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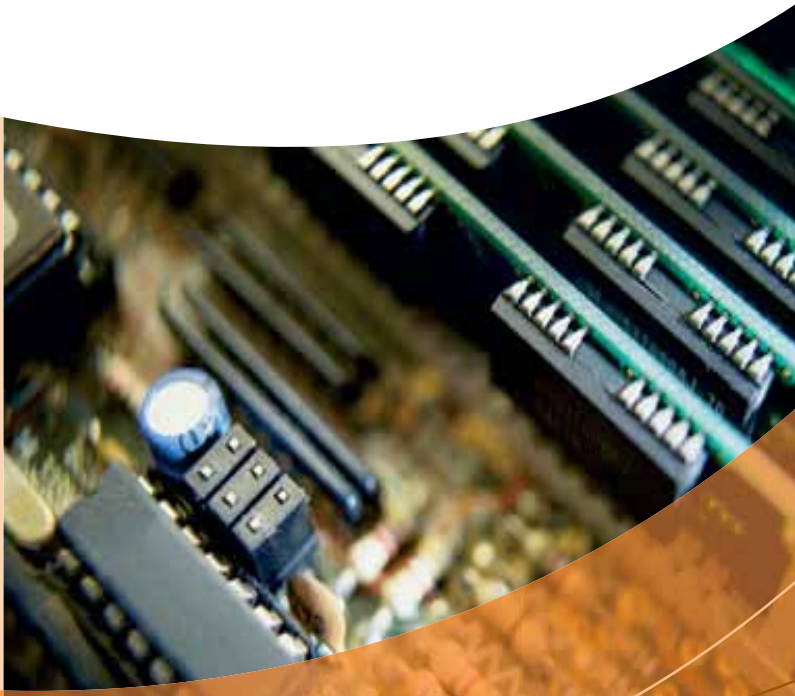
Science, technology and innovation in Europe



2010 edition

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Table of contents

Introduction

This pocketbook gives an overview of science, technology and innovation (STI) statistics. All the statistical data and indicators it contains are based on sources available at Eurostat. Only the most relevant indicators have been selected in order to provide an overall statistical picture of science, technology and innovation in Europe and a ranking of the EU in relation to its partners. Eurostat has been collecting STI data for many years to meet the needs of policy-makers and the scientific community.

This publication is a compendium of data available at Eurostat, but it is by no means exhaustive: it is a showcase for the main available data sets. Although most data are provided by Eurostat, other databases relevant to STI have also been used, such as the OECD's Main Science and Technology Indicators (MSTI). The exact source is shown beneath each table or graph.

The focus is on the EU-27 and the candidate countries. However, to allow international comparisons, data for Iceland, Liechtenstein, Norway, Switzerland, China, Japan, Russia, South Korea and the United States are included when available.

The pocketbook is divided into three main parts and seven chapters, including:

- Part 1 — Investing in R&D
- Part 2 — Monitoring the knowledge workers
- Part 3 — Productivity and competitiveness

The first part on investing in R&D is divided into government budget appropriations or outlays on R&D (GBAORD — Chapter 1) and R&D expenditure (Chapter 2). Part 2, on monitoring the knowledge workers, presents data on R&D personnel (Chapter 3) and human resources in science and technology (HRST — Chapter 4). Part 3 provides information on productivity and competitiveness and includes statistics on innovation (Chapter 5), patents (Chapter 6) and high-technology (Chapter 7).

The three main parts are followed by methodological notes (including definitions) for each of the statistical data sources used.

NB: tables and figures in this publication refer to the data available on Eurostat's reference database at the time of writing (November 2009). However, the reference database is updated regularly as new data are received, so more recent data may differ from those available at the time of publishing.

Abbreviations and symbols

Statistical symbols and abbreviations

b	Break in series
e	Estimate
f	Forecast
i	Further information in explanatory notes
p	Provisional
r	Revised
s	Eurostat estimate
u	Unreliable
:	Not available
:c	Confidential
:u	Extremely unreliable
-	Not applicable or real zero or zero by default
%	Percent
0	Less than half of the unit used
1000s	Thousands
2001-2006	Period of several calendar years (e.g. from 1.1.2001 to 31.12.2006)

Acronyms and abbreviations

AAGR	Average annual growth rate
ABR	Abroad
AGR	Annual growth rate
BERD	Business expenditure on R&D
BES	Business enterprise sector
CC	Candidate countries
CIS 2006	Community innovation survey 2006
COMEXT	Eurostat reference database containing external trade statistics
EC	European Community/Communities
EEA	European Economic Area (EU-27, Iceland, Liechtenstein and Norway)
EFTA	European Free Trade Association
EPO	European Patent Office
EU	European Union
EU-15	European Union (15 Member States)
EU-25	European Union (25 Member States)
EU-27	European Union (27 Member States)
EU LFS	European Union labour force survey

EUR	Euro
Eurostat	Statistical Office of the European Communities
FTE	Full-time equivalent
GBAORD	Government budget appropriations or outlays on R&D
GDP	Gross domestic product
GERD	Gross domestic expenditure on R&D
GOV	Government sector
GUF	General university funds
HC	Head count
HES	Higher education sector
HRST	Human resources in science and technology
HRSTC	Human resources in science and technology — core
HRSTE	Human resources in science and technology — education
HRSTO	Human resources in science and technology — occupation
HRSTU	Human resources in science and technology — unemployed
ICT	Information and communications technology
IPC	International Patent Classification
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
JPO	Japan Patent Office
KIS	Knowledge-intensive services
LKIS	Less knowledge-intensive services
M	Million
MS	Member State
MSTI	Main science and technology indicators (OECD)
NABS	Nomenclature for the analysis and comparison of scientific programmes and budgets
NACE	Statistical Classification of Economic Activities in the European Community
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Cooperation and Development

PCT	Patent Cooperation Treaty
PNP	Private non-profit sector
PPS	Purchasing power standard
PSL	Personnel
R&D	Research and development
S&E	Science and engineering
S&T	Science and technology
SMEs	Small and medium-sized enterprises
USPTO	United States Patent and Trademark Office
VCI	Venture capital investment
WIPO	World Intellectual Property Organisation

Country abbreviations

EU Member States

BE	Belgium
BG	Bulgaria
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
CY	Cyprus
LV	Latvia
LT	Lithuania
LU	Luxembourg
HU	Hungary
MT	Malta
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia
FI	Finland
SE	Sweden
UK	United Kingdom

Candidate countries

MK[1]	The former Yugoslav Republic of Macedonia
HR	Croatia
TR	Turkey

Other countries

AL	Albania
ASIOTH	Other Asian countries
AU	Australia
BR	Brazil
CA	Canada
CH	Switzerland
CN	China
HK	Hong Kong
ID	Indonesia
IL	Israel
IN	India
IS	Iceland
JP	Japan
KR	South Korea
LI	Liechtenstein
MX	Mexico
MY	Malaysia
NO	Norway
PH	Philippines
RU	Russia
SG	Singapore
TH	Thailand
TW	Taiwan
US	United States

[1] 'Provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed following conclusion of the negotiations currently being held on this subject at the United Nations'.

I

Investing in R&D

Government budget appropriations or outlays on R&D (GBAORD)

1

Government budget appropriations or outlays on R&D (GBAORD) are funds allocated to R&D in central government or federal budgets.

In 2008, GBAORD expressed as a percentage of GDP stood at 0.72 % in the EU-27 and 0.99 % in the United States. This was down on the previous year in the United States, but up slightly in the EU-27. At 0.70 % of GDP, GBAORD levels in Japan were slightly lower than in the EU-27.

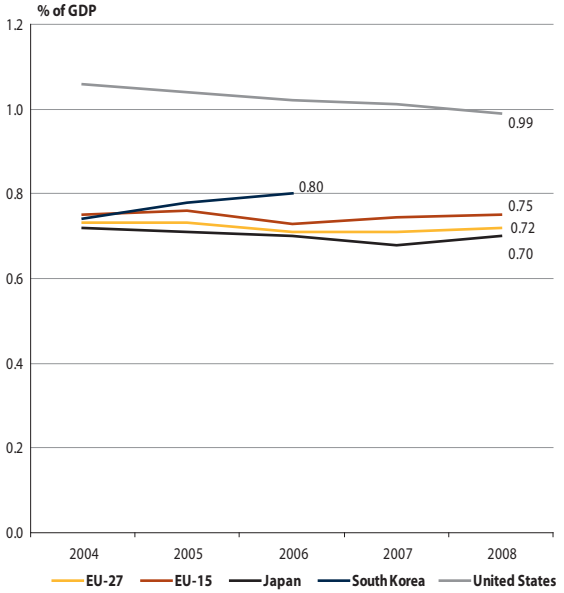
Between 2004 and 2006 South Korea recorded a significant increase in GBAORD as a share of GDP. Comparison of national GBAORD data reveals fairly significant differences between countries. In 2008, two EU Member States recorded GBAORD levels higher than 1 % of GDP, namely Spain (1.07 %) and Portugal (1.02 %).

This is the first issue of the Pocketbook to include the breakdown of government budget appropriations or outlays on R&D by NABS 2007 socio-economic objectives (the NABS is the Nomenclature for the analysis and comparison of scientific programmes and budgets). GBAORD data in previous issues of the Pocketbook were based on NABS 1992. One of the main differences between NABS 2007 and NABS 1992 is the division of the chapter on 'social structures and relationships' into three separate chapters: 'culture, recreation, religion and mass media', 'education' and 'political and social systems, structures and processes'.

In 2008, 'general advancement of knowledge: R&D financed from GUF (general university funds)' accounted for 30.1 % of total GBAORD in the EU-27. The situation was similar in Japan (34.0 %), but not in the United States, where more than half of total GBAORD (56.6 %) was allocated to 'defence'.

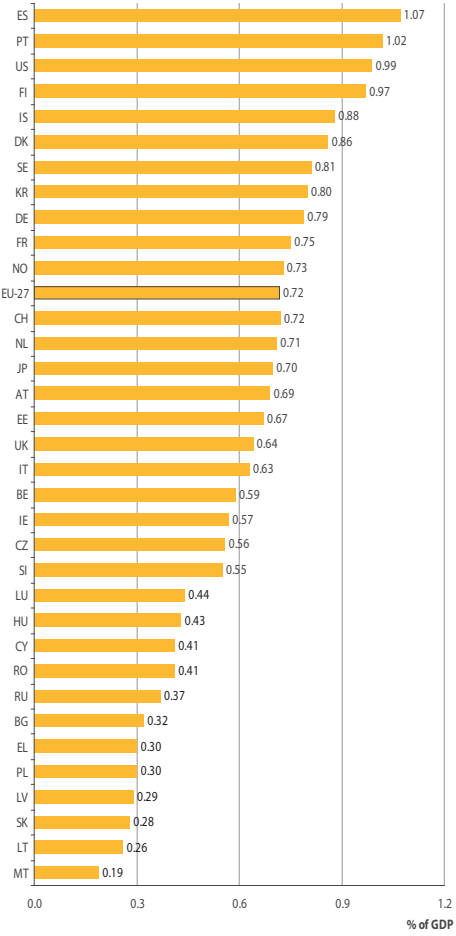
Variations were also recorded between the EU Member States in terms of socio-economic objectives: in 2008 'general advancement of knowledge: R&D financed from GUF' accounted for the largest share of total GBAORD in ten Member States, while 'general advancement of knowledge: R&D financed from sources other than GUF' was the foremost objective in 12 Member States. 'Industrial production and technology' was the top socio-economic objective in three Member States, whereas 'defence' and 'education' were the prime socio-economic objectives in France and Lithuania respectively. In the United Kingdom, R&D financed from GUF and from other sources took equal shares, followed very closely by 'defence'.

Figure 1.1: Total GBAORD as a percentage of GDP, EU-27, EU-15, Japan, South Korea and the United States — 2004 - 2008



Note:
EU-27 and EU-15: Eurostat estimations.
KR (2006) and US (2008): provisional data.
JP and US: federal or central government only.
US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).
Source: Eurostat (gba_nabsfin07), OECD-MSTI for KR, JP and US.

Figure 1.2: Total GBAORD as a percentage of GDP, EU-27 and selected countries — 2008



Note:
Exceptions to the reference year: 2007: EL; 2006: CH and KR.
EU-27: Eurostat estimation.
BE, DK, DE, EL, FR, LU, NL, AT, PL, FI, SE, UK, KR and US: provisional data.
EE: national estimation.
AT, JP and US: federal or central government only.
US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).
Source: Eurostat (gba_nabsfin07), OECD-MSTI for KR, JP and US.

Table 1.3 (Part 1): Total GBAORD in EUR million and by socio-economic objectives (NABS 2007) as a percentage of total, EU-27 and selected countries — 2008

	Total in EUR million	Exploration and exploitation of the earth	Environment	Exploration and exploitation of space	Transport, telecommunication and other infrastructures	Energy	Industrial production and technology	Health
EU-27	89 773 s	1.6 s	2.9 s	4.2 s	3.1 s	3.5 s	11.4 s	7.9 s
BE	2 041 p	0.6 p	2.5 p	7.3 p	2.2 p	1.8 p	31.1 p	1.9 p
BG	109	9.6	0.8	1.9	1.0	9.2	10.7	0.4
CZ	821	2.0	2.6	1.7	3.7	2.8	11.8	5.4
DK	1 988 p	0.4 p	2.4 p	1.7 p	0.7 p	3.3 p	10.3 p	7.8 p
DE	19 805 p	1.7 ip	3.2 ip	4.8 ip	1.7 ip	3.7 ip	12.2 ip	4.5 ip
EE	107 e	2.3 e	6.1 e	1.3 e	7.0 e	3.9 e	8.7 e	14.5 e
IE	1 029	1.5	1.3	:	1.1	4.2	12.9	5.3
EL	673 p	3.2 p	2.6 p	2.1 p	1.6 p	2.0 p	9.0 p	6.9 p
ES	11 635	1.3	4.5	2.0	10.5	2.7	19.4	9.3
FR	14 642 ip	0.9 p	2.7 p	8.8 p	0.9 p	5.8 p	8.4 p	7.0 p
IT	9 942	2.8	4.1	6.7	1.9	5.9	11.4	12.3
CY	70	0.6	1.0	:	0.5	:	1.2	6.5
LV	67	2.1	4.2	0.6	6.8	5.1	9.7	8.1
LT	85	:	7.9	:	0.1	0.6	0.3	1.1
LU	171 p	0.3 p	1.0 p	0.5 p	5.7 p	0.3 p	6.2 p	0.9 p
HU	453	0.1	3.5	0.1	5.6	2.1	8.5	10.2
MT	11	:	0.4	:	:	0.1	:	:
NL	4 231 p	0.2 p	1.2 p	2.9 p	4.5 p	2.7 p	10.7 p	4.4 p
AT	1 938 ip	1.8 ip	1.7 ip	0.5 ip	1.5 ip	0.8 ip	15.3 ip	3.4 ip
PL	1 099 p	1.5 p	3.2 p	1.5 p	3.5 p	2.3 p	18.9 p	3.4 p
PT	1 272	1.2	3.7	0.5	9.6	1.2	13.3	7.3
RO	557	1.0	3.8	2.6	11.5	7.4	20.6	14.9
SI	203	0.7	2.9	:	1.7	1.0	16.3	3.6
SK	179	1.6	3.0	0.4	2.2	2.1	6.7	5.8
FI	1 798 p	1.2 p	1.5 p	1.7 p	2.1 p	4.9 p	27.2 p	6.1 p
SE	2 662 p	0.9 p	1.5 p	0.8 p	4.3 p	3.5 p	5.7 p	0.6 p
UK	11 717 p	2.5 p	1.9 p	1.9 p	1.3 p	0.6 p	0.1 p	16.0 p
IS	91	:	0.4	:	4.7	1.6	1.4	9.4
NO	2 250	2.3	1.9	2.3	2.5	2.9	6.8	15.3
RU	4 223 i	:	0.2	14.1	1.2	2.1	9.2	2.6
JP	23 423 i	1.8 i	0.9 i	7.0 i	4.1 i	13.7 i	7.3 i	4.1 i
US	96 827 ip	0.7 ip	0.5 ip	8.2 ip	1.0 ip	1.7 ip	0.4 ip	22.2 ip

Note:
Exception to the reference year: 2007: EL and PT.
Flag 'i':
AT, JP and US: federal or central government only.
DE: unrevised breakdown not adding up to the revised total.
FR and RU: the sum of the breakdown does not add up to the total.
US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).
Source: Eurostat (gba_nabsfin07), OECD-MSTI for JP and US.

Table 1.3 (Part 2): Total GBAORD in EUR million and by socio-economic objectives (NABS 2007) as a percentage of total, EU-27 and selected countries — 2008

	Total in EUR million	Agriculture	Education	Culture, recreation, religion and mass media	Political and social systems, structures and processes	General advancement of knowledge: R&D financed from GUF	General advancement of knowledge: R&D financed from other sources than GUF	Defence
EU-27	89 773 s	3.6 s	1.2 s	1.1 s	2.9 s	30.1 s	15.0 s	11.5 s
BE	2 041 p	1.4 p	0.3 p	2.3 p	4.0 p	17.7 p	26.7 p	0.3 p
BG	109	23.0	2.1	0.1	2.4	4.2	34.1	0.4
CZ	821	4.9	0.4	0.8	1.1	26.4	33.9	2.4
DK	1 988 p	3.5 p	2.9 ep	2.2 ep	2.9 ep	43.2 p	18.1 p	0.6 p
DE	19 805 p	2.8 ip	0.9 ip	1.1 ip	1.7 ip	39.0 ip	17.1 ip	6.0 ip
EE	107 e	7.0 e	1.8 e	3.1 e	6.3 e	:	36.9 e	1.2 e
IE	1 029	11.2	3.5	:	1.9	23.3	33.9	:
EL	673 p	5.6 p	2.2 p	1.0 p	1.0 p	50.7 p	11.4 p	0.5 p
ES	11 635	5.5	0.9	1.2	1.9	16.7	10.1	14.1
FR	14 642 ip	1.8 p	: i	: i	2.5 ip	27.4 p	4.5 p	27.7 p
IT	9 942	4.4	2.7	1.0	9.2	30.7	5.6	1.2
CY	70	13.5	3.6	2.1	0.1	33.6	37.2	:
LV	67	18.4	4.4	5.5	0.8	0.2	33.9	:
LT	85	:	88.6	:	0.8	0.4	:	0.1
LU	171 p	1.2 p	18.7 p	0.8 p	0.4 p	13.7 p	50.4 p	:
HU	453	9.3	0.1	1.0	1.8	28.0	29.2	0.6
MT	11	3.4	:	2.4	0.7	92.9	:	:
NL	4 231 p	5.5 p	0.3 p	0.4 p	3.5 p	46.1 p	15.7 p	1.9 p
AT	1 938 ip	1.9 ip	0.2 ip	0.5 ip	1.6 ip	57.5 ip	13.5 ip	:
PL	1 099 p	1.9 p	1.2 p	1.2 p	1.9 p	4.4 p	51.9 p	3.2 p
PT	1 272	6.7	2.5	0.5	2.3	35.4	15.3	0.5
RO	557	9.0	3.4	0.6	0.8	:	21.6	2.7
SI	203	3.9	0.4	4.2	3.4	2.7	47.4	11.9
SK	179	6.0	1.5	4.5	1.7	27.4	32.8	4.5
FI	1 798 p	5.2 p	0.3 p	0.6 p	4.0 p	25.2 p	17.1 p	2.8 p
SE	2 662 p	1.6 p	0.3 p	0.1 p	1.5 p	42.3 p	24.5 p	12.4 p
UK	11 717 p	2.7 p	0.8 p	1.9 p	1.7 p	24.3 p	21.0 p	23.4 p
IS	91	18.1	:	:	49.4	14.9	:	:
NO	2 250	7.3	0.8	0.9	4.9	34.4	12.8	4.8
RU	4 223 i	1.3	1.2	0.2	0.1	:	:	:
JP	23 423 i	3.7 i	0.2 i	0.3 i	0.3 i	34.0 i	17.2 i	5.2 i
US	96 827 ip	1.7 ip	0.3 ip	:	0.5 ip	:	6.1 ip	56.6 ip

Note:
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Flag 'i':
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FR: the sum of the breakdown does not add up to the total; 'Education' and 'Culture, recreation, religion and mass media' are included elsewhere; 'Political and social systems, structures and processes' includes other classes.
RU: the sum of the breakdown does not add up to the total.
JP: defence is underestimated or based on underestimated data.
US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).
Source: Eurostat (gba_nabsfin07), OECD-MSTI for JP and US.

2

R&D expenditure

In 2007, R&D intensity in the EU-27 stood at 1.85 %, remaining stable in comparison with the previous year and still below the 3 % target set for 2010 by the Lisbon strategy. R&D intensity remained significantly lower in the EU-27 than in Japan and the United States. Looking at the latest data available, Japan reported the highest R&D intensity among the countries surveyed (2006: 3.40 %), followed by South Korea (2006: 3.00 %) and the United States (2007: 2.67 %).

