s	0.06	0.31	0.35	0.12	0.15	0.48	0.11 e	0.21	0.36	0.13 (2)	0.15	0.39	0.13	0.29	0.31 s	0.58	0.30	0.29	0.24 h
HES	2000	0.38 s			0.40 e		0.27 p	0.36 e							0.37	0.38 s			0.45	0.37 jp	
	1999	0.39 s	0.47	0.42	0.41 e	0.34	0.27	0.38		0.26 e			0.29	0.63	0.81	0.38	0.39 s	0.51	0.49	0.45	0.37 jp
	1998	0.38 s	0.46	0.41 e	0.40 e		0.27	0.38	0.26 e	0.25 e	0.53			0.57	0.76 e	0.36	0.38 s	0.51		0.45	0.37 jp
	1997	0.39 s	0.45	0.43	0.41	0.26	0.27	0.39	0.27 e	0.26 e	0.56		0.25	0.54	0.79	0.36	0.39 s	0.52	0.44	0.41	0.37 j
	1996	0.39 s	0.43	0.40 e	0.42		0.27	0.39	0.26 e	0.27	0.58			0.46		0.37	0.39 s	0.36 e		0.42 b	0.38 j
	1995	0.39 s	0.41	0.45	0.41	0.22	0.26	0.39	0.26 e	0.25	0.57	0.51 (2)	0.21	0.45	0.76	0.38	0.39 s	0.42	0.45	0.62 l	0.38 j

Sources: Eurostat, OECD (JP, US).

#### Methodological notes:

- (1) Annual Average Growth Rate (AAGR).  
The AAGR is calculated using 1995 data to the latest available year.
- (2) Refers to 1993 data.

s: Eurostat estimation.  
e: estimated by other than Eurostat.  
b: break in series.  
h: Federal or central government only.

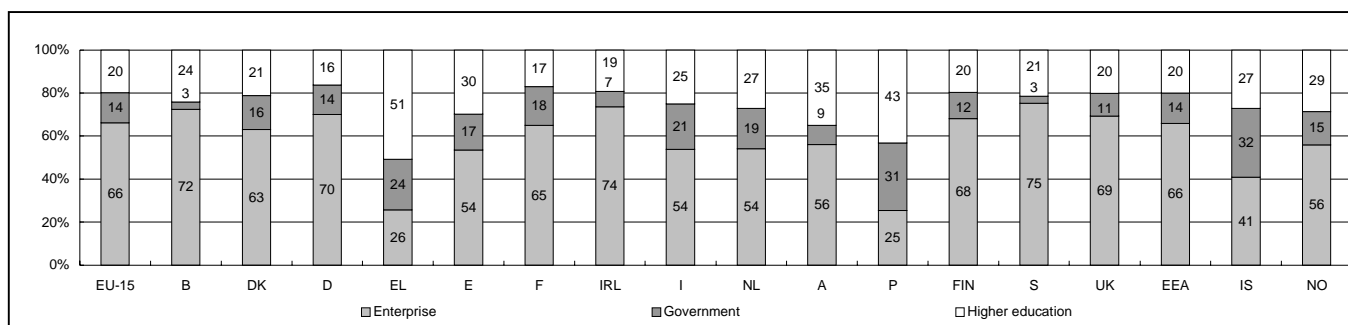
j: excludes most or all capital expenditure.  
l: overestimated or based on overestimated data.  
p: provisional data.

## Sweden, Ireland, Belgium and Germany perform more than 70 % of their R&D activities in the business sector. Meanwhile Portugal and Greece carry out more than 74 % in the public sector

In the EEA, the BES is the first important sector where R&D expenditures are performed. At the national level, 12 countries in Europe perform over 54 % in the BES. This proportion falls below 26 % for Portugal and Greece, which stand out from the global European trend.

R&D activities in the public sector are more important in countries for which the total amount of R&D expenditure in volume is relatively weak in comparison to the EU average. It is particularly the case for Portugal and Greece, where the shares of R&D expenditure in the GOV represent respectively 31 and 24 % of total R&D expenditure. In the HES, R&D expenditure represents 43 and 51 % of total R&D for the same countries. In less a degree, it concerns also Iceland, which R&D expenditure in the GOV are almost one third of its total expenditure (Figure 6).