Among the EU Member States, only Sweden and Finland exceeded the EU goal of channelling 3 % of GDP into R&D, with 3.60 % and 3.47 % respectively in 2007.

R&D expenditure in the EU-27 increased by an average of 2.6 % per year between 2002 and 2007, climbing to EUR 228.7 billion in 2007. Germany, France, Italy and the United Kingdom together accounted for more than half of all R&D expenditure in the EU-27.

The business enterprise sector (BES) accounted for almost two thirds (63.9 %) of total R&D expenditure in the EU-27, with the higher education sector (HES) and government sector (GOV) taking most of the remainder (35.1 %).

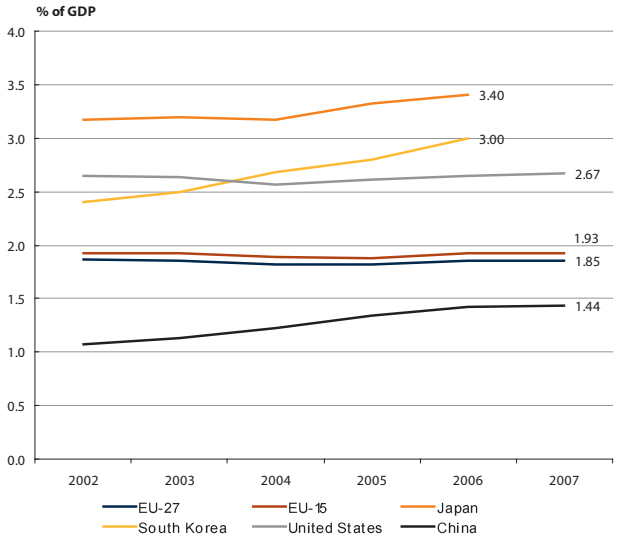
In the EU-27, 55.4 % of R&D expenditure was financed by the business enterprise sector. At national level, three EU Member States achieved the second goal set by the Lisbon strategy of having two thirds of R&D expenditure financed by the business enterprise sector (BES): Luxembourg (79.7 %), Finland (68.2 %) and Germany (68.1 %).

'Manufacturing' was the sector of activity on which the greatest share of business R&D expenditure was spent in many of the countries surveyed, notably in Germany and Slovenia, where 90.0 % and 85.6 % of R&D expenditure in the BES respectively was on manufacturing.

In the higher education sector, the breakdown of R&D expenditure by field of science varied significantly between countries. However, in most countries 'natural sciences', 'engineering and technology' and 'medical and health sciences' accounted for more than two thirds of R&D expenditure in higher education.

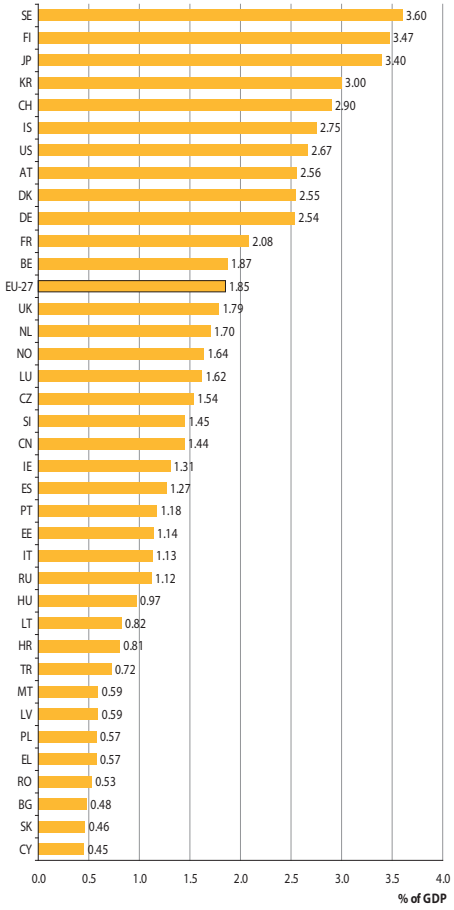
The leading regions in terms of R&D intensity were mainly located in Germany, followed by Sweden. In 2006, Braunschweig (DE) came first, with 5.83 %, followed by Västsverige (SE), with 5.40 %, and Stuttgart (DE), with 5.37 %. R&D intensity in all other EU-27 regions was below 5 %.

Figure 2.1: R&D intensity (R&D expenditure as % of GDP), all sectors, EU-27, EU-15, China, Japan, South Korea and the United States — 2002 - 2007



Note:
EU-27 and EU-15: Eurostat estimations.
KR: excludes R&D in social sciences and humanities.
US: provisional data for 2007; excludes most or all capital expenditure.
Source: Eurostat (rd_e_gerdtot), OECD-MSTI for CN, KR, JP and US.

Figure 2.2: R&D intensity (R&D expenditure as % of GDP), all sectors, EU-27 and selected countries — 2007



Note:
Exceptions to the reference year: 2006: IT, KR and JP; 2004: CH.
EU-27: Eurostat estimation.
BE, IE, FR, CY, LU, MT, NL, PT, SE, UK and US: provisional data.
DK, DE, EL and AT: national estimates.
KR: excludes R&D in social sciences and humanities.
US: excludes most or all capital expenditure.
Source: Eurostat (rd_e_gerdtot), OECD-MSTI for CN, KR, JP and US.

Table 2.3: Total and business R&D expenditure in EUR million and average annual growth rate (AAGR)([1]), EU-27 and selected countries — 2002 - 2007

	All sectors			Business enterprise sector		
	2002	2007	AAGR 2002-2007	2002	2007	AAGR 2002-2007
EU-27	185 835 s	228 682 s	2.6 s	119 126 s	146 241 s	2.7 s
BE	5 201	6 263 p	1.5	3 662	4 337 p	1.2
BG	81	140	5.8	15	43	17.4
CZ	959	1 955	10.8	586	1 248	11.8
DK	4 634	5 779 e	2.4	3 198	3 752 e	1.1
DE	53 364	61 543 e	1.8	36 950	43 003 p	2.0
EE	56	174	18.5	17	82	29.2
IE	1 436	2 311 p	9.8	988	1 560 p	9.3
EL	978	1 311 e	4.3	313	353 e	-0.2
ES	7 194	13 342	8.9	3 926 b	7 454	9.4 b
FR	34 527	39 369 p	0.6	21 839	24 872 p	0.5
IT	14 600	16 831	1.2	7 057	8 210	1.4
CY	34	70 p	12.1	7	16 p	15.3
LV	42	126	17.7	17	41	12.5
LT	100	233	13.1	17	66	25.7
LU	426	591 p	4.9	379	495 p	3.3
HU	706 i	977	2.9	250 i	492 i	10.4
MT	12	32 p	20.4	3	21 p	46.1
NL	8 019	9 666 p	2.1	4 543	5 840 p	3.4
AT	4 684	6 946 e	6.3	3 131	4 891 e	7.4
PL	1 172	1 764	5.5	238	535	14.2
PT	1 029 e	1 921 p	10.2	334 e	988 p	20.8
RO	184	653	13.7	111	272	5.6
SI	360	501	4.6	215	299	4.6
SK	148	252	2.5	95	100	-7.0
FI	4 830	6 243	4.2	3 375	4 513	4.9
SE	10 606 i	11 936 p	1.9	7 886 i	8 805	1.7
UK	30 579	36 728 p	2.8	19 830	23 544 p	2.5 b
HR	271	348	1.2	115	141	0.2
TR	1 280	3 410	13.9	367	1 407	22.4
IS	280 e	401	3.6	160 e	219	2.7
NO	3 388	4 665	2.4	1 946	2 488	0.9
CN	16 452	35 614	17.8	10 066	25 744	21.8
KR	14 717 i	22 777 i	10.1	11 059 i	17 604 i	10.9
RU	4 545	10 597	5.1	3 176	6 807	3.3
JP	131 726	118 295	3.9	98 059	91 271	4.8
US	293 005 i	269 098 ip	3.0	205 021 i	193 501 ip	3.5

Note:

([1]) Calculated on R&D expenditure in PPS at 2000 constant prices.

Exceptions to the reference year 2002: EL, LU and SE: 2003.

Exceptions to the reference year 2007: IT, IE, KR and JP: 2006.

Exceptions to the reference period 2002-2007: EL, LU and SE: 2003-2007; IT, IE, KR and JP: 2002-2006.

Flag 'i':

HU: incomplete breakdown of R&D expenditure by sector of performance; All sectors for 2002: defence excluded (all or mostly).
SE: underestimated or based on underestimated data.
KR: excludes R&D in social sciences and humanities.
US: excludes most or all capital expenditure.

Source: Eurostat (rd_e_gerdtot), OECD-MSTI for CN, KR, JP and US.

Table 2.4: R&D expenditure in government and higher education sectors in EUR million and average annual growth rate (AAGR)([1]), EU-27 and selected countries — 2002 - 2007

	Government sector			Higher education sector		
	2002	2007	AAGR 2002-2007	2002	2007	AAGR 2002-2007
EU-27	24 276 s	30 238 s	2.7 s	40 804 s	49 964 s	2.4 s
BE	373	520 p	4.6	1 100	1 367	2.2
BG	58	82	1.7	8	13	5.0
CZ	220	370	6.6	150	330	12.5
DK	341 b	402	1.2 b	1 068 b	1 589	6.0 b
DE	7 333 i	8 540 i	2.0	9 080	10 000 e	0.9
EE	9	15	3.6	27	73	15.3
IE	125	150	2.0	322	601 p	13.9
EL	198	281 e	5.7	457	661 e	6.2
ES	1 108	2 349	11.8	2 142	3 519	6.3
FR	5 709	6 500 p	0.5	6 512	7 545 p	0.9
IT	2 565	2 897	0.7	4 792	5 094	-0.8
CY	14	18 p	2.3	10	30 p	20.9
LV	8	30	23.6	17	54	19.5
LT	33	48	3.0	50	118	13.5
LU	45	78 p	11.1	2 e	18 p	78.9
HU	232 i	236 i	-3.2	178 i	228 i	1.4
MT	2	1 p	-10.5	7	10 p	6.0
NL	1 106	1 260 ip	0.9	2 312	2 566 ep	0.4
AT	266	363 e	4.5	1 266	1 674 e	3.9
PL	533	625	0.3	398	598	5.5
PT	194 e	176 p	-4.6	386 e	574 p	5.3
RO	44	222	21.7	29	157	24.1
SI	83	122	5.8	56	78	4.6
SK	39 i	89	8.5	13	63	25.5
FI	501	528	0.1	926	1 165	3.6
SE	371 i	574	10.3	2 308	2 543	1.3
UK	2 810	3 388 ep	2.9	7 344	9 012 p	3.2
HR	60	89	4.0	95	117	0.4
TR	90	360	23.6	823	1 643	7.5
IS	69 e	71	-2.8	45 e	101	13.3
NO	535	715 b	1.7 b	907	1 462 b	5.7 b
CN	4 719	6 850	8.8	1 667	3 021	13.7
KR	1 974 i	2 636 i	6.2	1 531 i	2 269 i	9.0
RU	1 112	3 084	8.8	247	670	8.3
JP	12 563	9 796	0.3	18 286	15 017	1.6
US	35 583 i	28 710 ip	0.3	39 342 i	35 690 ip	2.7

Note:

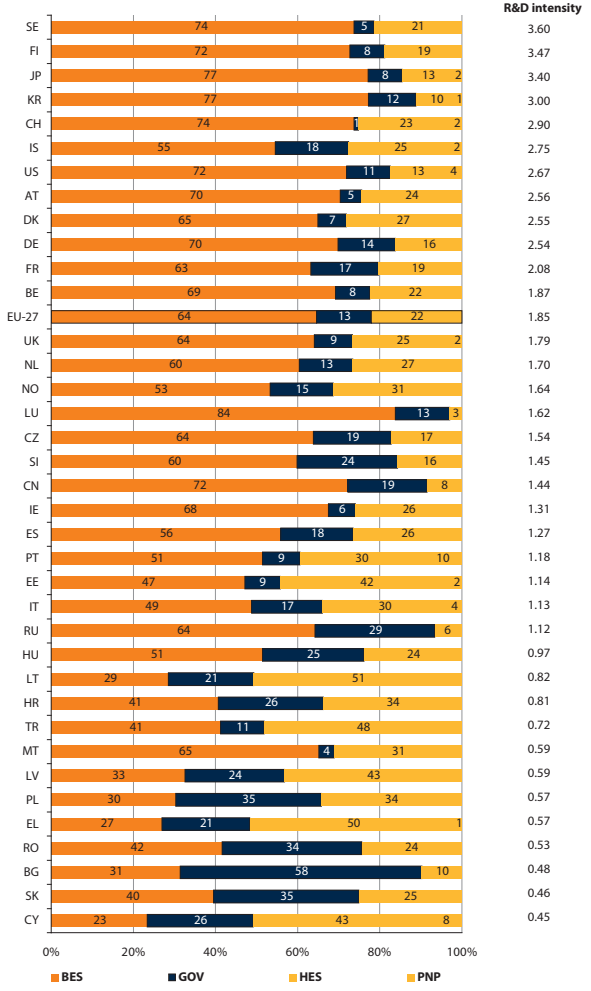
([1]) Calculated on R&D expenditure in PPS at 2000 constant prices.
Exceptions to the reference year 2002: EL, LU and SE: 2003.
Exceptions to the reference year 2007: IT, IE, KR and JP: 2006.
Exceptions to the reference period 2002-2007: EL, LU and SE: 2003-2007; IT, IE, KR and JP: 2002-2006.

Flag 'i':

HU: incomplete breakdown of R&D expenditure by sector of performance.
DE and NL: GOV sector includes PNP sector.
SK: defence excluded (all or mostly).
SE: underestimated or based on underestimated data.
SE and US: GOV sector includes federal or central government only.
KR: excludes R&D in social sciences and humanities.
US: excludes most or all capital expenditure.

Source: Eurostat (rd_e_gerdtot), OECD-MSTI for CN, KR, JP and US.

Figure 2.5: R&D expenditure by sector of performance as a percentage of total, EU-27 and selected countries ranked in terms of R&D intensity (R&D expenditure as a percentage of GDP) — 2007



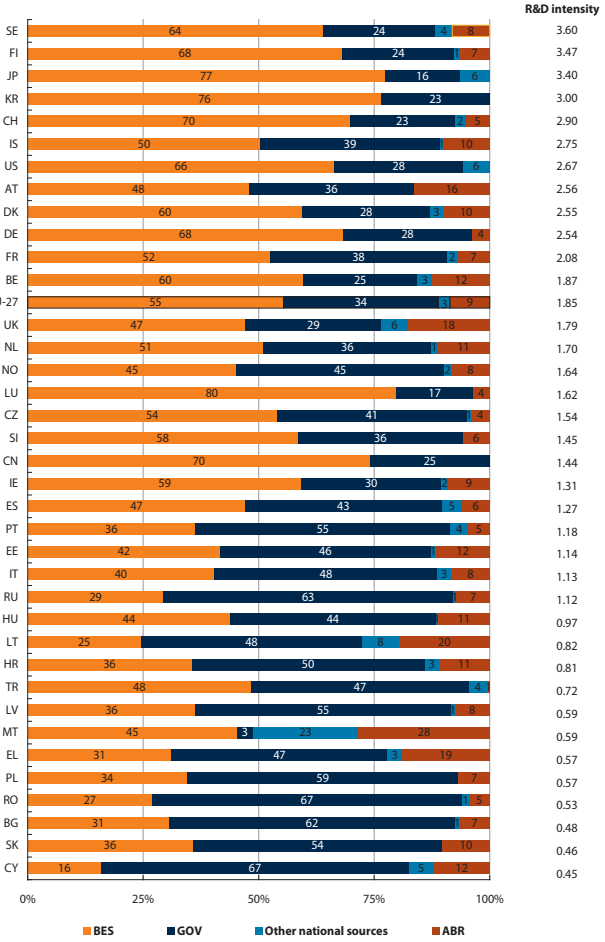
Note:

Exceptions to the reference year : 2006: IE (R&d expenditure), IT, KR and JP; 2004: CH.

BE, IE, FR, CY, LU, MT, NL, PT, SE, UK and US: provisional data; DK, DE, EL and AT: national estimates; HU: incomplete breakdown of R&D expenditure by sector of performance; DE and NL: GOV sector includes PNP sector; KR: excludes R&D in social sciences and humanities; US: excludes most or all capital expenditure; US and CH: GOV sector includes federal or central government only.

Source: Eurostat (rd_e_gerdtot), OECD-MSTI for CN, KR, JP and US.

Figure 2.6: R&D expenditure by source of funds as a percentage of total, EU-27 and selected countries ranked in terms of R&D intensity (R&D expenditure as a percentage of GDP) — 2007

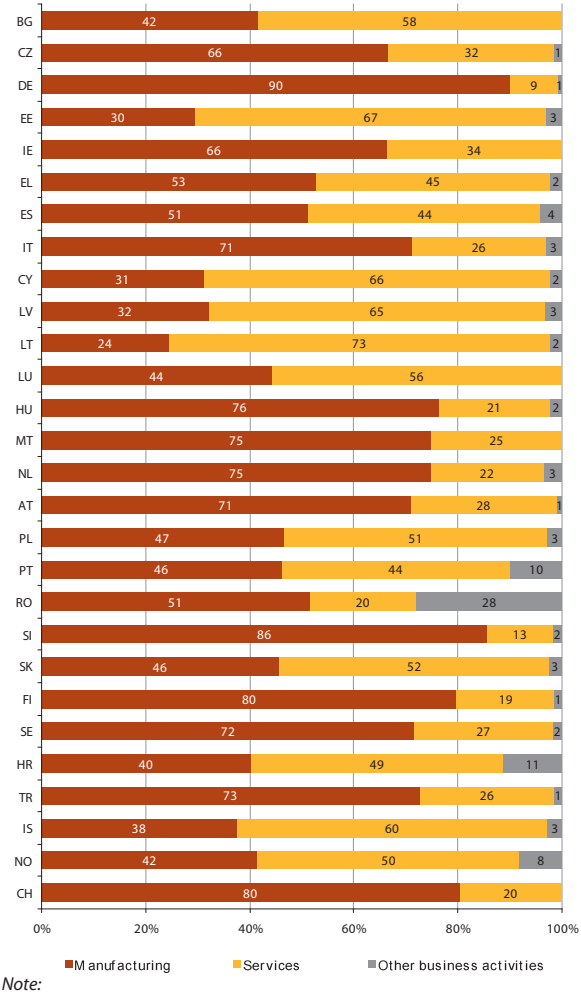


Note:

Exceptions to the reference year for R&D expenditure: 2006: EU-27, BG, DE, IE, ES, FR, IT, CY, JP and KR; 2005: BE, DK, EL, LU, PT and SE; 2004: CH; 2003: NL. Exceptions to the reference year for R&D intensity: 2006: IT, KR and JP; 2004: CH. EU-27: Eurostat estimation; IE, MT, UK and US: provisional data; AT: national estimates, SE: break in series; CN: the sum of the breakdown does not add to the total; KR: excludes R&D in social sciences and humanities; US: excludes most or all capital expenditure.

Source: Eurostat (rd_e_fundgerd and rd_e_gerdfund), OECD-MSTI for CN, KR, JP and US

Figure 2.7: Business enterprise R&D expenditure, by sector of activity (NACE Rev 1.1) as a percentage of total, EU-27 and selected countries — 2006



Note:

Exceptions to the reference year: 2005: IE, EL, LU, PT, SE and IS; 2004: CH.

BE, DK, FR, UK: breakdown according to the principle activity of the enterprises is not available.

EL: provisional data.

HU: the sum of the breakdown does not add to the total.

SE: break in series.