Figure 6: R&D expenditure in millions of constant 95 ECU/EUR at 1995 prices by institutional sector — 1995-2000



### Methodological notes:

Exceptions to the 2000 reference year — B, DK, I, P, FIN, S: 1999; NL: 1998 ; EL: 1997.

Source: Eurostat.

In terms of trends, the BES with 3.9 %, displayed the highest 1995-2000 annual average growth rate (AAGR) among the whole sectors (in 95 constant ECU/EUR). The AAGR is positive in the HES but is almost nil in the GOV (-0.1 %). The highest AAGR in the BES is evident in Iceland, Finland, Portugal and Ireland where it is above 12 %. Such high rates are also reached in the HES by Greece, Finland and Portugal.

Meanwhile, in the GOV just two countries, Portugal and Greece, display an AAGR greater than 7 %.

The strongest decrease between 1995 and 2000 is observed for the United Kingdom in the GOV, where R&D expenditure declined by an annual average rate of 5 % (Table 2).

Table 2: R&D expenditure in million of constant 95 ECU/EUR at 1995 prices by institutional sector — 1995-2000

Sector	Year	EU-15	B	DK	D	EL	E	F	IRL	I	NL	A	P	FIN	S	UK	EEA	IS	NO	JP	US
Total	2000	144 102 s			50 507 e		4 842 p	28 814 e				3 648 e				18 206 e	146 155 s				
	1999	140 882 s	4 593	3 051 e	48 510 e		4 581	28 488			9 265 e	3 606 e	728	3 833	7 767	17 954	143 140 s	101	2 157	124 572	174 342 jp
	1998	133 353 s	4 295	3 015 s	45 246 e		4 448 e	27 453			8 675 s	6 855	3 470 e	3 331	7 345 e	17 169	135 637 s	105		123 935	164 716 jp
	1997	129 076 s	4 141	2 822	43 902	483	3 897	27 142	840 e	8 527 e	6 925	3 139 e	552	2 972	6 960	16 775	131 208 s	90	2 042	120 748	156 175 j
	1996	126 682 s	3 862	2 617 e	42 747 e		3 800 e	27 596	764 e	8 540	6 645	2 942 e		2 613		16 901	128 725 s	71 e		115 999 b	147 798 j
	1995	124 475 s	3 629	2 531	42 438	437 e	3 624	27 447	683 e	8 386	6 313	2 797 e	470	2 263	6 361	17 097	126 464 s	69	1 920	117 129 i	140 438 j
AAGR 1995-2000		3.0	6.1	4.8	3.5	5.1	6.0	1.0	10.9	2.5	2.8	5.5	11.6	14.1	5.1	1.3	2.9	10.1	3.0	2.4 (3)	5.6
BES	2000	94 634 s	3 542		35 352 e		2 566 p	18 451 e								12 429	95 748 s				
	1999	91 566 s	3 289	1 901 e	33 650 e		2 382	17 998		4 982 e			165	2 613	5 835	12 177	92 814 s	41	1 207	88 089	131 986 jp
	1998	85 410 s	3 048	1 969	30 741 e		2 318	17 093		4 543	3 713		0	2 237	5 596 e	11 307	86 678 s	38		88 238	122 948 j
	1997	82 288 s	2 965	1 734	29 613	123	1 902	16 973	614 e	4 534	3 779		124	1 961	5 207	10 987	83 486 s	37	1 162	86 993	115 921 j
	1996	79 695 s	2 765	1 594 e	28 323 s	112	1 837 e	16 984	553 e	4 568	3 467		0	1 729		11 016	80 838 s	22 e		82 427 b	108 539 j
	1995	78 101 s	2 586	1 452	28 196	129	1 748	16 737	487 e	4 479	3 294	1 415 (2)	98	1 430	4 718	11 168	79 212 s	22	1 089	76 382 i	100 995 j
AAGR 1995-2000		3.9	6.5	7.0	4.6	-2.2	8.0	2.0	12.3	2.7	4.1		13.8	16.3	5.5	2.2	3.9	16.7	2.6	2.2 (3)	6.9
GOV	2000	20 013 s			6 941 e		800 p	5 119 e	53 e							1 907	20 352 s				
	1999	19 945 s	152	477	6 785 e	150	773	5 169	53 e	1 960 e			204	465	261	1 926	20 310 s	32	332	12 279	12 591 hp
	1998	19 852 s	148	436 e	0 e		724	5 117	60 e	1 902	1 281			419	254 e	2 290	20 237 s	39		11 462	13 044 h
	1997	19 263 s	137	435	6 425	113	677	5 066	59 e	1 765	1 253		134	404	246	2 289	19 626 s	27	336	10 667	12 859 h
	1996	19 913 s	127	426 e	6 515		695 e	5 593	61 e	1 706	1 231			412		2 418	20 273 s	29 e		10 887	12 817 h
	1995	20 066 s	125	431	6 540	111	675	5 761	58 e	1 772	1 142	225 (2)	127	390	239	2 464	20 423 s	26	332	11 301	13 452 h
AAGR 1995-2000		-0.1	5.0	2.6	1.2	7.6	3.5	-2.3	-2.5	2.6	3.9		12.6	4.5	2.2	-5.0	-0.1	5.5	0.0	4.1 (3)	-1.6
HES	2000	28 496 s			8 214 e		1 428 p	4 816 e								3 619	29 095 s				
	1999	28 410 s	1 097	637	8 075 e	341	1 380	4 889			2 323 e		281	756	1 662	3 600	29 054 s	27	618	18 489	24 642 jp
	1998	27 201 s	1 045	610 e	7 871 e		1 357	4 834	174 e	2 231 e	1 861			653	1 490 e	3 349	27 831 s	26		18 400	23 689 jp
	1997	26 670 s	986	626	7 864	244	1 275	4 727	161 e	2 228 e	1 892		221	593	1 501	3 283	27 239 s	26	544	17 236	22 624 j
	1996	26 168 s	918	566 e	7 910		1 226	4 647	145 e	2 266	1 884			472		3 261	26 704 s	17 e		17 118 b	21 856 j
	1995	25 428 s	867	620	7 702	194	1 161	4 585	132 e	2 135	1 817	885 (2)	174	442	1 393	3 252	25 946 s	19	500	24 243 i	21 421 j
AAGR 1995-2000		2.3	6.1	0.7	1.3	15.2	4.2	1.0	9.5	2.1	0.8		12.7	14.3	4.5	2.2	2.3	9.4	5.5	2.6 (3)	3.6

### Methodological notes:

(1) Annual Average Growth Rate (AAGR). The AAGR is calculated using 1995 data to the latest available year.

(2) Refers to 1993 data.

(3) Refers to 1996-99 AAGR because of 1995 overestimated data.

s: Eurostat estimation.

e: estimated by other than Eurostat.

b: break in series.

h: Federal or central government only.

j: exclude most or all capital expenditure.

i: overestimated or based on overestimated data.

p: provisional data.

Sources: Eurostat, OECD (JP, US).

## R&D personnel in the countries of the European Economic Area (EEA)

### The share of labour force working as R&D personnel is highest in the Nordic countries

The situation for R&D personnel is similar to the one observed for expenditure, although, in general, growth rates of R&D personnel are lower. At the EU level, the trends on R&D personnel measured with the AAGR (FTE) by institutional sectors are positive for the BES and the HES (1.93 % respectively), but decreasing for the GOV (-0.82 %) (Table 4).

For the sectors as a whole, in 2000, the fastest growing countries over the last years (1995-99) were Ireland (12 %), Finland (11 %), Iceland (9 %) and Austria (9 %). As the data show, the trend appears more evident in smaller countries, where personnel as a percentage of labour force also increased over the last years. The trends for countries with the most R&D personnel in Europe (Germany, France and Italy, as no recent data are available for the United Kingdom) are stable.