Source: Eurostat (rd_e_berdind)

Table 2.8: R&D expenditure in higher education sector by field of science as a percentage of total, EU-27 and selected countries — 2006

	Total EUR million	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities
EU-27	47 478 s	:	:	:	:	:	:
BE	1 239	21.0	16.6	27.3	10.4	17.0	7.6
BG	12	29.3	39.1	8.1	1.7	15.3	6.5
CZ	279	25.5	33.5	19.5	5.8	10.1	5.7
DK	1 404	23.5	15.0	29.0	4.7	17.9 b	9.8 b
DE	9 568	28.5	19.4	27.5	3.5	9.2	12.0
EE	61	45.3	23.8	8.9	6.0	9.5	6.5
IE	601 i	27.0	22.1	18.1	2.6	15.3	6.6
EL	585 e	:	:	:	:	:	:
ES	3 266	23.1	23.4	14.1	2.5	22.3	14.6
FR	7 279 p	:	:	:	:	:	:
IT	5 094 i	31.5	14.6	15.6	4.1	18.6	15.2
CY	26	41.6	18.1	1.1	:	28.6	10.6
LV	39	40.7	19.6	10.0	5.9	14.1	9.6
LT	94	20.9	26.7	18.6	4.8	18.4	10.7
LU	7	36.6	25.4	:	0.0	25.4	12.7
HU	219	27.1	17.9	16.2	9.3	17.5	12.0
MT	9 i	16.1	17.0	19.1	1.0	31.7	13.5
NL	2516 ep	:	:	:	:	:	:
AT	1 523	31.3	14.3	26.1	4.6	13.7	10.0
PL	469	:	:	:	:	:	:
PT	425	29.2	24.9	8.2	7.4	18.4	11.9
RO	79	18.6	31.6	11.5	10.7	26.8	0.7
SI	73	10.2	39.7	15.4	16.1	13.2	5.5
SK	52	40.6	22.7	9.7	7.4	16.5	3.2
FI	1 079	25.6	19.0	24.2	2.4	21.1	7.7
SE	2 418 i	19.8 e	23.6 e	32.1 e	5.1 e	12.1 e	6.3 e
UK	8 892	:	:	:	:	:	:
HR	109	8.8	31.6	11.5	18.6	6.3	23.2
TR	1 248	8.2	13.4	44.5	5.7	18.1	10.1
IS	80 i	1.8	3.0	13.6	6.7	18.8	7.6
NO	1 136	20.5	11.1	33.0	4.8	20.4	10.1
CH	1 943	23.0	9.3	15.7	2.3	:	:
RU	517	31.7	46.4	3.2	1.8	13.9	2.9

Note:

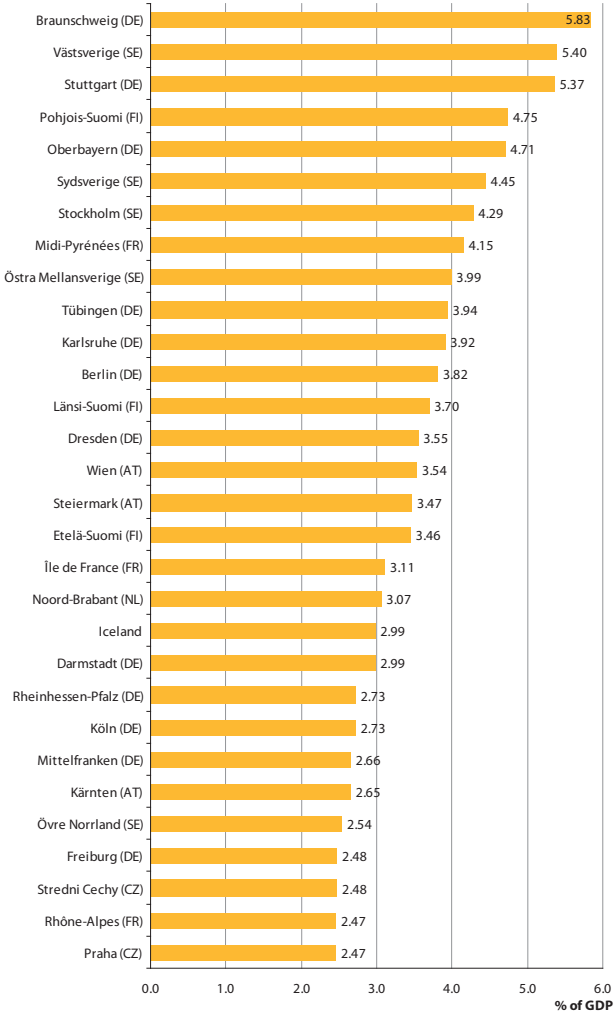
Exceptions to the reference year: 2005: BE, LU, PT, IS and NO;
2004: CH .

Flag 'i':

IE, IT, MT, SE and IS include not specified data.

Source: Eurostat (rd_e_gerdsc)

Figure 2.9: Top 30 regions in terms of R&D intensity (R&D expenditure as % of GDP), all sectors — 2006



Note:
Exceptions to the reference year: 2005: regions from DE, NL and SE; 2004: regions from FR.
NL: national estimate and provisional data.
SE: in some cases R&D expenduture are allocated to the head office.
Source: Eurostat (rd_e_gerdreg)

II

Monitoring the knowledge workers

3

R&D personnel

In 2006, R&D personnel made up 1.54 % of total employment in the EU-27 (in head count or HC). At national level, the shares of R&D personnel in total employment were highest in Iceland (3.68 %), Finland (3.27 %) and Sweden (2.71 %).

In the business enterprise sector, R&D personnel as a percentage of total employment ranged from 2.15 % in Luxembourg to 0.10 % in Bulgaria and Lithuania, with an EU-27 average of 0.64 %.

In 2007, in terms of full-time equivalents (FTE) 2.3 million people were working in R&D in the EU-27. Between 2002 and 2007, R&D personnel in all sectors and in the business enterprise sector increased at an average rate of 2.2 % per year. Over the same period, the increase in R&D personnel was slightly smaller in the higher education sector (2.1 %) and in the government sector (2.0 %).

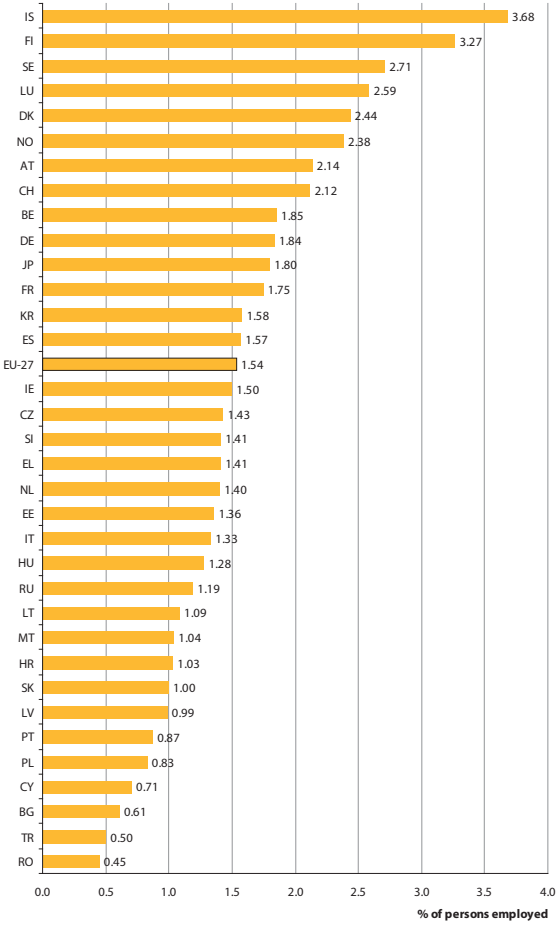
The breakdown of researchers by institutional sector reveals a complex picture across the EU-27. In 2007, the business enterprise sector employed, on average, 48.8 % of all researchers (in FTE) in the EU-27.

R&D remains a predominantly male field of activity: in 2006, women working in R&D (34.8 %) and female researchers (30.4 %) in HC were a minority in the EU-27. Lithuania (53.9 %), Latvia (50.8 %) and Bulgaria (50.2 %) were the only countries where more than half of all R&D personnel were women. In the case of researchers, none of the countries surveyed achieved an even gender balance.

In the business enterprise sector, manufacturing accounted for the highest shares of R&D personnel in most EU Member States. Nevertheless, the share of R&D personnel in the services sector was by no means negligible in Member States such as Estonia, Cyprus, Latvia and Slovakia, where close to 60 % of R&D personnel (in FTE) were employed in this sector.

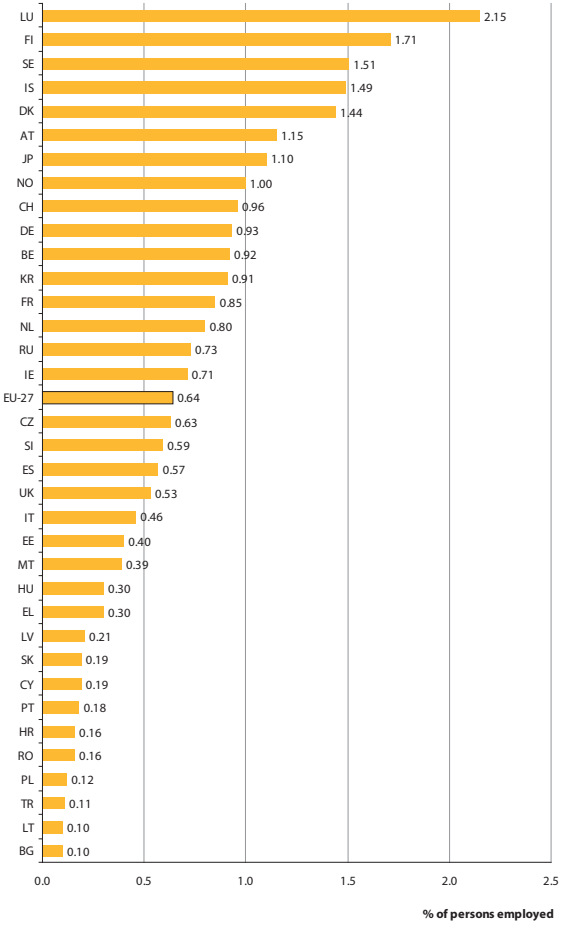
In 2006, Wien (AT) was the leading European region as regards the share of R&D personnel in total employment, with 4.58 %. It was followed by Praha (CZ), with 4.53 %, and Trøndelag (NO), with 4.36 %. The share of R&D personnel in total employment stood below 4 % in all other European regions. Capital regions were well represented, in relative terms, among the leaders.

Figure 3.1: R&D personnel (HC) as a percentage of persons employed, all sectors, EU-27 and selected countries — 2006



Note:
Exceptions to the reference year: 2005: BE, DE, EL, LU, NL, PT, SE, NO and RU; 2004: CH.
EU-27: Eurostat estimation.
UK: data not available.
IE, NL: provisional data.
SE: break in series.
TR and RU: underestimated or based on understimated data.
FR: defence excluded (all or mostly).
KR: excludes R&D in social sciences and humanities.
Source: Eurostat (rd_p_perslf), OECD-MSTI for JP and KR.

Figure 3.2: R&D personnel (HC) in the business enterprise sector, as a percentage of persons employed, EU-27 and selected countries — 2006



Note:
Exceptions to the reference year: 2005: DE, EL, LU, NL, PT, SE and RU; 2004: CH.
EU-27: Eurostat estimation.
BE and IE: provisional data.
SE: break in series.
UK: national estimate.
RU: underestimated or based on understimated data.
KR: excludes R&D in social sciences and humanities.
Source: Eurostat (rd_p_perslf), OECD-MSTI for JP and KR.

Table 3.3: Total and business R&D personnel in FTE, total, percentage of woman in 2007 and average annual growth rate (AAGR)([1]) 2002-2007, EU-27 and selected countries

	All sectors			Business enterprise sector		
	R&D PSL in FTE	% of women	AAGR 2002-2007	R&D PSL in FTE	% of women	AAGR 2002-2007
EU-27	2 314 627 s	33.5 s	2.2 s	1 205 421 s	22.7 s	2.2 s
BE	56 244 p	:	1.6	32 515 p	:	0.5
BG	16 940	:	2.4	2 422	:	7.7
CZ	49 192	31.8	13.6	25 650	22.0	15.2
DK	46 029 e	:	1.7	29 976 e	:	1.0
DE	493 858 e	:	0.6	315 214 p	18.3 e	0.8
EE	5 002	43.3	3.9	1 689	31.7	19.2
IE	17 660	:	6.8	10 800	:	4.1
EL	35 629 e	:	2.8	11 660 e	:	0.1
ES	201 108	:	8.4	87 543	:	9.2
FR	363 867 p	:	1.4	202 157 p	:	1.1
IT	192 002	34.8	4.0	80 082	19.0	3.3
CY	1 285 p	:	9.3	335 p	:	12.4
LV	6 378	52.1	3.8	1 128	49.2	-2.3
LT	12 656	53.3	5.8	2 160	37.0	39.3
LU	4 585 p	:	3.4	3 671 p	31.8 p	1.2
HU	25 954	40.5	1.8	10 342	31.9	7.5
MT	845 p	:	12.2	503 p	:	46.3
NL	91 090 p	:	0.8	49 238 p	:	0.9
AT	53 019 e	:	6.4	36 643 e	:	6.5
PL	75 309	:	-0.2	15 032	:	12.1
PT	34 593 p	:	7.4	12 444 p	:	20.0
RO	28 977	45.8	-2.4	13 107	40.7	-6.6
SI	10 369	:	3.8	5 299	:	3.3
SK	15 421	44.7	2.5	2 699	30.8	-9.6
FI	56 243	:	0.4	31 940	:	1.0
SE	76 815 bip	28.9 bip	1.3 b	55 948 b	24.9 b	3.8 b
UK	333 671 e	:	0.7	162 828 p	:	0.6
HR	10 124	50.6	-4.8	2 382	44.6	-0.9
TR	63 377	30.8	17.0	24 261	22.3	32.6
IS	2 982	37.6	1.3	1 417	30.5	3.7
NO	34 086	:	4.5	17 392	:	3.5
CH	52 250	:	0.0	33 085	:	-2.2
CN	1 736 155 i	:	10.9	1 186 751 i	:	14.6
KR	237 599 i	:	8.4	171 643 i	:	9.2
RU	912 291	:	-1.6	507 415	:	-3.5
JP	935 182	:	2.2	619 184	:	2.7

Note:
([1]) Calculated on R&D personnel expressed in FTE.
Exceptions to the reference year: 2006: IE, IT, JP, KR; 2004: CH.
Exceptions to the reference period: 2002-2006: IT, JP, KR; 2003-2007: EL, LU, SE; 2000-2004: CH.

Flag 'i':
SE: underestimated or based on underestimated data.
CN: data do not comply with Frascati Manual recommendations.
KR: excludes R&D in social sciences and humanities.

Source: Eurostat (rd_p_persocc), OECD-MSTI for CN, JP and KR.

Table 3.4: R&D personnel in government and higher education sectors in FTE, total, percentage of woman in 2007 and average annual growth rate (AAGR)(1) 2002-2007, EU-27 and selected countries

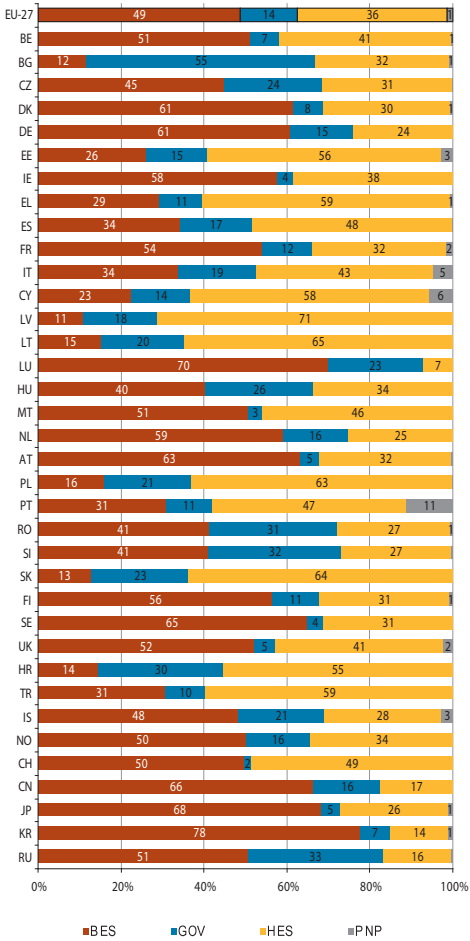
	Government sector			Higher education sector		
	R&D PSL in FTE	% of women	AAGR 2002-2007	R&D PSL in FTE	% of women	AAGR 2002-2007
EU-27	342 788 s	43.9 s	2.0 s	736 053 s	45.7 s	2.1 s
BE	3 911 p	:	1.2	19 442 p	:	3.8
BG	10 124	:	-0.7	4 269	:	8.4
CZ	10 908	47.2	8.2	12 465	38.3	16.3
DK	3 361 e	:	-0.1	12 400 e	:	3.8
DE	80 644	37.7	2.1	98 000 e	:	-1.3
EE	782	62.1	-0.3	2 406	44.7	-1.3
IE	1 248	38.3	1.0	5 612	42.1	15.3
EL	4 584 e	:	-2.6	19 172 e	:	6.4
ES	37 919	:	10.3	75 148	:	6.7
FR	54 506 p	:	2.7	101 073 p	:	1.4
IT	36 165	43.7	4.0	67 688	46.1	2.9
CY	350 p	:	-1.4	495 p	:	19.2
LV	1 371	57.6	4.1	3 879	50.9	5.9
LT	2 992	57.1	-2.6	7 504	56.5	5.6
LU	722 p	:	11.0	193 i	:	54.4
HU	7 834	47.3	-0.4	7 778	45.0	-1.8
MT	33 p	30.3 p	-24.6	310 p	32.9 p	3.2
NL	12 114 ip	:	-1.1	29 738 ep	:	2.2
AT	2 601 e	:	4.8	13 603 e	:	6.6
PL	17 467	:	-6.0	42 595	:	-0.5
PT	4 467 p	:	-3.9	14 002 p	:	5.6
RO	8 786	52.2	-0.3	6 931	47.3	4.8
SI	3 096	:	6.4	1 950	:	3.4
SK	4 214	52.6	2.0	8 493	45.2	9.7
FI	7 325	:	-0.2	16 503	:	-0.5
SE	3 253 i	36.0 i	2.0	17 525	40.8	-5.0
UK	18 380 p	:	-2.9	:	:	:
HR	3 344	54.0	2.0	4 384	51.2	-10.0
TR	9 572	23.1	11.7	29 543	40.2	11.0
IS	701	40.5	-1.3	773	45.0	0.2
NO	5 683 b	:	2.9 b	11 011 b	:	7.2 b
CH	810 i	:	-2.5	18 355 e	:	4.8
CN	295 503 i	:	3.2	253 901 i	:	6.9
KR	19 026 i	:	8.0	44 150 i	:	5.6
RU	295 851	:	1.2	105 643	:	1.5
JP	63 196	:	-0.3	238 813	:	2.0

Note:
(1) Calculated on R&D personnel expressed in FTE.
Exceptions to the reference year: 2006: IE, IT, JP, KR; 2004: CH.
Exceptions to the reference period: 2002-2006: IT, JP, KR; 2003-2007: EL, LU, SE; 2000-2004: CH .

Flag 'i':
LU: national estimate.
NL: includes other classes.
SE: underestimated or based on underestimated data.
CH: federal or central government only.
CN: data do not comply with Frascati Manual recommendations.
KR: excludes R&D in social sciences and humanities.

Source: Eurostat (rd_p_persocc), OECD-MSTI for CN, JP and KR.

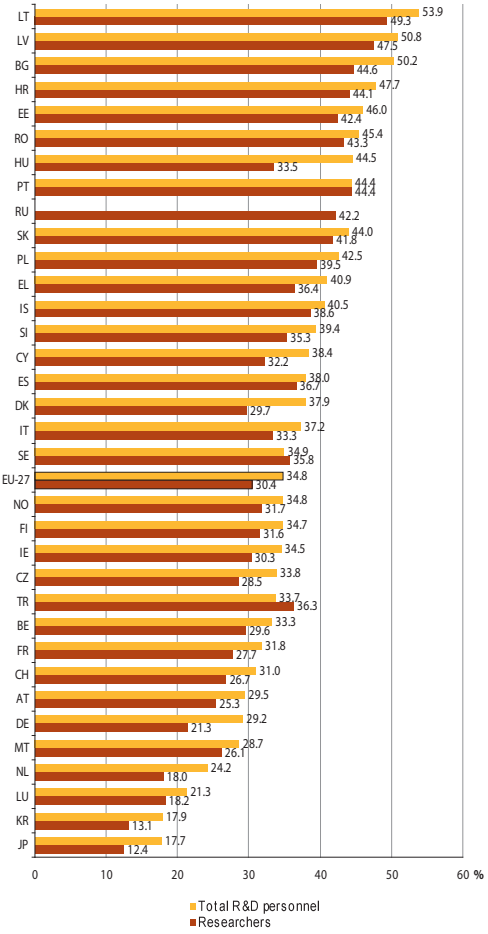
Figure 3.5: Researchers (FTE) by sector of performance as a percentage of total, EU-27 and selected countries — 2007



Note:
Exceptions to the reference year: 2006: IE, IT, JP and KR; 2004: CH
EU-27: Eurostat estimation.
BE, IE, FR, CY, LU, MT, NL, PT and SE: provisional data.
DK, DE, EL, LU (HES), AT and UK: national estimations.
NL (GOV): includes other classes; SE: underestimated or based on underestimated data; SE and NO (GOV and HES): break in series; NO (BES and GOV): university graduates instead of reseachers; CH: federal or central government only; CN: data do not comply with Frascati Manual recommendations; KR: excludes R&D in social sciences and humanities.