Table 3: R&D personnel in HC as a % of the labour force and by institutional sectors — 1995-2000

Sector	EU-15	B	DK	D	EL	E	F	IRL	I	NL	A	P	FIN	S	UK	EEA	IS	NO
Total 2000	1.34 s																	
1999	1.33 s		1.92 s			1.09						0.73	2.54	2.45				1.88
1998	1.31 s		2.00 s	1.48		1.02	1.49				1.38		2.43	2.35 s		1.32 s	2.51	
1997	1.29 s		1.85	1.49	1.02	0.97	1.49	0.99 e		1.44		0.61 b	2.23	2.34		1.30 s	2.46	1.92
1996	1.27 s		1.84 e	1.47 e		0.98 s	1.46	0.93 e	0.81	1.45						1.28 s	1.84	
1995	1.27 s	1.22	1.81	1.50	0.87	0.94	1.46	0.86 e	0.81	1.44	1.16 <sup>(2)</sup>	0.53	1.97	2.18	1.28 <sup>(2)</sup>	1.27 s	1.94	1.87
BES 2000	0.63 s																	
1999	0.62 s		1.04 e			0.28						0.11	1.38	1.14				0.74
1998	0.62 s		1.01	0.84		0.26	0.72		0.31		0.65		1.29	1.21 s	0.60	0.62 s	0.87	
1997	0.60 s		0.94	0.84	0.13	0.22	0.73	0.61 e	0.30	0.64		0.08 b	1.17	1.13	0.55	0.60 s	0.85	0.77
1996	0.59 s		0.92 e	0.81 e	0.12	0.21 s	0.71	0.55 e	0.30	0.61			1.08		0.58	0.60 s	0.54	
1995	0.59 s	0.63	0.92	0.84	0.13	0.21	0.72	0.49 e	0.30	0.59	0.47 <sup>(2)</sup>	0.07	1.00	1.07	0.60	0.59 s	0.61	0.73
GOV 2000	0.19 s							0.06 e							0.11			
1999	0.19 s		0.38		0.18	0.18		0.06 e				0.18	0.40	0.12	0.11			0.27
1998	0.19 s		0.46 s	0.22		0.17	0.20	0.07 e	0.18		0.15		0.39	0.12 s	0.11	0.19 s	0.72	
1997	0.19 s	0.06	0.38	0.22	0.23	0.16	0.20	0.07 e	0.18	0.25		0.14 b	0.37	0.12	0.11	0.19 s	0.70	0.29
1996	0.20 s	0.06	0.40 e	0.23		0.13 s	0.26	0.08 e	0.18	0.30					0.12	0.20 s	0.56	
1995	0.20 s	0.06	0.41	0.25	0.24	0.14	0.26	0.08 e	0.18	0.28	0.14 <sup>(2)</sup>	0.13	0.37	0.12	0.14	0.20 s	0.54	0.31
HES 2000	0.50 s																	
1999	0.49 s		0.49		0.91	0.62						0.35	0.76	1.19		0.49 s	0.89	0.86
1998	0.48 s		0.50 s	0.42		0.58	0.54	0.29 e			0.57		0.72	1.01 s		0.48 s	0.87	0.86
1997	0.48 s	0.52	0.52	0.42	0.65	0.57	0.53	0.29 e		0.53		0.31 b	0.67	1.09		0.47 s	0.69	
1996	0.46 s	0.52	0.50 e	0.43		0.63	0.47	0.27 e	0.33	0.54						0.46 s	0.75	0.83
1995	0.45 s	0.51	0.46	0.42	0.49	0.58	0.46	0.26 e	0.33	0.55	0.54 <sup>(2)</sup>	0.25	0.61	0.98	0.37 <sup>(2)</sup>	0.46 s	0.75	0.83

Source: Eurostat.