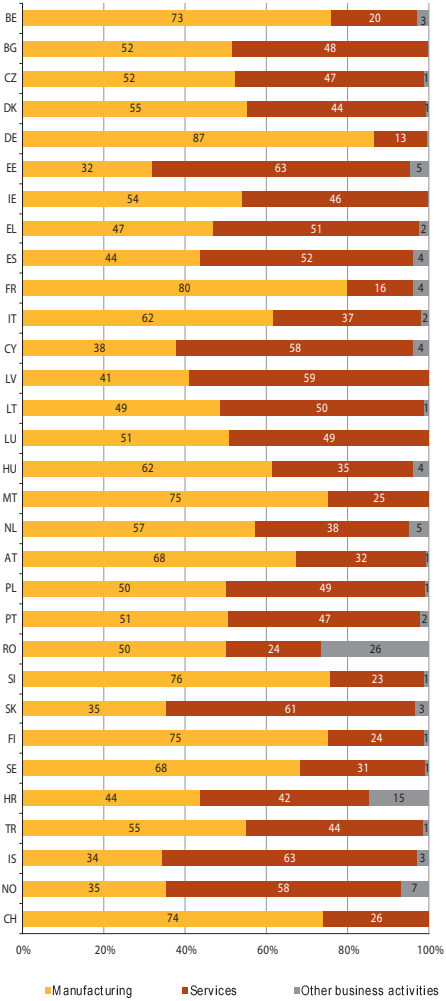
Source: Eurostat (rd_p_persocc), OECD-MSTI for CN, KR and JP.

Figure 3.6: Percentage of women in total R&D personnel and among researchers (HC), all sectors, EU-27 and selected countries — 2006



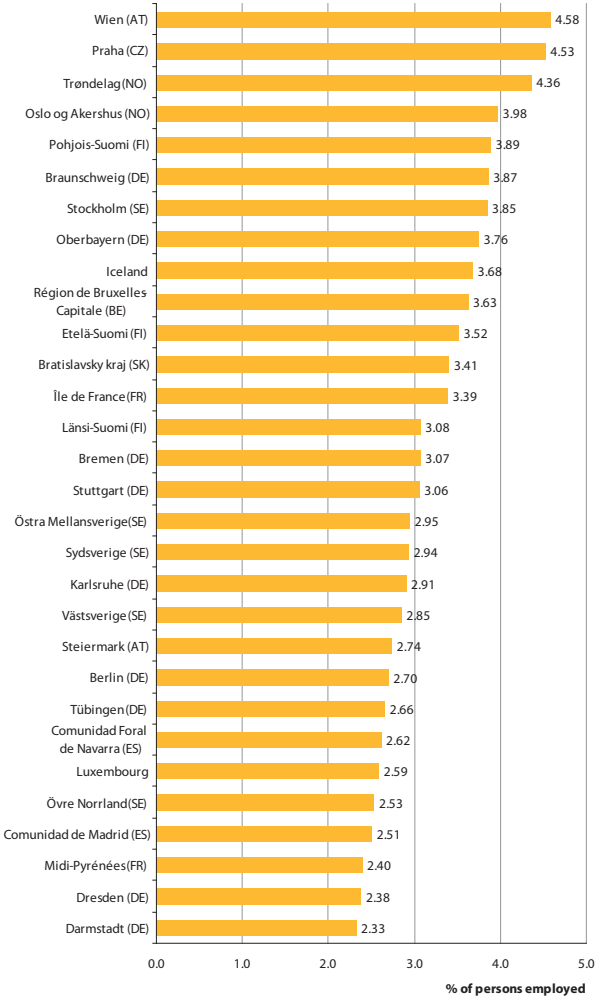
Note:
Exceptions to the reference year: 2005: BE, DK, DE, IE, EL, LU, NL, PT, SE and NO; 2004: CH.
EU-27: Eurostat estimation.
UK: data not available.
SE: break in series; university graduates instead of reseachers.
NL: provisional data.
FR: defence excluded (all or mostly).
TR (R&D personnel) and RU: underestimated or based on understimated data.
KR: excludes R&D in social sciences and humanities.
Source: Eurostat (rd_p_persocc), OECD-MSTI for JP and KR.

Figure 3.7: Business enterprise researchers in FTE, by economic activity (NACE Rev 1.1), EU-27 and selected countries — 2007



Note:
Exceptions to the reference year: 2006: BE, BG, DK, ES, FR, IT, CY, MT, NL, AT, SI, UK, US, JP and KR; 2005: IE, EL, PT and IS; 2004: CH.
BE and LU: provisional data.
DE: national estimate.
BE: breakdown does not equal to the total.
NO: university graduates instead of reseachers.
UK: confidential data for 'Manufacturing' and 'Services'.
Source: Eurostat (rd_p_bempocc)

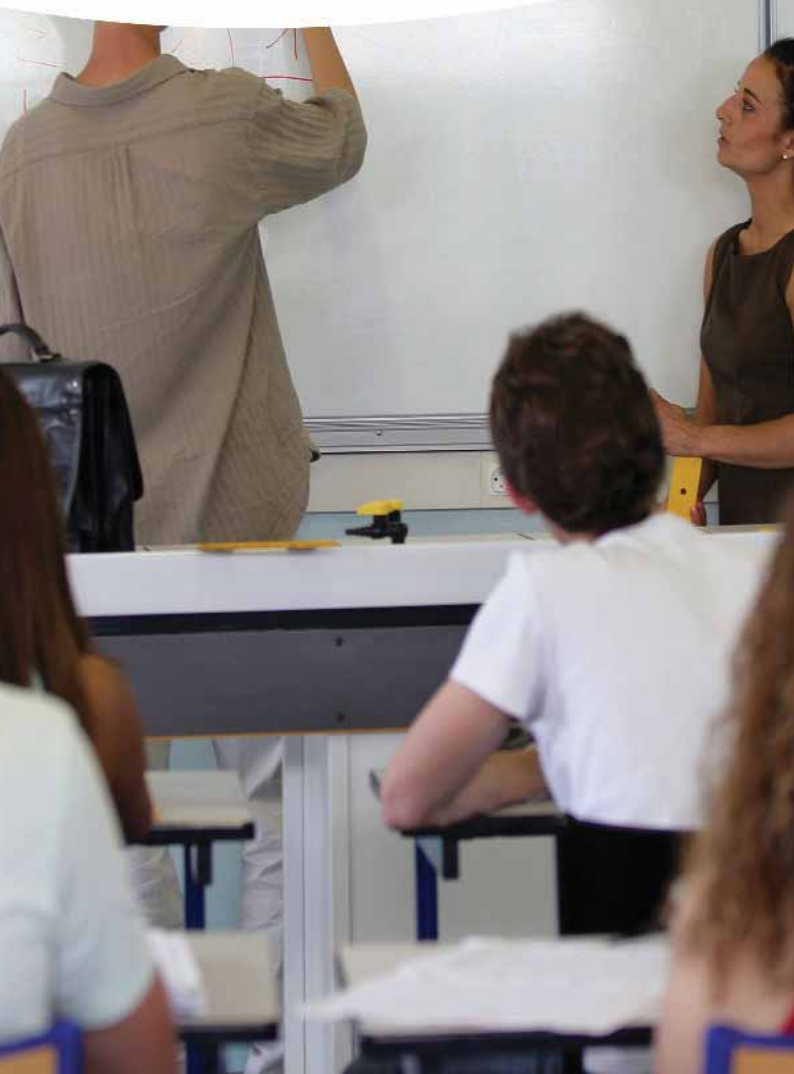
Figure 3.8: Top 30 regions in terms of R&D personnel (HC) as a percentage of persons employed, all sectors — 2006



Note:
Exceptions to the reference year: 2005: BE, DE, LU, SE and NO; 2001: FR.
BE: by NUTS 1 regions.
SE: in some cases R&D personnel is allocated to the head office.
Source: Eurostat (rd_p_persreg)

Human resources in science and technology (HRST)

4



Statistics on human resources in science and technology (HRST) indicate the supply of and demand for highly qualified science and technology specialists by measuring HRST stocks and flows.

In 2007, 28.6 % of the EU population aged 20-29 were in tertiary education. Finland had the highest proportion of the 20-29 age group in tertiary education (46.7 %), followed by Slovenia (40.5 %) and Lithuania (40.1 %). In the EU-27, the annual average growth rate in the number of students in tertiary education reached 4.5 % between 2002 and 2007, which confirms the growing trend to opt for tertiary education. Moreover, only five Member States reported a decrease in their number of students in tertiary education between 2002 and 2007: Luxembourg, Portugal, Austria, France and Spain.

Of the EU-27 students in tertiary education, 4.6 million were studying science and engineering (S&E) in 2007, equivalent to 7.0 % of the population aged 20-29 years. The number of S&E students likewise increased between 2002 and 2007, but at a slower pace than the total number of students in tertiary education.

In Europe, women made up 55.2 % of all students in higher education in 2007. Nevertheless, a different picture emerges when looking at science and engineering graduates: almost 70 % of graduates in this specific field were men.

In terms of HRST stocks, the EU had more than 90 million highly qualified knowledge workers in 2008, of whom 65.6 million were considered HRST by education (HRSTE), 61.6 million HRST by occupation (HRSTO) and 37.0 million HRST by virtue of both education and occupation (HRSTC). In the EU-27, the proportion of women was higher than 50 % in all categories of HRST.

Between 2003 and 2008, the HRST population in the EU-27 increased at a rate of 3.3 % per year on average. This was even higher than the increase in the total labour force over the same period (1.1 %). The HRST population grew faster than the total labour force in every EU-27 Member State except Bulgaria.

In 2008, HRSTE made up 24.3 % of the population aged 25-69 years in the EU-27. At country level, Finland reported the largest proportion of HRSTE among the population aged 25-69 years (37.3 %), followed by Norway (35.1 %), Cyprus (34.5 %), Estonia (34.3 %) and Denmark (33.7 %). By contrast, six EU Member States, along with the former Yugoslav Republic of Macedonia and Turkey, recorded shares lower than 15 %.

In 2008, HRSTC accounted for almost one fifth (19.0 %) of total employment in the EU-27. The highest shares were recorded by Norway (30.0 %), Luxembourg (29.2 %) and Denmark (28.7 %). The distribution of HRSTC by age group was fairly homogeneous, with approximately one third of all HRSTC aged 25-34, one third aged 34-45 and the last third aged 45-64. However, some countries, such as Malta and Turkey, had a large proportion of HRSTC aged 25-34 years, whereas in the former Yugoslav Republic of Macedonia, Croatia, Germany and Bulgaria a large share were aged 45-64.

The proportion of professionals, as opposed to technicians and associate professionals, varied from 73.7 % in Ireland to 33.0 % in the Czech Republic, with the EU average standing at 46.8 %.

In 2008, Praha (CZ) was the leading region as regards the share of HRSTO in the labour force, with 52.6 %. Praha (CZ) was also the only region where HRSTO accounted for more than half of the labour force. As a rule, capital regions were well represented among the leaders in terms of HRSTO as a share of the labour force.

Table 4.1: Students participating in tertiary education, total and in science and engineering (S&E), total and as a percentage of population aged 20-29 and AAGR 2002-2007, EU-27 and selected countries — 2007

	Total			Science and engineering		
	Total in 1000's	As a % of population aged 20-29	AAGR 2002-2007	Total in 1000's	As a % of population aged 20-29	AAGR 2002-2007
EU-27	18 877	28.6	4.5	4 638	7.0	3.5
BE	394	29.8	1.4	63	4.8	-4.9
BG	259	23.7	2.5	64	5.9	0.4
CZ	363	23.9	5.0	83	5.5	0.0
DK	232	37.3	3.5	44	7.0	2.2
DE	2 279	23.3	1.1	701	7.2	1.8
EE	69	34.0	2.5	16	7.8	4.5
IE	190	25.4	1.5	41	5.4	-3.2
EL	603	39.8	2.6	184	12.2	3.2
ES	1 777	27.5	-0.6	500	7.7	-2.1
FR	2 180	27.0	-1.0	549	6.8	5.1
IT	2 034	30.1	1.9	478	7.1	1.6
CY	22	16.9	9.8	4	3.2	12.5
LV	129	37.4	3.2	20	5.8	1.0
LT	200	40.1	6.1	48	9.6	4.7
LU	3	4.4	-2.4	1	1.0	4.2
HU	432	30.2	4.0	79	5.5	4.4
MT	10	16.4	6.2	2	3.0	15.0
NL	583	29.7	2.7	85	4.3	0.2
AT	261	24.7	-1.6	64	6.1	-2.3
PL	2 147	33.6	2.4	473	7.4	5.3
PT	367	25.3	-1.4	109	7.5	-0.9
RO	928	27.4	9.8	217	6.4	8.2
SI	116	40.5	3.2	26	9.0	4.1
SK	218	24.1	7.4	54	5.9	4.9
FI	309	46.7	1.7	113	17.1	1.4
SE	414	37.6	1.6	105	9.6	-0.9
UK	2 363	29.0	1.1	515	6.3	-2.8
HR	140	22.9	3.6	33	5.4	2.9
MK	58	17.9	5.4	14	4.3	1.9
TR	2 454	18.8	16.3	506	3.9	8.1
IS	16	34.4	6.4	2	5.4	3.3
LI	1	15.3	11.2	0	3.5	-0.2
NO	215	37.5	1.8	34	5.9	-0.7
CH	213	23.0	4.6	51	5.5	2.9
AL	74	14.4	18.7	15	2.8	50.6
JP	4 033	:	0.3	754	:	-1.5
US	17 759	:	1.4	2 765	:	1.3

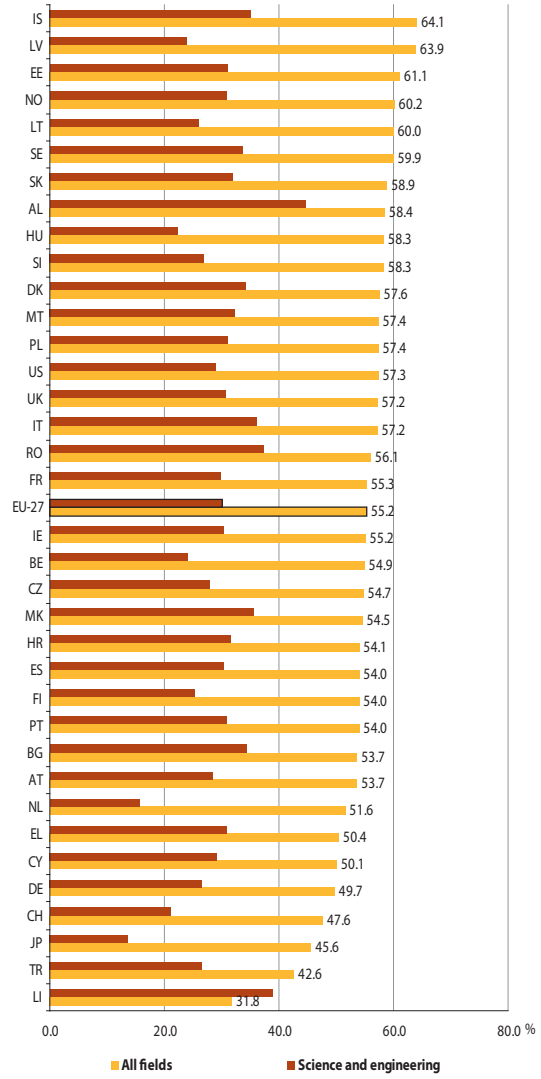
Note:

Exceptions to the reference year: 2006: LU and AL.

Exceptions to the reference period: 2002-2006: LU;
2003-2007: HR and LI;
2004-2006: AL;
2005-2007: US;
2006-2007: FR.

Source: Eurostat (educ_enrl5 and demo_ppavg)

Figure 4.2: Share of female students in tertiary education, all fields and science and engineering (S&E), EU-27 and selected countries — 2007



Note:
Exception to the reference year: 2006: AL.
Source: Eurostat (educ_enrl5)

Table 4.3: Stocks of HRST and HRSTC, 25-64 years old, total and percentage of women, EU-27 and selected countries — 2008

	HRST		HRSTC	
	Total in 1000's	% of women	Total in 1000's	% of women
EU-27	90 293	50.9	37 018	52.2
BE	2 260	49.8	954	53.2
BG	1 106	58.4	520	66.3
CZ	1 878	52.0	564	47.7
DK	1 368	51.1	683	56.7
DE	17 454	48.4	6 900	44.6
EE	289	63.3	105	72.4
IE	882	53.5	351	55.0
EL	1 594	48.9	802	49.9
ES	8 953	49.0	3 758	51.9
FR	11 766	50.9	4 912	53.8
IT	8 807	50.1	2 955	52.4
CY	167	50.3	78	50.0
LV	433	65.4	170	69.4
LT	651	61.8	285	69.1
LU	99	46.5	55	43.6
HU	1 480	58.5	604	57.8
MT	49	40.8	20	50.0
NL	3 955	48.3	1 795	47.2
AT	1 451	44.4	461	47.1
PL	5 491	59.0	2 444	61.0
PT	1 175	54.0	559	61.0
RO	2 197	53.6	1 055	52.1
SI	390	55.4	173	59.5
SK	823	57.0	283	54.4
FI	1 287	54.9	606	57.9
SE	2 170	51.7	1 078	58.5
UK	12 120	49.7	4 846	51.5
HR	514	50.6	240	56.3
MK	199.0	49.2	75	52.0
TR	4 413	34.8	1 617	38.1
IS	73	54.8	35	54.3
NO	1 152	51.6	633	55.9
CH	2 062	44.1	873	38.8

Note:
Exception to the reference year: 2007: MK.

Source: Eurostat (hrst_st_ncat)

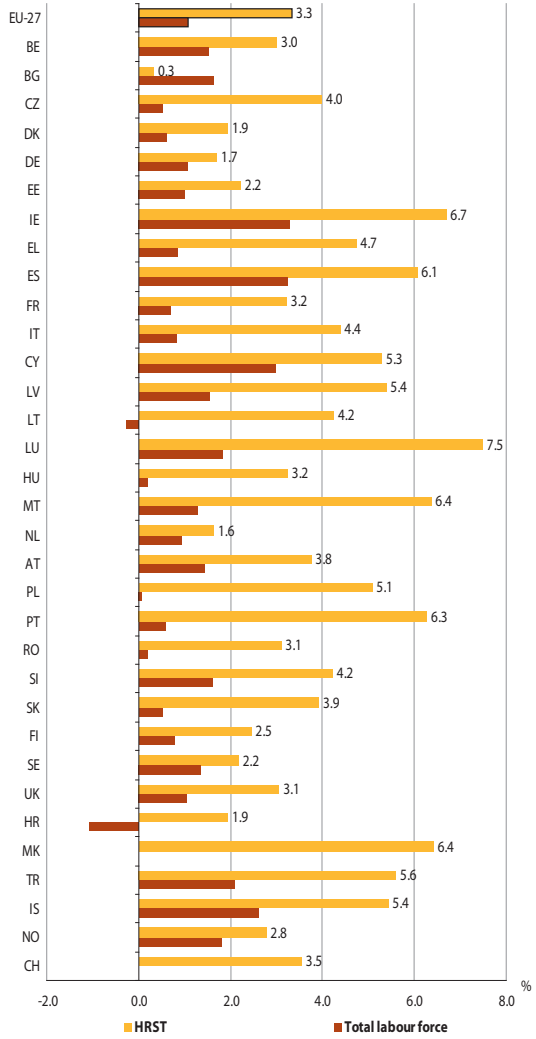
Table 4.4: Stocks of HRSTE and HRSTO, 25-64 years old, total and percentage of women, EU-27 and selected countries — 2008

	HRSTE		HRSTO	
	Total in 1000's	% of women	Total in 1000's	% of women
EU-27	65 643	51.3	61 667	51.2
BE	1 866	52.4	1 348	48.7
BG	940	60.6	686	61.5
CZ	880	47.2	1 562	53.2
DK	998	53.4	1 053	52.5
DE	11 467	43.4	12 887	50.8
EE	242	64.0	152	68.4
IE	788	54.4	445	53.0
EL	1 377	49.3	1 019	49.1
ES	7 910	50.3	4 801	49.1
FR	8 872	54.4	7 805	48.8
IT	4 754	55.0	7 008	47.7
CY	149	51.7	96	47.9
LV	306	64.1	297	69.0
LT	542	60.3	395	68.9
LU	73	46.6	81	45.7
HU	1 069	56.2	1 016	60.4
MT	30	46.7	39	41.0
NL	2 838	46.8	2 912	49.1
AT	828	43.4	1 084	46.4
PL	4 082	58.5	3 854	60.8
PT	847	60.6	886	52.3
RO	1 528	49.6	1 724	56.1
SI	264	57.2	299	56.2
SK	451	51.4	655	59.5
FI	1 072	56.9	821	54.7
SE	1 540	56.8	1 707	51.4
UK	9 930	51.2	7 036	48.8
HR	369	53.4	385	51.4
MK	157.0	49.0	116	52.6
TR	3 590	38.1	2 440	32.2
IS	51	52.9	58	55.2
NO	899	54.2	886	52.0
CH	1 433	38.2	1 502	46.7

Note:
Exception to the reference year: 2007: MK.