Table 4: R&D personnel in FTE by institutional sectors — 1995-2000

Sector	EU-15	B	DK	D	EL	E	F	IRL	I	NL	A	P	FIN	S	UK	EEA	IS	NO	JP
Total 2000	1 683 112 s					103 259 e										1 711 494 s	2 405	25 402	919 132
1999	1 667 513 s	49 476	35 822 s	465 550 e		102 237						20 830	50 605	66 674		1 695 320 s	2 273	25 402	925 569
1998	1 636 370 s	46 428	35 194 s	461 542 e		97 099	307 310			85 485	31 308		46 521	68 405 s		1 663 782 s	2 273	25 402	925 569
1997	1 584 989 s	44 221	34 173	460 408	20 172	87 150	303 411	12 030 e	141 737	83 967		18 035 b	41 257	65 496		1 612 017 s	2 151	24 877	894 003
1996	1 579 616 s	42 548	32 148 e	453 680 e		87 261 s	316 804	10 838 e	142 288	80 820						1 605 539 s	1 516	24 877	891 783 b
1995	1 565 903 s	39 848	30 215	459 134	17 572	79 990	315 528	9 662 e	141 789	79 256	24 458 <sup>(2)</sup>	15 465	33 635	62 637	277 500 <sup>(2)</sup>	1 591 533 s	1 694	23 936	948 088 l
AAGR <sup>(1)</sup>																			
1995-1999	1.5	5.6	4.3	0.3	7.1	6.3	-0.9	11.6	0.0	2.6	8.6	7.7	10.8	1.6		1.5	9.2	1.5	-0.8
BES 2000	931 429 s	33 148				38 706 e										946 144 s			
1999	920 751 s	30 868	21 191 e	293 130 e		38 323				44 807 e		3 260	27 818	44 170	152 865	935 067 s	1 006	13 310	604 544
1998	902 960 s	29 263	21 198	288 090 e		34 667	168 118		61 117	43 871	20 385		25 011	46 741 s	149 695	917 001 s	915		613 160
1997	871 956 s	28 161	20 037	286 271	3 290	30 023	166 262	8 174 e	61 414	42 408		1 981 b	22 304	43 881	138 420	885 730 s	832	12 942	586 156
1996	852 285 s	27 212	18 615 e	276 794 e	2 898	29 430 s	162 589	7 164 e	60 915	39 498			20 756		143 430	865 262 s	461		589 491 b
1995	846 427 s	24 347	17 195	283 314	3 098	27 558	162 042	6 151 e	60 323	37 456	15 114 <sup>(2)</sup>	1 917	17 798	41 637	146 369	859 068 s	551	12 090	573 714 l
AAGR <sup>(1)</sup>																			
1995-2000	1.9	6.4	5.4	0.9	3.1	7.0	1.2	15.3	0.4	5.4	10.5	14.2	11.8	1.5	0.5	1.9	16.2	2.4	1.3
GOV 2000	252 643 s					22 506 e		882 e							29 734	258 064 s			
1999	254 359 s	2 229	6 236	72 700 e	4 431	22 283		884 e				5 928	7 946	3 195	29 672	259 805 s	667	4 779	59 025
1998	250 911 s	2 071	5 853 s	73 370		20 170	47 554	941 e	31 284	17 449	2 104		7 500	3 384 s	29 196	256 384 s	647		58 762
1997	245 269 s	2 145	5 662	73 492	4 481	19 189	47 531	938 e	31 292	17 147		5 230 b	6 827	3 334	25 896	250 771 s	629	4 873	56 554
1996	262 520 s	2 071	5 506 e	74 723		17 865 s	62 815	945 e	32 225	16 924					27 488	267 990 s	588		56 176 b
1995	263 203 s	2 020	5 439	75 148	4 908	17 155	62 525	959 e	33 039	16 020	2 107 <sup>(2)</sup>	4 716	6 691	3 518	28 960	268 658 s	563	4 892	55 990 l
AAGR <sup>(1)</sup>																			
1995-2000	-0.8	2.5	3.5	-0.8	-2.5	5.6	-8.7	-1.7	-1.8	2.9	0.0	5.9	4.4	-2.4	0.5	-0.8	4.3	-0.6	1.3
HES 2000	479 145 s					41 032 e										487 355 s			
1999	473 420 s	15 871	8 019	99 720 e	17 294	40 626						9 187	14 841	19 176		481 429 s	696	7 313	227 562
1998	464 184 s	14 600	7 693 s	100 082		41 042	84 964	2 847 e		24 165	8 670		13 653	18 197 s		472 047 s	676		225 179
1997	450 411 s	13 426	8 139	100 645	12 309	36 843	83 110	2 658 e	49 031	24 412		8 442 b	11 854	18 198		458 129 s	656	7 062	222 285
1996	449 135 s	12 782	7 676 e	102 163		38 956	85 869	2 469 e	49 148	24 398						456 551 s	408		217 558 b
1995	435 473 s	13 045	7 213	100 672	9 417	34 330	85 382	2 292 e	48 427	24 860	7 136 <sup>(2)</sup>	6 484	9 146	17 302	65 527 <sup>(2)</sup>	442 957 s	530	6 954	290 549 l
AAGR <sup>(1)</sup>																			
1995-2000	1.9	5.0	2.7	-0.2	16.4	3.6	-0.2	7.5	0.6	-0.9	6.7	9.1	12.9	2.6		1.9	7.0	1.3	-5.9

Methodological notes for Tables 3 and 4:

(1) Annual Average Growth Rate (AAGR).

The AAGR is calculated using 1995 data to the latest available year.

(2) Refers to 1993 data.

s: Eurostat estimation.

e: estimated by other than Eurostat.

b: break in series.

l: overestimated or based on overestimated data.

Sources: Eurostat, OECD (JP).

Looking at the breakdown by institutional sector, very different growth rates emerge. For Iceland, Ireland, Portugal and Finland, annual average growth rates over 11 % are seen in the BES, whereas 5 countries (including Germany and France), display an annual average growth rate under 1.5 %. Very high growth rates are reached in the HES by Greece (16 %) and Finland (13 %), meanwhile only two countries

exceeded 5 % in the GOV — Portugal (5.9 %) and Spain (5.6 %).

In the public sector, the trend is negative for the two countries (Germany and France) that employ the most R&D personnel in Europe.

## R&D researchers in the EEA countries

**Taking all the sectors into account, more than half of the R&D personnel are researchers. The ratio is the biggest in the higher education sector.**

Portugal and Norway employ 76 and 72 % of researchers respectively, which are employed in all the sectors (Table 5). Overall, the differences between countries are small.

The situation by institutional sectors is slightly different. The BES and the GOV employ similar ratios whereas the HES employs considerably more researchers.

In general, the share of researchers is much higher in the HES, reaching up to 90 % in Portugal.

In both the BES and GOV, the highest proportion of researchers does not exceed 73 %. These top proportions are retained for the former sector by Norway, Finland and Ireland, and for Iceland, Norway and Denmark for the latter one.

In terms of trends between 1995 and 2000, the percentage of researchers did not vary significantly. The BES however benefited the most from an increase in its share of researchers. 4 countries gained over 5 percentage points: Greece and Portugal (5 percentage points), Ireland and Norway (7 percentage points respectively) and Austria (11 percentage points).

The proportion of researchers increased to a lower degree in the GOV. Amongst 9 countries that had a positive rise during the second half of the decade, it was superior to 5 percentage points only in three countries (Iceland, France and Spain).

With the highest proportion of researchers in the total R&D personnel, the HES is also the most stable. Only Iceland and Sweden stand out with researchers increases by 11 and 7 percentage points respectively.

Table 5: Researchers as a proportion of total R&D personnel (in FTE) in percentage and by institutional sector — 1995-2000

Sector		B	DK	D	EL	E	F	IRL	I	NL	A	P	FIN	S	UK	IS	NO
Total	2000																
	1999	61		52		60						76	65			67	72
	1998	61		52		62	50				60		65			67	
	1997	58		51	54	62	50					75	64	56		68	70
	1996	58				59	48		54	42						59	
	1995	59	53	50	55	59	47		82	53	43	52	75	62	54	63	67
BES	2000	54													61		
	1999	53		46		40						61	62		60	58	73
	1998	53	38	46		40	43		43		57		63		62	58	
	1997	49		46	55	40	43	62				60	62	48	60	58	72
	1996	49			53	38	42	59	46	35					58	69	
	1995	50	39	46	50	39	41	55	45	35	46	56	58	46	58	65	66
GOV	2000														51		
	1999	54	63	53	45	54						59	61		50	66	64
	1998	54		52		55	43		41		45		62		49	66	
	1997	52	66	51	44	55	43					56	58	73	48	66	63
	1996	50		50		51	36		42	46					47	60	
	1995	50	66	50	41	49	36	60	42	49	43	58	58	78	47	58	62
HES	2000	77	71	66	61	83						90	71	76		83	75
	1999	76		66		84	69						71			83	
	1998	76		66		84	69				69		71			83	
	1997	77	75	65	58	83	69					89	72	74		83	72
	1996	77		65		79	69		71	51						55	
	1995	77	77	64	64	81	69	84	71	50	68	90	72	69		72	72