Source: Eurostat (hrst_st_ncat)

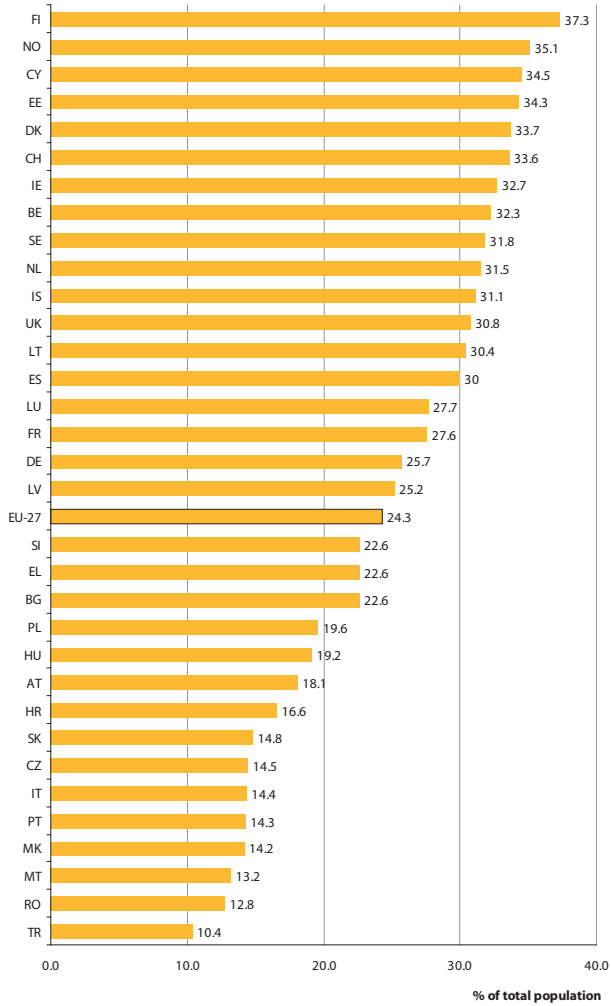
Figure 4.5: Annual average growth rate (AAGR) of HRST and of total labour force, 2003-2008, EU-27 and selected countries



Note:
Exceptions to the reference period: 2006-2007: MK; 2006-2008: TR.

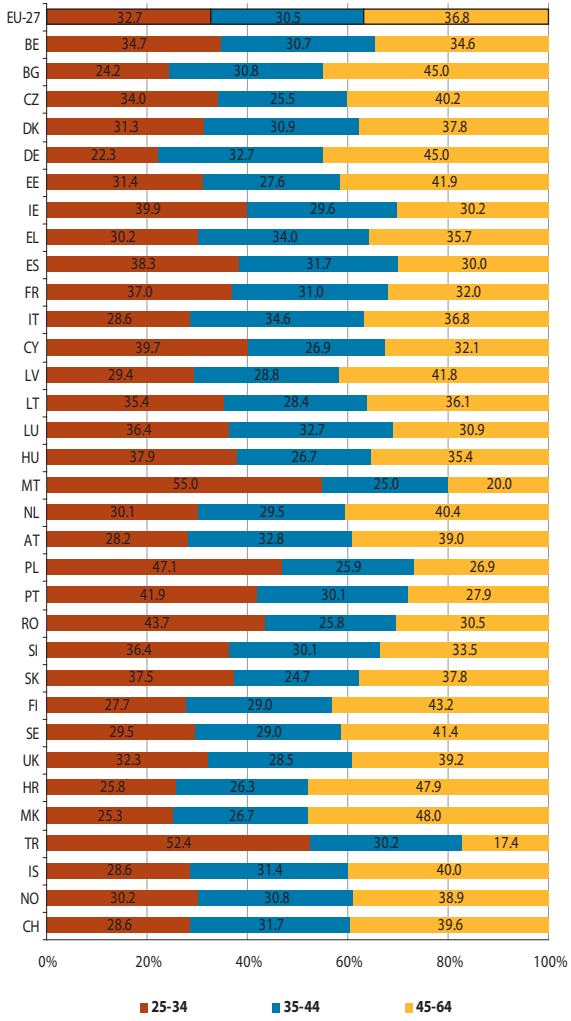
Source: Eurostat (hrst_st_ncat and lfsi_act_a)

Figure 4.6: Percentage of HRSTE aged 25-64 in total population, EU-27 and selected countries — 2008



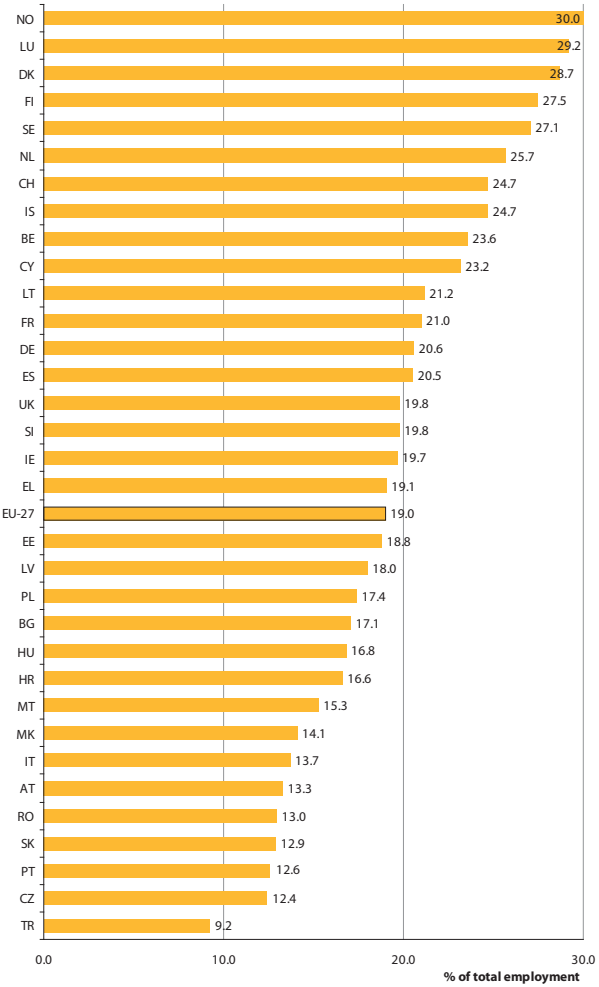
Note:
Exception to the reference year: 2007: MK.
Source: Eurostat (hrst_st_ncat)

Figure 4.7: HRSTC by age group, EU-27 and selected countries — 2008



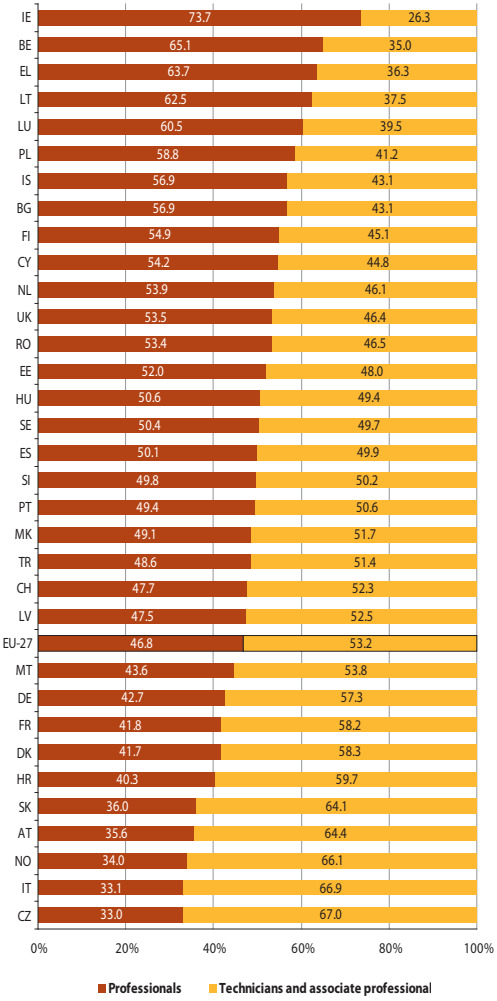
Note:
Exception to the reference year: 2007: MK.
Source: Eurostat (hrst_st_ncat)

Figure 4.8: HRSTC as a percentage of total employment, EU-27 and selected countries — 2008



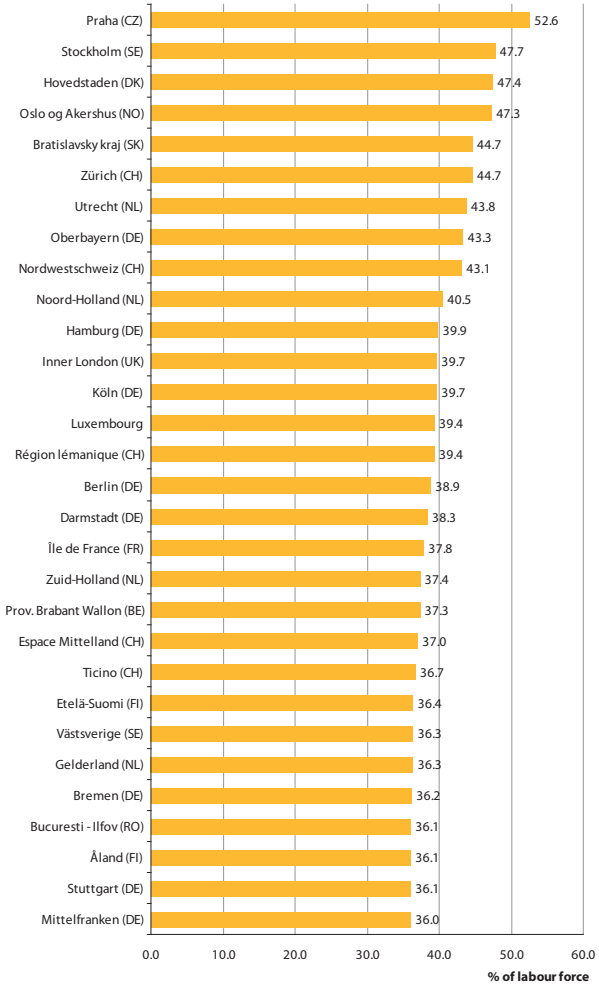
Note:
Exception to the reference year: 2007: MK.
Source: Eurostat (hrst_st_nocc)

Figure 4.9: HRSTO aged 25-64 by occupation, EU-27 and selected countries — 2008



Note:
Exception to the reference year: 2007: MK.
Source: Eurostat (hrst_st_nocc)

Figure 4.10: HRST in terms of occupation (HRSTO) as a percentage of the labour force (NUTS level 2) — 2008



Source: Eurostat (hrst_st_rcat)

III

Productivity and competitiveness

5

Innovation

Community innovation surveys

The Community innovation surveys (CIS) are the source of statistics on innovation activity in enterprises in the EU Member States, candidate countries and Norway.

The Community legislation has increased the frequency for compiling Community innovation statistics from each four years to each two years. However, only part of the survey is compulsory[1]. The latest surveys decided to keep almost the entire harmonised survey questionnaire and harmonised survey method used earlier for CIS 4 (2004).

As the questionnaire and method were left unchanged from CIS 4 (2004) to CIS 2006, it is possible to compare data and analyse trends.

The pilot modules on marketing and organisational innovations include questions on whether such innovations are integrated into or linked with product or process innovations. Data of this kind can provide insights into how innovation activities (and, hence, also knowledge transfer) are linked across firms and to what extent innovation projects span more than one 'area'.

Data collection for CIS 2008 has already begun and the first results will be made available in autumn 2010.

Some results of CIS 2006

In 2006, 38.8 % of enterprises in the EU-27[2] (France is missing from the EU aggregates) were considered innovative. Germany headed the ranking, with 62.6 % of its enterprises classified as innovative. The proportion of innovative enterprises was above the EU-27 average in only two of the Member States from the 2004 enlargement (Estonia and Cyprus). By contrast, the rest of the new Member States, together with the United Kingdom, the Netherlands, Italy and Spain, were below the EU-27 average.

Although the EU-27 average of innovative enterprises decreased slightly from 2004 to 2006, this trend is not entirely mirrored in the national figures.

In most of the countries for which data are available, the share of innovative enterprises was generally higher in manufacturing than in services.

(1) See Commission Regulation (EC) No 1450/2004 and derogations.
(2) On 22 July 2005 the European Commission granted France a derogation. As a result, the CIS 2006 data for France cover only the manufacturing sector (NACE D) and enterprises with more than 50 employees.

In many countries the national markets account for the highest shares of innovative enterprises, but in some, such as Cyprus, Greece, Sweden, Spain and Slovenia, the local markets occupy more than 30 % of innovative enterprises.

The share of innovative enterprises generally increases in step with the size of the enterprises. However, there are generally far fewer medium-sized and large enterprises than small enterprises.

Everywhere except in Cyprus, innovative enterprises were engaged in in-house R&D more often than outside R&D.

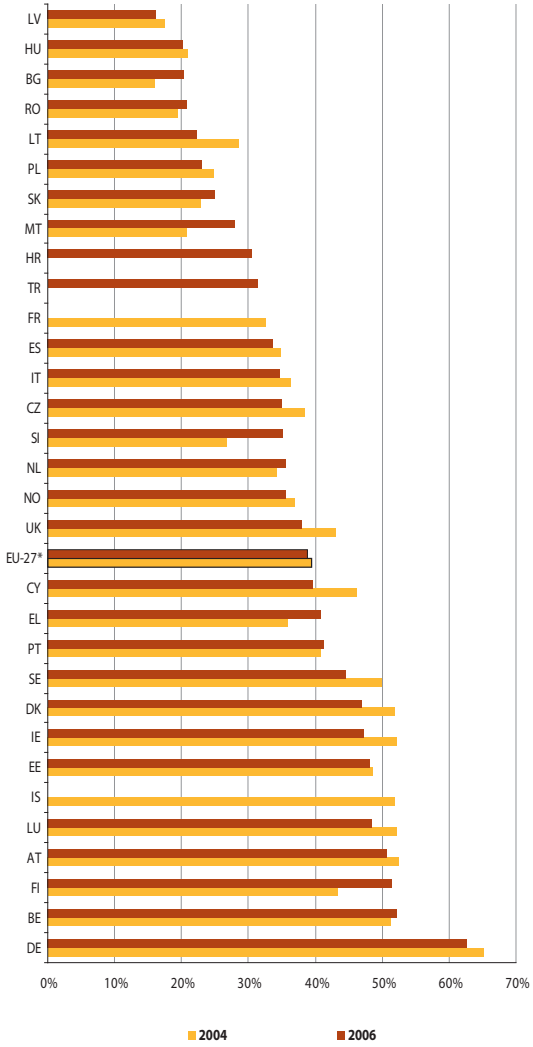
CIS 2006 draws a distinction between product- and process-oriented effects of innovation. Unsurprisingly, 'increased range of goods and services' and 'improved quality of goods and services' were the product-oriented effects of innovation most frequently chosen by innovative enterprises. 'Improved flexibility' and 'increased capacity' of production or service provision were the process-oriented effects mentioned by the highest shares of innovative enterprises.

CIS 2006 also takes a look at the factors hampering innovation. A distinction is drawn between three groups:

- Cost factors;
- Market factors; and
- Knowledge factors.

Although results vary from one country to another, cost factors still seem to be the highest barriers to innovation.

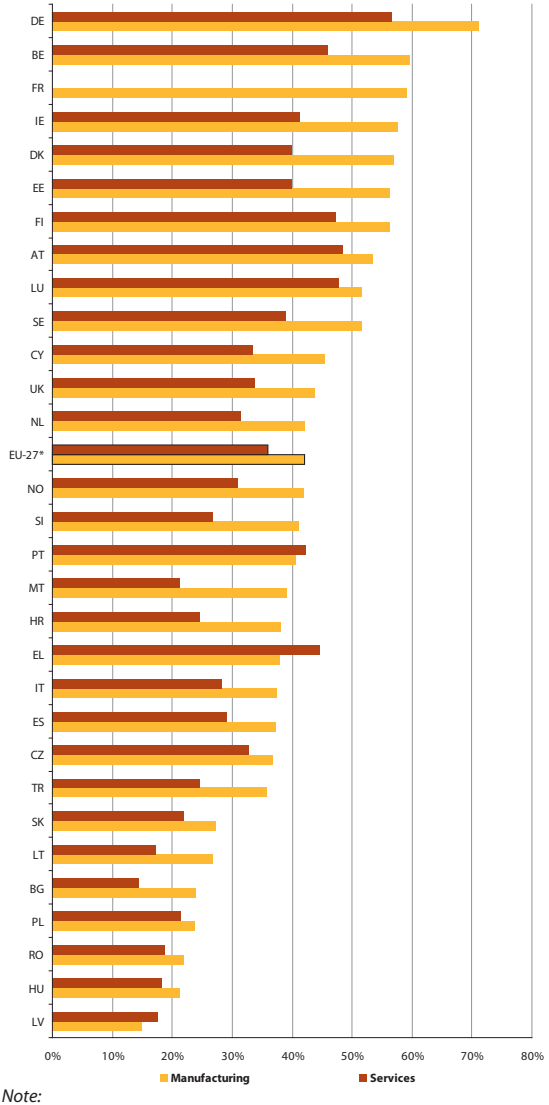
Figure 5.1: Enterprises with innovation activity in CIS 4 and CIS 2006 as a percentage of all enterprises by country — 2004 and 2006



Note:
CIS 2006: EU-27* excluding FR; statistics cover enterprises with 10 or more employees.

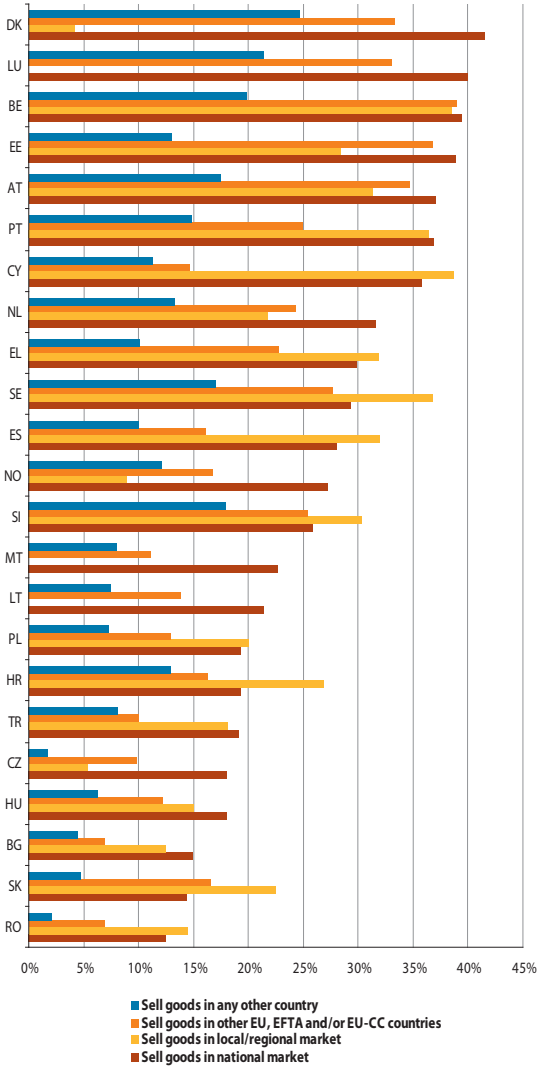
Source: Eurostat (inn_cis4_prod and inn_cis5_prod)

Figure 5.2: Innovative enterprises as a percentage of all enterprises by main NACE group, EU-27 and selected countries – 2006



Note:
EU-27* excluding FR; statistics cover enterprises with 10 or more employees.
Source: Eurostat (inn_cis5_prod)

Figure 5.3: Geographic markets of innovative enterprises as a percentage of innovative enterprises by country — 2006



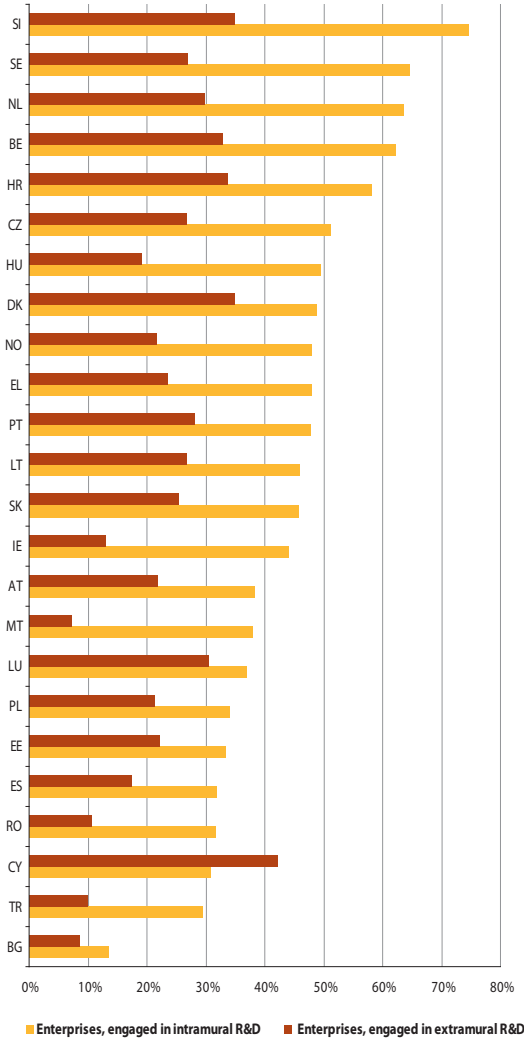
Note:
Data missing for DE, IE, FR, IT, LV, FI and UK.
Source: Eurostat (inn_cis5_gen)