Methodological notes:

Exceptions to the 1995 reference year — GOV: IRL and A: 1993; HES and total sectors: IRL and A: 1993; UK: 1994  
Sources for IRL 1995 data for the HES: MSTI, OECD.

Source: Eurostat.

## ➤ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

### Research and development input indicators (R&D expenditure and R&D personnel)

The definitions of R&D personnel and R&D expenditure are taken from the *Frascati Manual* OECD, 1993 and concern the variables at national level (for further details, see the *Frascati Manual*, § 279 ff and § 333 ff respectively).

### R&D personnel

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 R&D expenditure.

- **Full-time equivalent (FTE):** full-time equivalent corresponds to one year's work by one person. Thus, someone who normally devotes 40 % of his/her time to R&D and the rest to other activities (e.g. teaching, university administration or counselling) should be counted as only 0.4 FTE.
- **Personnel in head count (HC):** the number of individuals who are employed mainly or partly on R&D. For purposes of comparison between different regions and periods, this indicator is often used in conjunction with employment or population variables.

### Institutional classifications

Internal expenditure and R&D personnel are broken down by institutional sector, i.e. the sector in which the R&D is performed.

There are four main sectors:

- **The business enterprise sector (BES)**

With regard to R&D, the business enterprise sector includes (*Frascati Manual*, § 145): 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; and the private non-profit institutes mainly serving them.

- **The government sector (GOV)**

In the field of R&D, the government sector includes (*Frascati Manual*, § 168): 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) and PNP controlled and mainly financed by government.

- **The higher education sector (HES)**

This sector is composed of (*Frascati Manual*, § 190): 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 (PNP)**

The field covered by this sector includes (*Frascati Manual*, § 178): non-market, private non-profit institutions serving households (i.e. the general public) and private individuals or households.

### Time series

Data measured in constant 1995 ECU/EUR are first corrected for inflation using the GDP deflator (a Paasche index with 1995 = 100 as a base) of the country in question before applying the 1995 ECU/EUR exchange rate. The GDP deflator in general conforms to the 1995 European System of Accounts (ESA 95), available on New Cronos Theme 2. Where the series was incomplete, the adjusted GDP deflator from ESA 79 was used. Appropriate caution should be employed interpreting the results in such cases.

As with the GDP deflator, time series on GDP are built up using the two systems of European System of Accounts.

### Figures in PPS

Financial aggregates in different countries are not even fully comparable after conversion to ECU, since exchange rates are influenced not only by disparate price trends but also by other factors, and this may distort any comparisons based on those rates. Purchasing power parities, based on comparisons of the prices of representative and comparable goods or services in different countries in different currencies on a specific date, are used to eliminate such effects. As a result, financial aggregates are expressed in purchasing power standards (PPS) rather than ECU based on exchange rates. The calculations in this SIF are based on current purchasing power standards.

### R&D intensity

Some methodological changes occurred this year for the calculation of R&D intensity. Previously the GDP from New Cronos Theme 1 and including both regional and national level data was used as a priority. Now, the GDP from national account data serves for the computation of the R&D intensity at the national level and the GDP from the regional account data is used at the regional level. As mentioned for the GDP deflator, GDP ESA 1995 data, were completed with ESA 79 data where necessary. More information is available on New Cronos Theme 9.

### Aggregates

EU-15: Luxembourg not included.

EEA: Luxembourg and Lichtenstein not included.

# Further information:

## ➤ Reference publications

Title Research and Development: Annual Statistics 2001 (forthcoming).

## ➤ Databases

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