Table 5.4: Share of innovative enterprises by size-class, EU-27 and selected countries — 2006

	Total	10 to 49 employees	50 to 249 employees	More than 250 employees
EU-27	38.9	34.4	52.3	70.1
BE	52.2	48.6	62.3	81.5
BG	20.2	17.0	26.4	52.7
CZ	35.0	28.9	48.6	70.4
DK	46.9	42.3	59.7	81.2
DE	62.6	57.3	71.9	87.4
EE	48.2	43.0	64.4	85.2
IE	47.2	42.7	62.5	74.9
EL	40.9	37.3	55.7	73.6
ES	33.6	30.0	48.6	72.0
FR	:	:	:	:
IT	34.6	31.3	54.2	69.2
CY	39.5	35.0	56.6	82.1
LV	16.2	13.1	23.7	48.4
LT	22.3	18.3	39.1	58.8
LU	48.5	43.6	56.1	83.3
HU	20.1	15.6	31.6	55.5
MT	28.0	22.3	45.7	77.8
NL	35.5	31.3	49.2	65.5
AT	50.6	44.0	71.1	82.8
PL	23.0	15.5	37.7	64.1
PT	41.3	37.3	56.7	78.5
RO	20.7	17.2	26.6	41.6
SI	35.1	27.7	51.3	76.9
SK	24.9	19.1	33.7	56.2
FI	51.4	46.9	61.2	83.0
SE	44.6	40.5	56.9	74.2
UK	38.1	36.0	45.0	52.3
HR	30.6	25.4	42.6	58.3
TR	31.4	29.7	37.2	43.6
NO	35.5	31.9	48.1	57.3

Note:
EU-27* excluding FR; statistics cover enterprises with 10 or more employees.
Source: Eurostat (inn_cis5_prod)

Figure 5.5: Number of innovative enterprises engaged in intramural and extramural R&D as a percentage of innovative enterprises by country — 2006



Note:
Data missing for DE, FR, IT, LV, FI and UK.
Source: Eurostat (inn_cis5_exp)

Table 5.6: Product oriented effects as a percentage of innovative enterprises by country — 2006

	Increased range of goods and services	Entered new markets or increased market share	Improved quality in goods or services
BE	:	:	:
BG	38.2	30.1	38.9
CZ	39.3	28.8	38.2
DK	18.6	15.8	16.6
DE	:	:	:
EE	29.8	25.7	27.2
IE	:	:	:
EL	9.1	11.6	5.8
ES	25.2	18.6	33.5
FR	:	:	:
IT	:	:	:
CY	45.4	38.0	57.5
LV	27.9	15.8	26.6
LT	32.4	28.0	34.4
LU	57.7	45.1	62.1
HU	32.4	26.2	37.2
MT	27.7	15.9	31.3
NL	44.8	38.8	44.0
AT	39.4	33.7	48.7
PL	36.1	26.9	38.1
PT	34.1	25.4	44.3
RO	37.0	29.4	41.7
SI	:	:	:
SK	38.1	23.1	41.6
FI	16.5	15.5	17.0
SE	33.0	24.3	34.2
UK	:	:	:
HR	39.1	32.8	52.3
TR	38.3	32.6	49.5
NO	:	:	:

Source: Eurostat (inn_cis5_eff)

Table 5.7: Process oriented effects as a percentage of innovative enterprises by country — 2006

	Improved flexibility of production or service provision	Increased capacity of production or service provision	Reduced labour costs per unit output	Reduced materials and energy per unit output
BE	:	:	:	:
BG	21.0	21.7	15.9	13.3
CZ	25.4	26.1	18.2	14.2
DK	15.3	18.8	11.5	7.3
DE	:	:	:	:
EE	20.0	20.5	14.3	7.8
IE	:	:	:	:
EL	8.3	9.2	26.2	20.8
ES	22.6	27.4	12.9	8.5
FR	:	:	:	:
IT	:	:	:	:
CY	69.8	62.4	29.2	19.9
LV	16.4	17.3	6.2	5.4
LT	25.0	30.5	10.7	8.5
LU	35.2	33.6	12.9	6.8
HU	21.9	22.3	6.2	7.2
MT	21.0	18.5	11.8	7.7
NL	31.8	31.6	16.6	10.5
AT	30.0	27.8	11.9	9.7
PL	20.8	25.7	13.8	11.6
PT	31.2	36.5	22.4	15.0
RO	28.2	34.1	18.3	14.8
SI	:	:	:	:
SK	28.5	27.2	8.0	10.8
FI	14.5	15.3	10.7	5.2
SE	18.4	23.1	17.0	:
UK	:	:	:	:
HR	34.5	32.2	19.9	15.1
TR	39.4	39.4	18.0	10.2
NO	:	:	:	:

Source: Eurostat (inn_cis5_eff)

Table 5.8: Cost and market hampering factors as a percentage of innovative enterprises by country — 2006

	Cost factors			Market factors	
	Lack of funds within your enterprise or enterprise group	Lack of finance from sources outside your enterprise	Innovation costs too high	Uncertain demand for innovative goods or services	Markets dominated by established enterprises
BE	:	:	:	:	:
BG	19.6	15.3	23.6	10.3	12.0
CZ	21.9	12.6	17.7	9.0	14.1
DK	:	:	:	:	:
DE	:	:	:	:	:
EE	21.6	16.3	16.5	4.9	10.2
IE	18.6	12.2	16.3	14.1	14.9
EL	18.5	16.2	9.5	23.2	24.2
ES	25.7	23.3	34.8	18.8	18.7
FR	:	:	:	:	:
IT	:	:	:	:	:
CY	18.9	19.1	28.5	14.2	7.8
LV	28.9	23.1	36.5	17.8	22.4
LT	25.1	19.8	29.5	7.2	17.8
LU	15.7	6.1	12.1	12.9	14.9
HU	28.8	19.9	27.3	14.0	15.4
MT	12.8	10.8	16.9	11.3	10.8
NL	8.5	4.7	7.6	4.0	4.8
AT	21.0	14.7	18.6	9.4	12.4
PL	28.8	25.0	29.7	14.6	16.0
PT	26.8	26.2	36.6	16.3	15.1
RO	30.6	31.0	28.6	13.3	18.9
SI	:	:	:	:	:
SK	20.2	14.5	22.2	8.2	12.6
FI	:	:	:	:	:
SE	15.5	:	11.5	:	14.4
UK	:	:	:	:	:
HR	35.9	27.2	35.8	8.2	17.9
TR	27.3	17.0	34.4	14.3	13.0
NO	14.0	9.0	15.7	6.9	6.6

Source: Eurostat (inn_cis5_ham)

Table 5.9: Knowledge hampering factors as a percentage of innovative enterprises by country — 2006

	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Difficulty in finding cooperation partners for innovation
BE	:	:	:	:
BG	10.7	5.3	6.1	9.5
CZ	15.4	2.1	2.7	3.0
DK	:	:	:	:
DE	:	:	:	:
EE	23.1	4.0	4.9	5.9
IE	10.1	3.4	6.1	6.2
EL	26.2	30.5	35.6	19.5
ES	16.6	11.1	8.5	11.9
FR	:	:	:	:
IT	:	:	:	:
CY	15.2	6.2	2.7	7.0
LV	20.8	11.9	1.3	14.8
LT	25.2	2.7	5.0	8.9
LU	20.4	3.4	3.4	8.5
HU	14.0	3.6	3.8	6.6
MT	7.2	2.1	5.6	6.2
NL	7.0	2.6	2.7	2.0
AT	16.7	3.4	4.1	6.7
PL	7.3	4.3	4.4	8.7
PT	13.3	5.5	6.9	12.6
RO	13.5	5.5	5.3	14.4
SI	:	:	:	:
SK	9.6	1.7	1.8	5.3
FI	:	:	:	:
SE	15.9	:	:	:
UK	:	:	:	:
HR	20.6	6.6	5.7	10.5
TR	17.6	9.2	6.1	10.7
NO	13.8	3.2	3.8	3.8

Source: Eurostat (inn_cis5_ham)

6

Patents

In 2005, Germany submitted the largest number of patent applications to the EPO (23 364), followed by France (8 191) and the United Kingdom (5 258). Germany was also in the lead in terms of patent applications per million inhabitants (283), followed by Sweden (258) and Finland (246). This number was even higher in Switzerland, with 414 patent applications to the EPO per million inhabitants.

At EU level, the number of patent applications to the EPO increased by an average of 1.4 % a year between 2000 and 2005. Over the same period, patenting activity rose in every EU Member State except the Netherlands, Finland and the United Kingdom.

In 2005, the majority of the EU-27 patent applications to the EPO were related to IPC section B 'performing operations; transporting'. Most countries were highly specialised, with 20 % or more of all their applications relating to just one section of the IPC. Denmark, Ireland, Greece, Spain and Slovenia specialised in patenting linked to 'human necessities' (IPC section A). 'Performing operations; transporting' (section B) was the most prominent section for patenting in Germany, Italy, Luxembourg and Austria, whereas 20 % or more of patent applications from Belgium, the Czech Republic, Hungary and India were on 'chemistry; metallurgy' (section C). By contrast, patenting was generally less frequent for 'textiles; paper' (section D) and 'fixed constructions' (section E). Almost a quarter of Dutch patent applications to the EPO concerned 'physics' (section G). More than 40 % of EPO applications from Finland related to 'electricity' (section H). The same section also accounted for similarly high shares in China and South Korea.

The majority of patent applications were submitted by the business enterprise sector, which accounted for half or even three quarters of all patent applications in many countries.

The share of high-tech patent applications varied significantly. Shares of over 40 % were posted by China (56.3 %), Finland (48.9 %), Canada (44.2 %) and South Korea (43.8 %).

Biotechnology is another fertile field in terms of patent applications. However, compared with all patent applications, it is one of the smaller fields. Denmark was in the lead on biotechnology patenting, as 15.3 % of all patent applications from this country were registered in this field. At EU level, only 4.4 % of all patent applications related to biotechnology inventions.

In 2009, Eurostat published a patent indicator on nanotechnology for the first time. This field of research is still in its infancy and is small in terms of patenting. Nevertheless, the EU-27 accounted for 30 % of all nanotechnology patent applications to the EPO, behind the United States (36 %), but ahead of Japan (19 %).

In the case of patents granted by the USPTO, the rankings between EU Member States were comparable to those for patent applications to the EPO. However, the USPTO granted four times as many patents to US inventors as to EU-27 inventors.

The three IPC sections in which most patents were granted by the USPTO were 'physics' (section G), 'electricity' (section H) and 'performing operations; transporting' (section B).

Eurostat also added new datasets on international and European co-patenting and on patent citations.

The vast majority of all EU patent applications to the EPO were made by single applicants. Moreover, co-patenting involved several applicants from the same country more frequently than from different countries.

Citations in EU patents refer to EU patent publications more often than to non-EU patent publications.

Looking at triadic patent families, in 2002 the United States accounted for 36 % of all triadic patents, followed by Japan with 31 % and the European Union with 25 %.

In 2005, the top thirty regions in terms of patent applications per million inhabitants consisted of 18 in Germany, four in Sweden, two each in Finland, Belgium and France, one in the Netherlands and one in Austria.

The share of high-tech patent applications varied considerably between the leading regions. In the Finnish regions of Etelä-Suomi and Länsi-Suomi, more than 45 % of all patent applications were in high-tech sectors, whereas in the Vorarlberg region in Austria only 1.5 % were classified as high technology.

Table 6.1: Patent applications to the EPO, total number, per million inhabitants and AAGR, EU-27 and selected countries — 2000-2005

	Total		Per million inhabitants		AAGR 2000-2005
	2000	2005	2000	2005	
EU-27	51 415	55 079	107	112	1.4
BE	1 298	1 408	127	135	1.6
BG	7	24	1	3	26.2
CZ	67	105	6	10	9.6
DK	936	1 078	176	199	2.9
DE	22 097	23 364	269	283	1.1
EE	6	6	4	5	2.7
IE	204	262	54	64	5.1
EL	55	110	5	10	14.9
ES	797	1 331	20	31	10.8
FR	7 283	8 191	120	131	2.4
IT	3 997	4 797	70	82	3.7
CY	6	16	9	21	20.9
LV	7	18	3	8	20.3
LT	5	9	1	3	13.7
LU	82	97	188	210	3.4
HU	121	134	12	13	2.1
MT	5	11	12	28	20.1
NL	3 434	3 379	216	207	-0.3
AT	1 178	1 468	147	179	4.5
PL	43	118	1	3	22.5
PT	42	114	4	11	22.2
RO	6	29	0	1	36.2
SI	51	106	25	53	15.8
SK	11	31	2	6	22.3
FI	1 415	1 288	274	246	-1.9
SE	2 281	2 328	257	258	0.4
UK	5 983	5 258	102	88	-2.5
HR	16	33	3	7	16.2
TR	44	163	1	2	30.0
IS	36	30	130	102	-3.8
LI	24	25	:	:	0.9
NO	398	481	89	104	3.9
CH	2 708	3 068	378	414	2.5
AU	990	1 067	51	52	1.5
CA	1 631	2 262	53	70	6.8
CN	318	1 609	0	1	38.3
IL	1 004	1 334	160	193	5.9
IN	178	572	:	:	26.2
JP	21 630	20 913	171	164	-0.7
KR	1 260	4 963	27	103	31.5
RU	227	299	2	2	5.7
TW	250	735	11	32	24.1
US	30 949	34 022	110	115	1.9

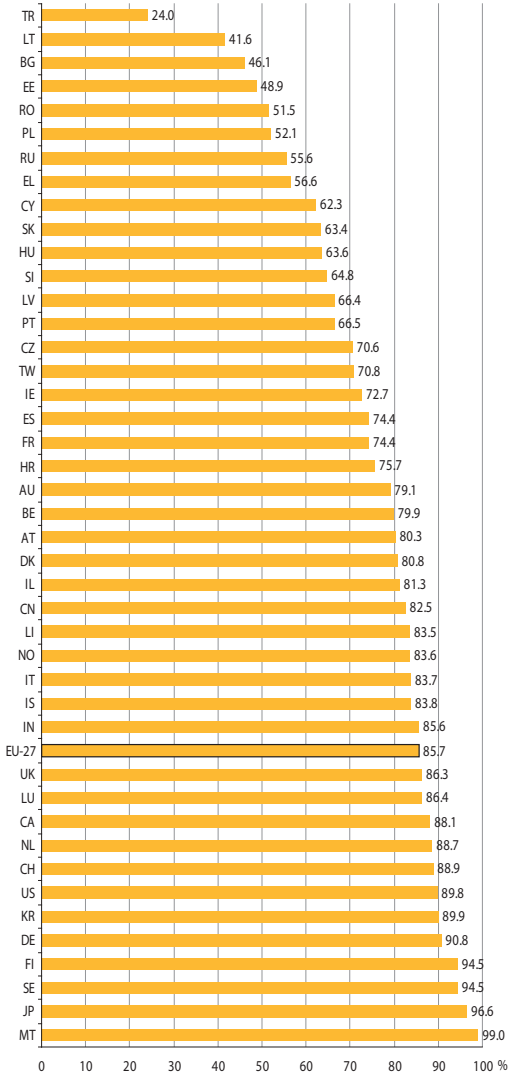
Source: Eurostat (pat_ep_ntot)

Table 6.2: Breakdown of patent applications to the EPO by IPC section as a percentage of total, EU-27 and selected countries — 2005

	IPC section							
	Human necessities	Performing operations; transporting	Chemistry; metallurgy	Textiles; paper	Fixed constructions	Mechanical engineering; lighting; heating; weapons; blasting	Physics	Electricity
EU-27	16.8	21.0	12.4	2.0	4.6	11.6	15.2	16.5
BE	17.9	20.0	23.1	2.4	3.2	4.8	13.4	15.1
BG	15.9	9.1	30.6	:	2.1	11.5	13.0	17.8
CZ	19.3	19.5	20.2	6.5	3.3	6.2	13.4	11.6
DK	31.1	12.2	18.0	0.6	6.0	9.4	9.9	12.8
DE	14.1	23.7	12.2	2.1	4.4	14.3	14.2	14.9
EE	10.0	:	19.3	:	:	:	31.4	39.2
IE	30.5	13.8	7.5	0.1	5.5	7.6	19.0	15.7
EL	22.5	22.2	12.7	1.7	5.7	9.9	13.8	11.5
ES	25.1	22.0	14.9	2.3	8.2	9.4	8.7	9.4
FR	16.4	21.0	10.5	0.9	4.3	10.9	16.5	19.6
IT	20.5	26.0	9.6	3.5	6.4	12.8	10.0	11.1
CY	22.1	8.5	3.7	10.0	35.8	11.3	6.5	2.1
LV	30.5	12.6	26.5	:	:	:	20.9	9.5
LT	21.5	16.8	19.0	:	:	11.2	26.9	4.5
LU	6.6	36.4	13.8	:	4.5	18.8	11.2	8.6
HU	24.6	16.5	26.1	:	3.6	4.3	8.9	16.1
MT	62.2	4.4	10.4	:	6.7	:	2.2	14.0
NL	17.9	14.5	13.2	1.4	3.7	5.2	24.9	19.3
AT	13.6	21.2	11.1	3.6	9.4	13.2	12.8	15.0
PL	15.7	13.2	19.0	1.0	5.5	15.5	12.0	18.2
PT	11.7	12.7	12.7	2.6	8.2	15.9	10.5	24.8
RO	20.2	22.4	1.7	:	12.8	19.2	14.4	9.3
SI	39.7	11.3	20.5	2.4	6.5	7.2	6.8	5.6
SK	4.1	9.8	22.7	2.9	3.3	21.2	3.6	32.5
FI	7.5	12.3	8.3	4.5	2.8	5.5	18.0	41.2
SE	17.8	19.8	9.1	1.9	4.0	10.0	14.2	23.2
UK	21.2	13.7	15.5	0.9	3.6	8.2	20.3	16.6
HR	48.5	0.5	33.0	:	0.0	4.0	3.6	10.3
TR	16.4	12.0	7.9	9.7	6.3	30.8	7.3	9.6
IS	58.9	13.4	10.0	:	:	3.4	13.2	1.1
LI	22.5	28.5	13.6	2.0	3.3	10.4	6.8	13.0
NO	17.0	18.9	13.4	0.6	12.7	10.5	16.2	10.7
CH	22.4	19.6	13.0	2.8	4.4	6.3	20.3	11.2
AU	28.7	15.8	13.9	0.7	5.9	6.4	18.0	10.6
CA	17.3	9.2	11.6	0.5	2.2	5.9	23.5	29.9
CN	14.1	7.8	8.2	0.7	1.1	3.7	12.9	51.4
IL	34.2	7.2	11.9	0.4	1.5	3.7	25.7	15.4
IN	25.7	5.6	41.0	1.3	0.4	3.1	12.4	10.6
JP	10.0	18.2	14.2	1.1	0.6	8.9	22.2	25.0
KR	7.2	5.6	8.0	2.3	0.9	6.2	23.2	46.7
RU	23.1	9.6	19.5	0.9	1.0	10.9	18.8	16.3
TW	14.0	16.2	3.7	2.3	1.6	6.4	23.4	32.4
US	24.4	11.5	15.5	0.9	1.4	5.6	21.4	19.4

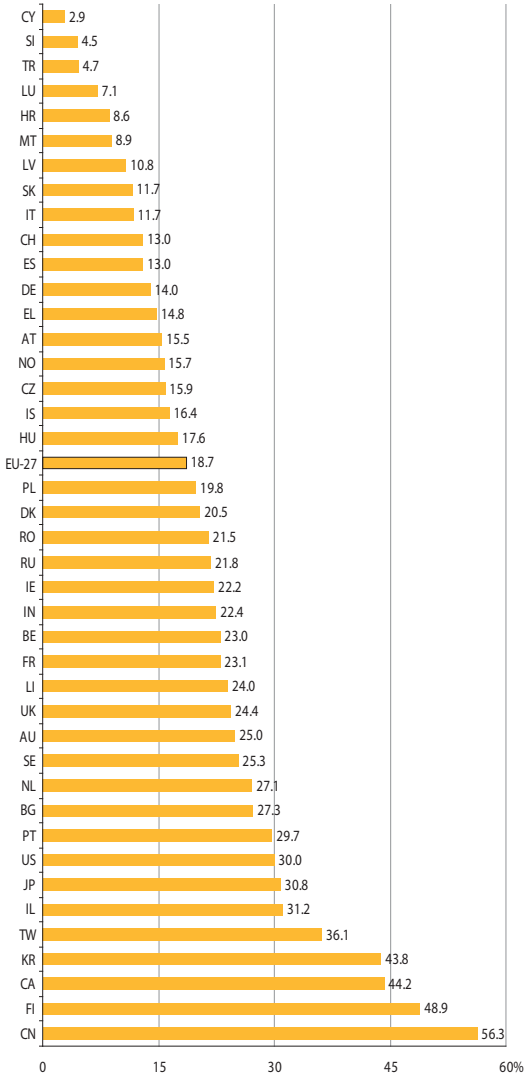
Source: Eurostat (pat_ep_nipc)

Figure 6.3: Percentage of patent applications by the business enterprise sector, EU-27 and selected countries — 2005



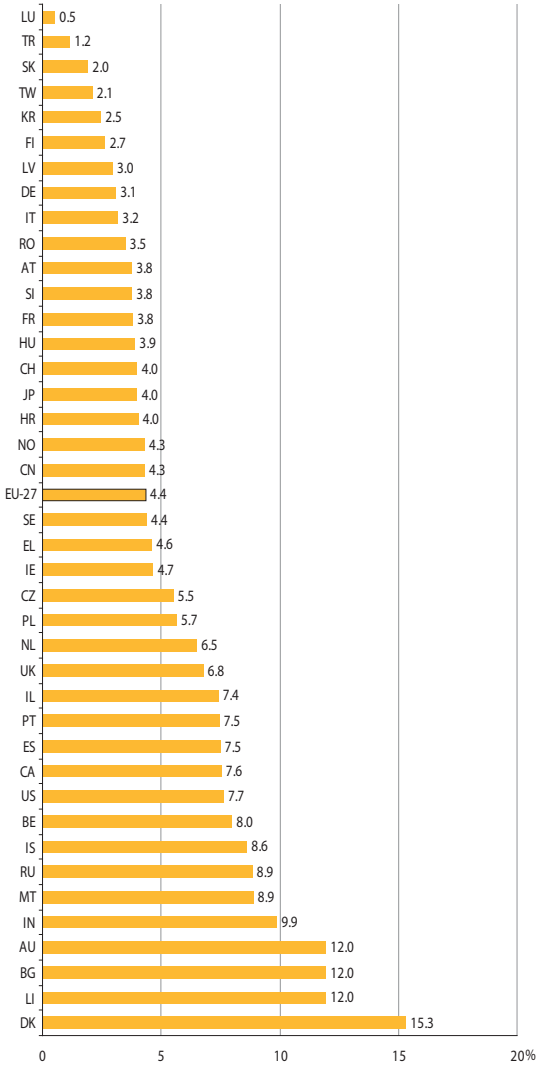
Source: Eurostat (pat_ep_nic)

Figure 6.4: High-tech patent applications to the EPO as a percentage of total, EU-27 and selected countries — 2005



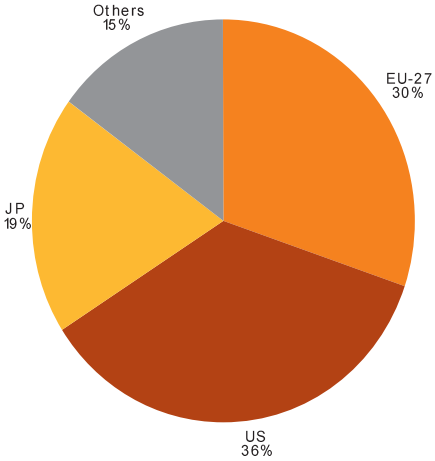
Note:
Cut-off: at least 10 patent applications.
Source: Eurostat (pat_ep_ntec)

Figure 6.5: Biotechnology patent applications to the EPO as a percentage of total, EU-27 and selected countries — 2005



Note:
Cut-off: at least 10 patent applications.
Source: Eurostat (pat_ep_nbio)

Figure 6.6: Distribution of nanotechnology patent application to the EPO, EU-27, Japan and United States and others — 2005



Source: Eurostat (pat_ep_nnano)

Table 6.7: Patents granted by the USPTO, total number, per million inhabitants and AAGR, EU-27 and selected countries — 1997-2002

	Total		Per million inhabitants		AAGR 1997-2002
	1997	2002	1997	2002	
EU-27	28 898	21 432	60	44	-5.8
BE	859	547	85	53	-8.6
BG	6	5	1	1	-2.8
CZ	38	44	4	4	3.0
DK	494	339	94	63	-7.2
DE	11 783	9 280	144	113	-4.7
EE	4	1	3	0	-34.0
IE	138	151	38	39	1.8
EL	27	25	3	2	-1.9
ES	312	298	8	7	-1.0
FR	4 431	2 977	74	48	-7.6
IT	1 802	1 508	32	26	-3.5
CY	1	3	1	4	37.8
LV	2	3	1	1	15.2
LT	3	8	1	2	26.4
LU	35	32	83	71	-1.8
HU	70	54	7	5	-5.1
MT	1	2	3	5	14.9
NL	1 475	1 193	95	74	-4.2
AT	584	491	73	61	-3.4
PL	30	33	1	1	2.1
PT	15	15	1	1	0.1
RO	6	8	0	0	5.8
SI	11	20	6	10	11.3
SK	6	6	1	1	-1.3
FI	912	660	178	127	-6.3
SE	1 898	948	215	106	-13.0
UK	3 956	2 784	68	47	-6.8
HR	11	23	2	5	16.8
TR	9	20	0	0	17.5
IS	14	22	50	77	10.4
LI	17	14	556	428	-3.7
NO	301	192	68	43	-8.5
CH	1 565	1 053	221	145	-7.6
AU	1 316	698	71	35	-11.9
CA	4 017	3 749	133	120	-1.4
CN	161	771	0	1	36.7
IL	1 068	1 076	183	164	0.1
IN	173	633	:	:	29.6
JP	35 611	33 748	286	265	-1.1
KR	4 004	6 137	87	129	8.9
RU	251	166	2	1	-7.9
TW	3 767	7 209	173	320	13.9
US	100 224	93 147	376	323	-1.5

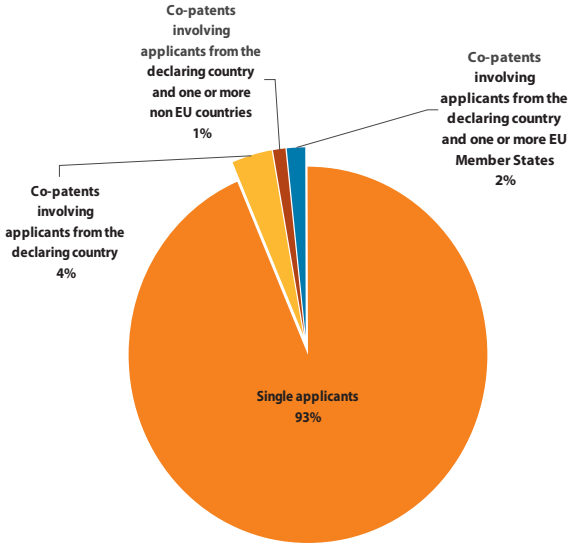
Source: Eurostat (pat_us_ntot)

Table 6.8: Breakdown of patents granted by the USPTO by IPC section as a percentage of total, EU-27 and selected countries — 2002

	IPC section							
	Human necessities	Performing operations; transporting	Chemistry; metallurgy	Textiles; paper	Fixed constructions	Mechanical engineering; lighting; heating; weapons; blasting	Physics	Electricity
EU-27	10.2	20.3	11.4	1.5	2.4	11.7	22.0	20.5
BE	12.4	17.1	24.6	3.3	2.1	5.0	17.8	17.6
BG	20.3	7.1	29.9	:	:	20.3	10.2	12.2
CZ	10.9	14.6	12.0	2.3	:	12.4	34.0	13.8
DK	21.4	15.3	12.5	0.6	1.4	10.3	20.3	18.3
DE	7.4	22.4	11.4	1.5	1.6	15.3	21.8	18.5
EE	:	:	:	:	:	:	100.0	:
IE	13.7	6.7	4.0	0.2	:	1.0	32.5	41.9
EL	26.5	17.5	9.1	:	12.0	:	17.3	17.5
ES	14.7	29.0	15.7	0.8	4.5	9.9	10.5	14.9
FR	12.0	20.4	11.9	1.0	1.9	9.7	21.7	21.4
IT	14.7	25.7	9.9	2.0	2.6	11.8	18.1	15.1
CY	11.7	35.3	:	:	:	23.7	17.7	11.7
LV	16.1	:	51.6	:	:	:	:	32.3
LT	13.9	:	19.0	:	:	12.4	52.6	2.1
LU	4.4	49.7	24.6	:	:	8.8	5.5	7.0
HU	11.5	7.5	32.1	:	0.9	0.8	17.9	29.2
MT	:	11.0	:	:	:	:	:	89.0
NL	11.2	13.6	13.3	0.7	2.9	4.4	30.2	23.7
AT	12.6	22.1	7.2	2.7	6.5	15.4	13.5	20.1
PL	9.8	12.7	33.6	1.0	:	3.6	22.5	16.7
PT	19.7	12.7	16.8	:	15.9	9.7	13.7	11.4
RO	:	19.2	1.8	:	12.1	18.2	41.5	7.3
SI	19.1	26.8	6.8	::	:	8.5	28.7	10.2
SK	2.9	51.1	6.3	:	:	17.0	22.7	:
FI	6.3	12.3	4.1	4.0	1.2	3.6	20.9	47.7
SE	15.2	24.7	7.3	2.0	2.8	10.6	16.4	21.0
UK	10.7	14.2	10.9	0.9	4.9	9.3	27.0	22.1
HR	50.5	:	32.8	:	8.5	1.1	4.3	2.9
TR	17.5	25.9	6.9	11.5	5.1	10.8	5.5	16.9
IS	38.0	2.3	20.2	:	4.5	:	26.9	8.1
LI	21.6	27.8	9.6	:	2.3	10.7	15.1	12.8
NO	11.6	17.8	7.1	0.9	14.2	6.3	28.8	13.4
CH	15.0	22.7	11.5	2.5	1.5	7.7	23.7	15.4
AU	13.8	23.3	6.7	0.3	6.6	8.4	25.8	15.1
CA	14.0	18.8	8.2	0.5	6.3	9.0	22.3	21.0
CN	12.7	12.2	8.8	1.4	2.0	5.9	23.1	33.9
IL	18.2	7.2	6.5	0.2	1.0	4.2	35.5	27.0
IN	17.8	4.0	34.2	0.0	0.1	1.7	28.5	13.7
JP	3.9	15.5	6.7	0.5	0.5	7.9	34.5	30.5
KR	4.6	7.9	5.1	1.5	0.8	6.7	33.3	40.1
RU	10.9	8.3	20.1	0.7	3.0	5.6	31.6	19.8
TW	11.3	13.8	2.9	0.4	2.6	6.6	23.2	39.3
US	16.0	15.1	8.4	0.7	3.3	7.1	27.1	22.2

Source: Eurostat (pat_us_nipc)

Figure 6.9: EU co-patenting at the EPO according to applicants' country of residence — 2005 (as a percentage)



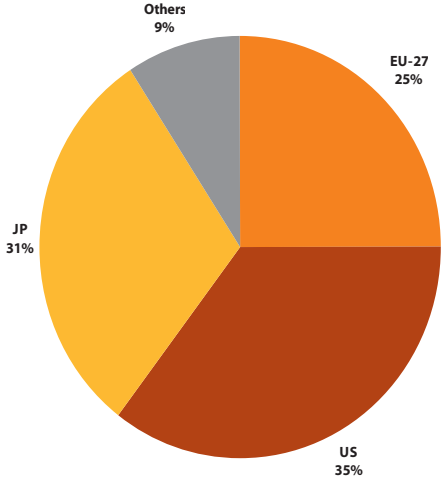
Source: Eurostat (pat_ep_cpa)

Table 6.10: EU patent citations referring to non-EU and EU patent publications, 1990-2005 (EPO) according to inventors' country of residence

	Number of citations in EU patents referring to non-EU patent publications	Number of citations in EU patents referring to EU patent publications
1990	6 320	8 288
1991	5 654	7 688
1992	4 973	6 862
1993	4 486	6 454
1994	4 277	6 093
1995	4 099	5 650
1996	4 241	5 957
1997	4 056	5 967
1998	3 841	5 925
1999	3 717	5 743
2000	3 188	4 882
2001	2 416	4 326
2002	1 915	3 539
2003	1 423	2 959
2004	862	2 200
2005	338	1 096

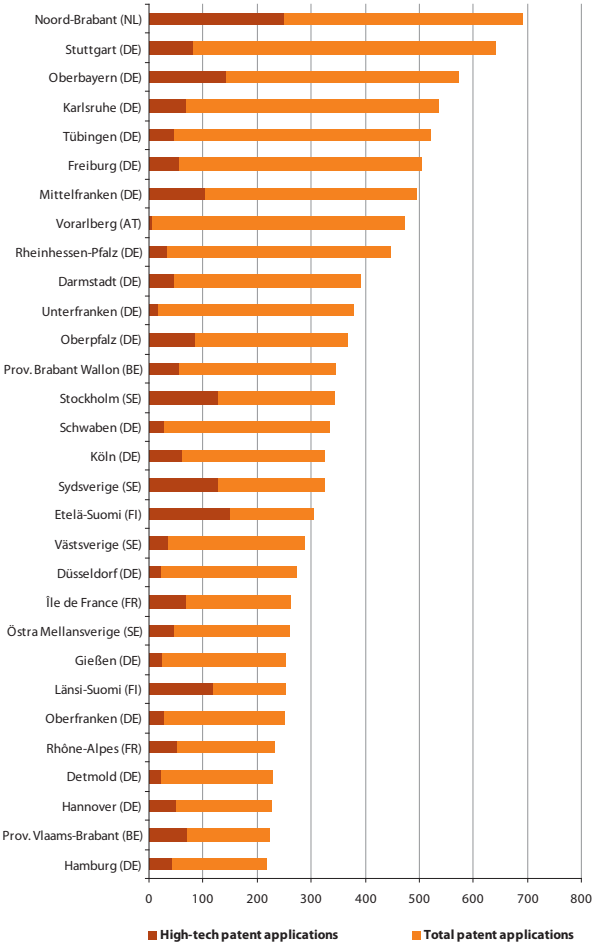
Source: Eurostat (pat_ep_cti)

Figure 6.11: Distribution of triadic patent families, EU-27, Japan and United States and others — 2002



Source: Eurostat (pat_td_ntot)

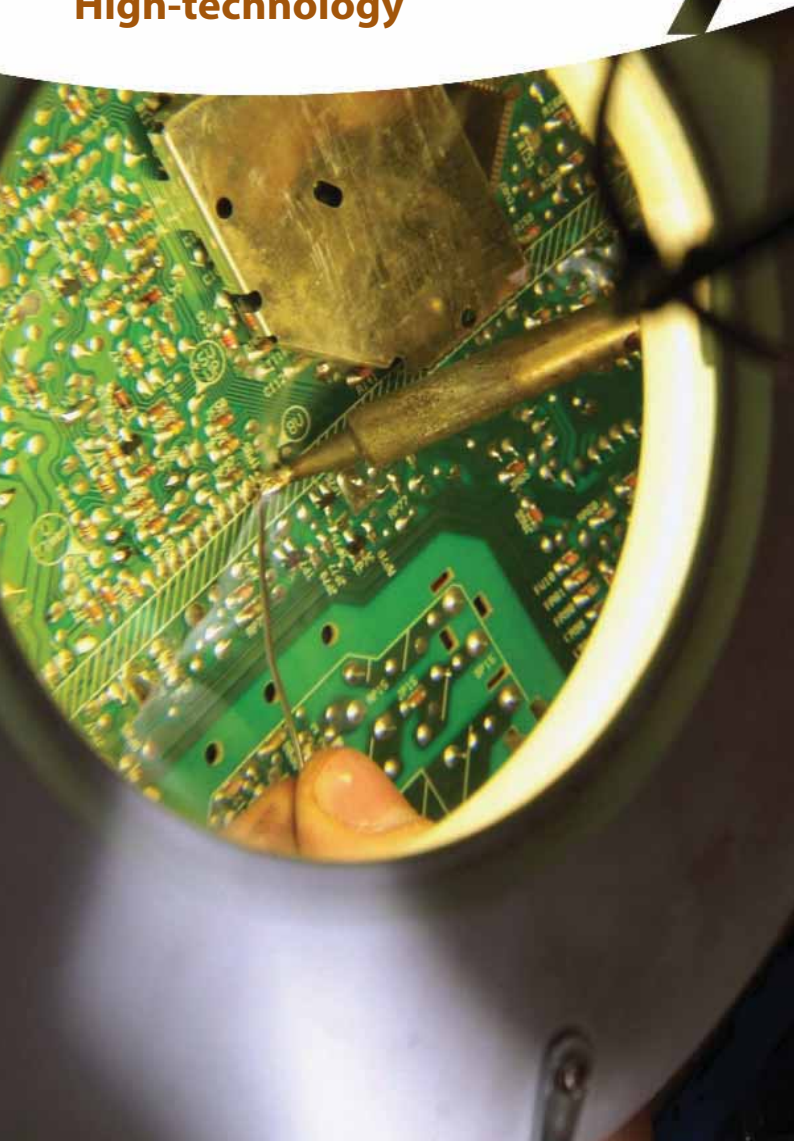
Figure 6.12: Top 30 regions in terms of total patent applications to the EPO and share of high-tech patent applications, per million inhabitants — 2005



Source: Eurostat (pat_td_rtot and pat_td_rtec)

7

High-technology



In 2008, venture capital investment (VCI) at an early stage in the EU 15 totalled almost EUR 2.5 billion (0.02 % of GDP). This was far below the EUR 36.2 billion (0.31 % of GDP) invested in buyouts and the EUR 12.5 billion (0.11 % of GDP) for VCI at the expansion and replacement stage. At country level, early-stage VCI was highest in Sweden (0.05 % of GDP), while VCI at the expansion and replacement stage (0.30 %) and the buyout stage (0.90 %) was highest in the United Kingdom.

In 2006, Italy had the largest number of high-tech manufacturing enterprises (31 055) in the EU. However, in terms of turnover, production value and value added in high-tech manufacturing, Germany ranked first, followed by France.

The United Kingdom had the largest number of enterprises (122 658) in the high-tech KIS sector. It also ranked first in terms of turnover, production value, value added and gross investment in tangible goods in the high-tech KIS sector.

In 2006, the average employee in high-tech sectors was better paid than the average employee in all sectors. In most countries large disparities persist between men and women. The highest paid employees in the high-tech sectors were found in Luxembourg, Norway, Denmark and the United Kingdom.

In 2007, China led the world market in high-tech exports, with a share of 22.7 %, followed by the EU-27 (19.3 %) and the United States (17.3 %). The EU-27 and the United States were the leaders in terms of high-tech imports, with 22.7 % and 20.1 % of the world market respectively.

Within the EU-27, Germany was the leading exporter of high-tech products, with 9.54 % of the world market, followed by the Netherlands (5.60 %) and France (4.78 %).

High-tech products made up 16.0 % of total EU-27 exports. 'Electronics and telecommunication' accounted for the largest share of these.

In 2008, 7.3 million people were employed in the high-tech KIS sector in the EU-27, compared with fewer than 2.4 million in high-tech manufacturing. Employment in high-tech KIS and in high-tech manufacturing increased between 2003 and 2008 at average annual rates of 2.8 % and 0.4 % respectively. Women employees were under-represented in both high-tech KIS (32.6 %) and high-tech manufacturing (35.3 %).

At EU level, professionals accounted for 25.9 % of employment in the high-tech sectors and technicians and associate professionals for 22.8 %

At regional level, in 2008 capital regions and the surrounding areas often ranked high in terms of employment in high-tech sectors. However, the only region with a share above 10 % was Berkshire, Buckinghamshire and Oxfordshire (UK).

Table 7.1: Venture capital investment (VCI) by stage of development in million Euro and as a percentage of GDP, EU-15 and selected countries — 2008

	VCI at early stage		VCI at expansion and replacement stage		Buyouts	
	Amount invested in EUR million	% of GDP	Amount invested in EUR million	% of GDP	Amount invested in EUR million	% of GDP
EU-15	2 493.9 i	0.02 i	12 508.7 i	0.11 i	36 161.9 i	0.31 i
BE	99.5	0.03	258.4	0.08	309.7	0.09
CZ	0.0	0.00	20.7	0.01	27.5	0.02
DK	86.1	0.04	119.3	0.05	276.3	0.12
DE	464.9	0.02	1 240.4	0.05	5 376.5	0.22
IE	27.8	0.02	26.4	0.01	25.6	0.01
EL	0.0	0.00	27.3	0.01	316.7	0.13
ES	98.9	0.01	1 027.6	0.09	715.9	0.07
FR	447.6	0.02	1 980.4	0.10	6 344.3	0.33
IT	13.9	0.00	706.4	0.05	2 351.0	0.15
HU	2.0	0.00	31.9	0.03	0.0	0.00
NL	228.0	0.04	499.9	0.08	1 059.7	0.18
AT	11.5	0.00	64.2	0.02	155.7	0.06
PL	19.2	0.01	212.0	0.06	488.0	0.14
PT	56.7	0.03	57.0	0.03	282.0	0.17
RO	2.5	0.00	46.5	0.03	51.1	0.04
SK	:	:	:	:	:	:
FI	61.6	0.03	159.5	0.09	258.5	0.14
SE	165.2	0.05	825.8	0.25	2 413.0	0.74
UK	732.3	0.04	5 516.2	0.30	16 276.9	0.90
NO	120.9	0.04	270.3	0.09	364.4	0.12
CH	190.8	0.06	459.4	0.14	656.7	0.19
US	4 665.9	0.05	14 526.1	0.15	:	:

Source: Eurostat (htec_vci_earl, htec_vci_exre, htec_vci_buyout)

Table 7.2: VCI in terms of number of investments and number of compgnies at early stage, expansion and replacement stage and buyout stage, EU-15 and selected countries — 2008

	VCI at early stage		VCI at expansion and replacement stage		Buyouts	
	Number of investments	Number of companies	Number of investments	Number of companies	Number of investments	Number of companies
EU-15	3 506 i	2 369 i	3 802 i	2 535 i	1 442 i	1 020 i
BE	123	97	98	84	32	28
CZ	0	0	8	6	2	2
DK	96	74	65	44	20	20
DE	949	646	847	683	187	144
IE	115	91	41	35	4	4
EL	0	0	3	3	5	5
ES	158	151	160	122	24	20
FR	583	272	895	503	477	281
IT	14	10	71	58	106	75
HU	4	4	10	10	0	0
NL	131	117	153	106	71	67
AT	44	42	28	27	24	21
PL	31	23	29	28	21	17
PT	159	102	17	17	25	22
RO	5	5	16	12	7	6
SK	:	:	:	:	:	:
FI	264	173	91	69	64	51
SE	314	222	262	161	50	42
UK	556	372	1 071	623	353	240
NO	144	114	72	57	15	14
CH	107	92	79	64	52	50
US	1 488	:	2 396	:	:	:

Source: Eurostat (htec_vci_earl, htec_vci_exre, htec_vci_buyout)

Table 7.3: Economic statistics on high-technology manufacturing sector, EU-27 — 2006

	High-tech manufacturing				
	Number of enterprises	Turnover in EUR million	Production value in EUR million	Value added in EUR million	Gross investment in tangible goods in EUR million
BE	1 917	16 699	18 376	7 411	781
BG	1 208	587	557	190	: c
CZ	9 364	11 380	10 939	1 841	: c
DK	1 106	10 809	10 998	4 529	555
DE	20 060	172 003	150 331	55 337	6 467
EE	256	: c	: c	: c	: c
IE	273	37 927	36 980	10 066	1 283
EL	: c	: c	: c	: c	: c
ES	8 233	28 349	25 810	7 498	1 077
FR	15 982	127 432	114 303	37 035	3 930
IT	31 055	67 376	63 917	20 133	2 675
CY	88	163	158	55	6
LV	272	: c	: c	: c	: c
LT	430	433	414	106	23
LU	68	: c	: c	: c	: c
HU	5 732	18 996	17 394	3 214	549
MT	:	:	:	:	:
NL	3 135	: c	: c	: c	: c
AT	1 983	11 881	10 925	4 986	471
PL	13 811	10 287	9 416	2 805	600
PT	1 666	: c	: c	: c	: c
RO	2 028	1 963	1 811	499	346
SI	909	2 305	1 998	938	: c
SK	: c	: c	: c	: c	: c
FI	1 275	40 254	22 468	7 298	447
SE	3 697	28 064	29 303	11 735	650
UK	11 163	87 350	82 764	35 685	3 011
NO	812	5 088	5 084	1 993	231

Source: Eurostat (htec_eco_sbs)

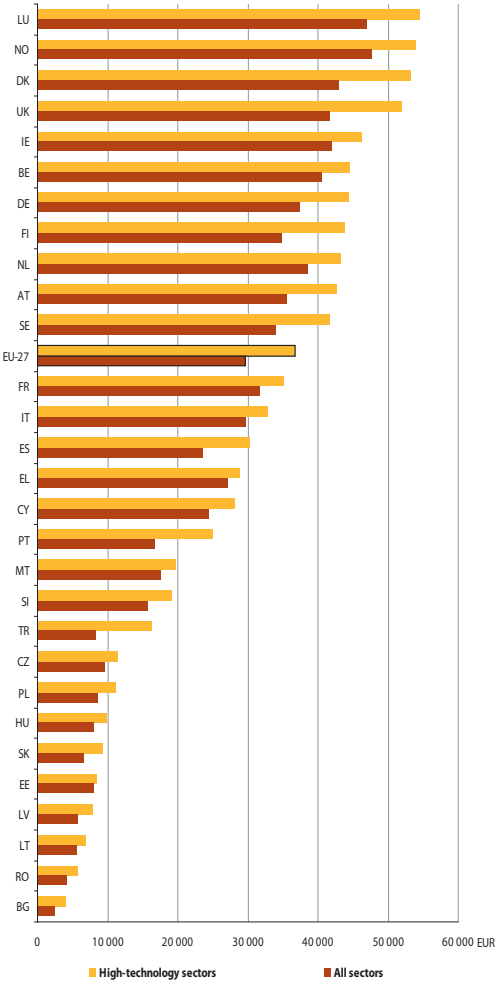
Table 7.4: Economic statistics on high-technology knowledge intensive services, EU-27 — 2006

	High-tech knowledge intensive services (KIS)				
	Number of enterprises	Turnover in EUR million	Production value in EUR million	Value added in EUR million	Gross investment in tangible goods in EUR million
BE	16 828	29 466	29 058	12 990	1 709
BG	4 243	2 253	2 125	1 078	379
CZ	23 886	10 002	9 234	4 793	723
DK	9 684	18 463	17 027	8 598	942
DE	65 713	164 568	142 663	85 427	9 794
EE	1 350	939	893	416	99
IE	6 166	24 713	13 795	6 378	1 648
EL	9 518	11 444	9 645	5 044	1 009
ES	39 933	64 565	51 217	30 894	4 516
FR	66 866	133 241	129 567	65 634	7 175
IT	107 484	106 308	101 605	49 469	6 567
CY	318	628	621	473	137
LV	1 756	1 155	1 070	569	154
LT	1 987	1 277	1 147	529	124
LU	1 200	: c	: c	: c	: c
HU	28 630	9 209	5 927	3 420	699
MT	684	314	312	230	67
NL	27 430	45 352	44 116	21 570	2 642
AT	14 475	16 544	12 014	7 743	1 153
PL	34 907	17 427	15 516	8 609	1 776
PT	15 485	11 455	10 826	4 851	1 113
RO	15 884	6 563	5 801	3 093	2 337
SI	3 913	2 496	2 162	1 093	260
SK	1 904	2 960	2 659	1 456	380
FI	6 118	13 840	13 408	5 905	622
SE	36 081	: c	: c	: c	: c
UK	122 658	214 226	201 866	107 820	17 326
NO	11 467	16 958	16 478	7 987	957

Note:
Exceptions to the reference year: 2005: CY High-tech KIS;
2002: MT High-tech KIS.

Source: Eurostat (htec_eco_sbs)

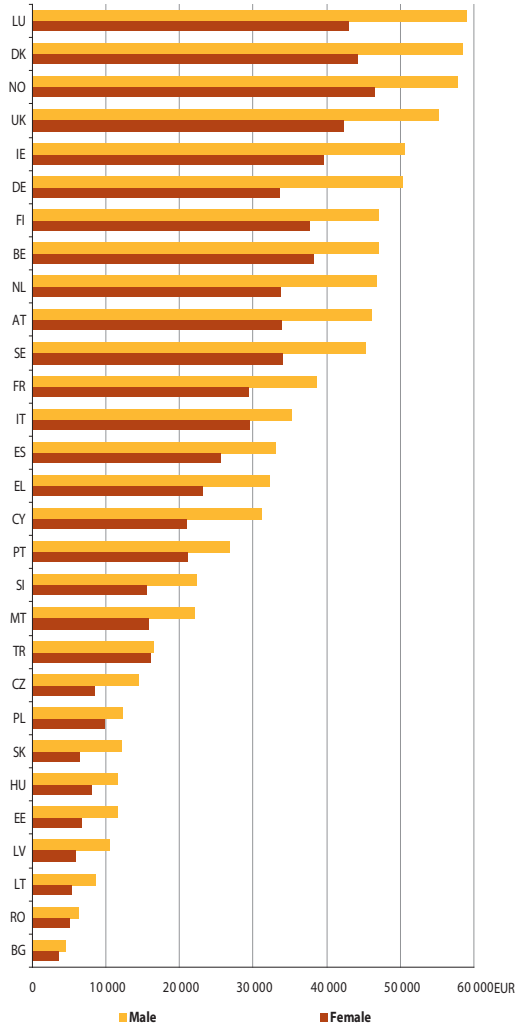
Figure 7.5: Mean annual earnings in high-technology sectors compared to earnings in all sectors, EU-27 and selected countries — 2006 (EUR)



Note:
"All sectors" includes all NACE Sections C to O except L.
"High-technology sectors" includes both high-technology manufacturing and high-technology knowledge intensive services sectors.
The high-technology EU-27 aggregates in this publication have been estimated.
Data cover enterprises of more than 10 employees.

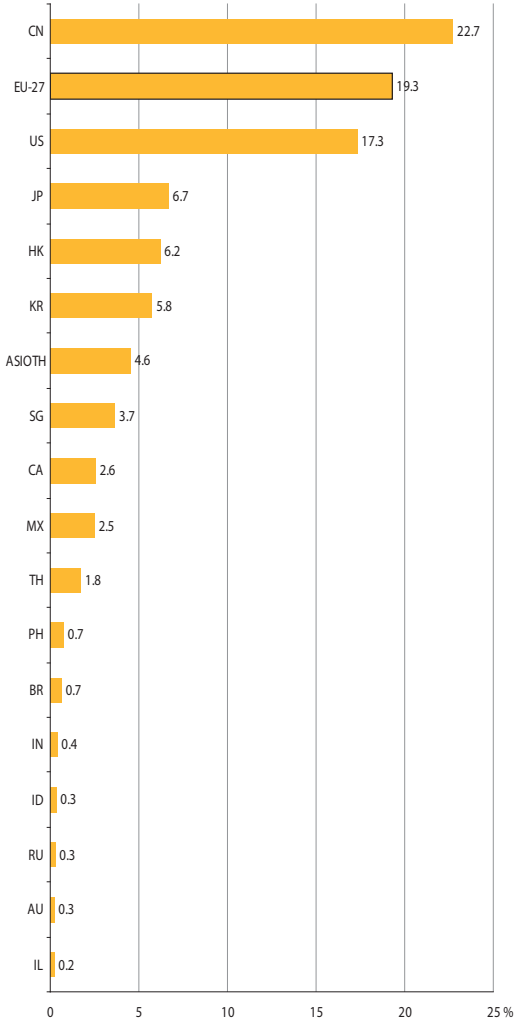
Source: Eurostat (htec_earn_sex06 and earn_ses06_27)

Figure 7.6: Mean annual earnings in high-technology sectors by gender, EU-27 and selected countries — 2006 (EUR)



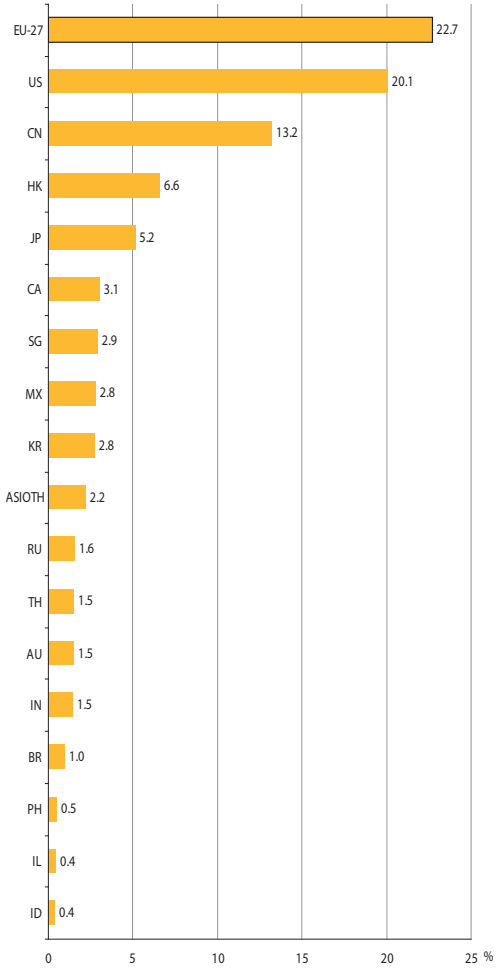
Source: Eurostat (htec_earn_sex06)

Figure 7.7: World market share of high-technology exports, EU-27 and leading high-tech trading countries — 2007



Note:
EU-27 excluding intra-EU trade.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_weu)

Figure 7.8: World market share of high-technology imports, EU-27 and leading high-tech trading countries — 2007



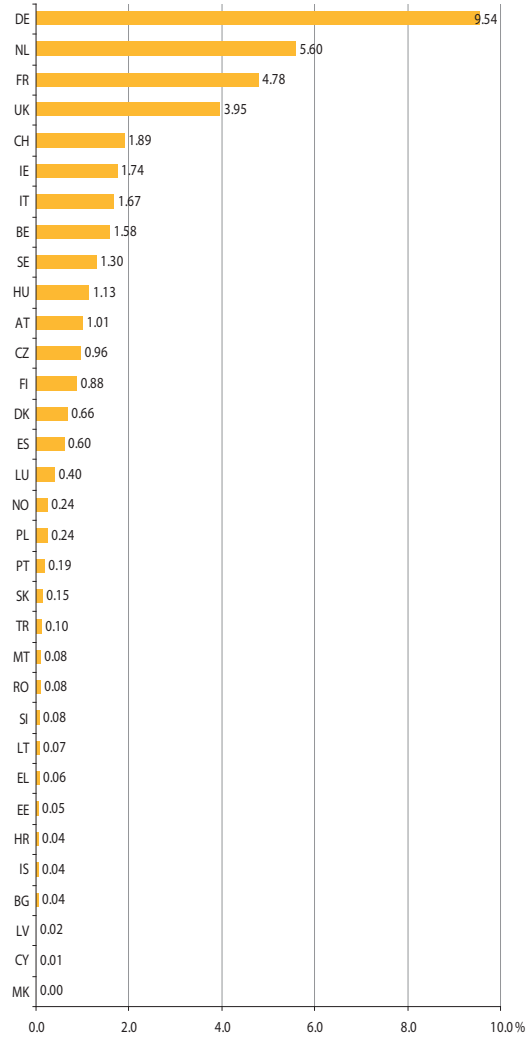
Note:
EU-27 excluding intra-EU trade.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_weu)

Table 7.9: High-technology trade in EUR million, as a percentage of total, EU-27 and selected countries — 2007

	Import		Balance	Export	
	EUR million	as a % of total imports	EUR million	EUR million	as a % of total exports
EU-27	231 894 i	16.2 i	-33 796 i	198 098 i	16.0 i
BE	21 669	7.2	-906	20 762	6.6
BG	1 446	6.6	-974	472	3.5
CZ	13 348	15.5	-720	12 628	14.1
DK	8 252	11.5	443	8 695	11.6
DE	108 277	14.1	16 933	125 210	13.0
EE	929	8.1	-302	628	7.8
IE	15 363	25.1	7 457	22 820	25.7
EL	4 558	8.2	-3 743	815	4.7
ES	26 820	9.4	-18 988	7 832	4.2
FR	54 443	12.0	8 250	62 693	15.6
IT	32 412	8.7	-10 521	21 890	6.0
CY	448	7.1	-299	149	14.6
LV	791	7.1	-511	280	4.6
LT	1 201	6.7	-283	918	7.3
LU	5 531	27.5	-232	5 300	32.4
HU	13 283	19.0	1 584	14 867	21.4
MT	935	26.9	139	1 074	47.8
NL	66 431	18.5	7 023	73 455	18.3
AT	12 832	10.8	434	13 267	11.1
PL	11 234	9.3	-8 125	3 108	3.0
PT	5 856	10.3	-3 404	2 452	6.5
RO	4 332	8.4	-3 297	1 035	3.5
SI	1 628	7.1	-613	1 015	4.6
SK	4 545	10.3	-2 642	1 903	4.5
FI	8 968	15.0	2 540	11 508	17.5
SE	14 911	13.4	2 148	17 059	13.8
UK	65 102	14.3	-13 284	51 818	16.2
HR	1 548	8.3	-963	585	6.6
MK	232	6.1	-215	17	0.7
TR	10 647	8.6	-9 291	1 356	1.7
IS	627	12.8	-61	565	16.2
NO	5 798	9.9	-2 621	3 177	3.2
CH	17 091	14.5	7 772	24 863	19.8
ASIOTH	22 456	14.0	24 385	46 841	26.0
AU	15 737	13.9	-13 115	2 622	2.6
BR	10 416	11.8	-3 647	6 769	5.8
CA	31 266	11.3	-5 006	26 260	8.6
CN	135 007	19.4	98 514	233 521	26.3
HK	67 599	25.0	-3 748	63 851	25.0
ID	4 448	8.2	-870	3 578	4.3
IL	4 491	10.9	-2 208	2 283	5.8
IN	15 070	9.4	-10 819	4 252	4.0
JP	52 610	11.6	16 261	68 871	13.2
KR	28 193	10.8	31 107	59 300	21.9
MX	28 445	13.8	-3 032	25 413	12.8
PH	5 459	12.9	2 016	7 475	20.3
RU	16 194	11.1	-13 159	3 035	1.2
SG	29 594	15.4	8 185	37 778	17.3
TH	15 791	15.1	2 341	18 132	16.2
US	204 577	13.9	-26 728	177 848	21.0

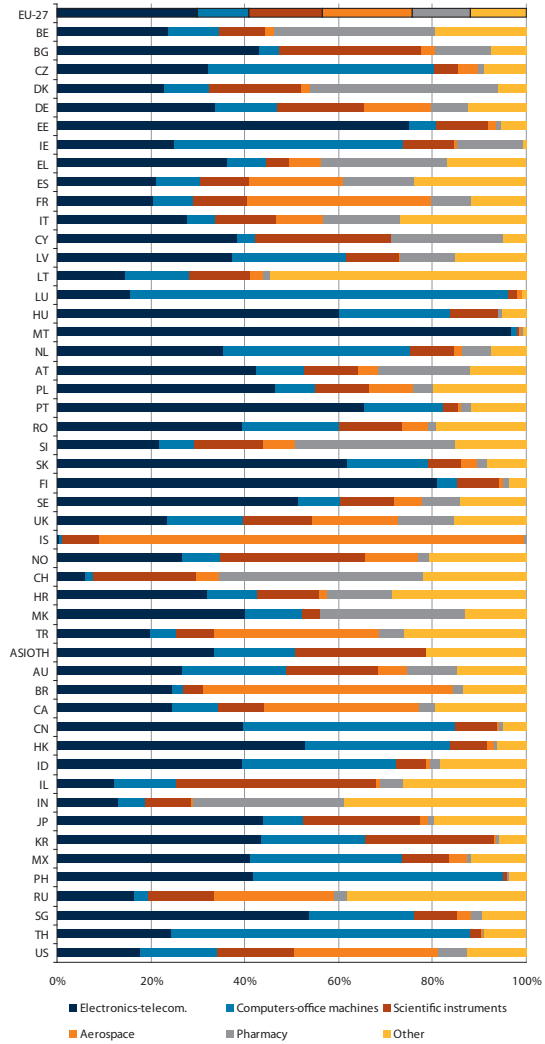
Note:
(i) EU-27 does not include intra-EU trade and therefore does not correspond to the sum of Member States.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_tot)

Figure 7.10: World market share for high-technology exports, EU-27 Member States and selected countries — 2007



Source: Eurostat (htec_trd_wms)

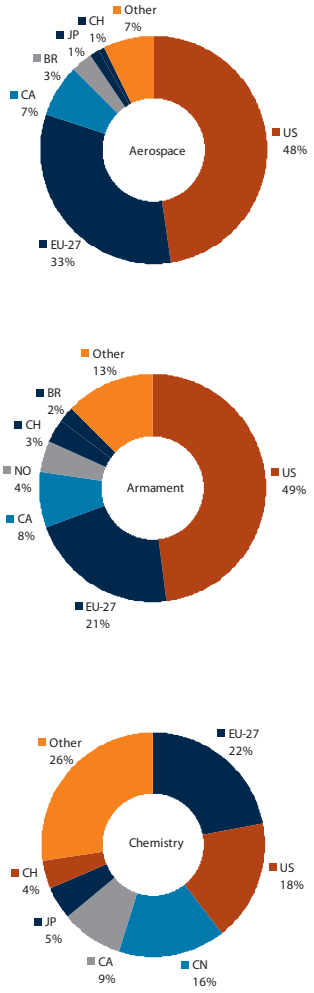
Figure 7.11: High-tech exports by high-technology group of products, EU-27 and selected countries — 2006



Note:
EU-27 does not include intra-EU trade and therefore does not correspond to the sum of Member States.
"Other" includes "Electrical machinery", "Chemistry", "Non-electrical machinery" and "Armament".
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.

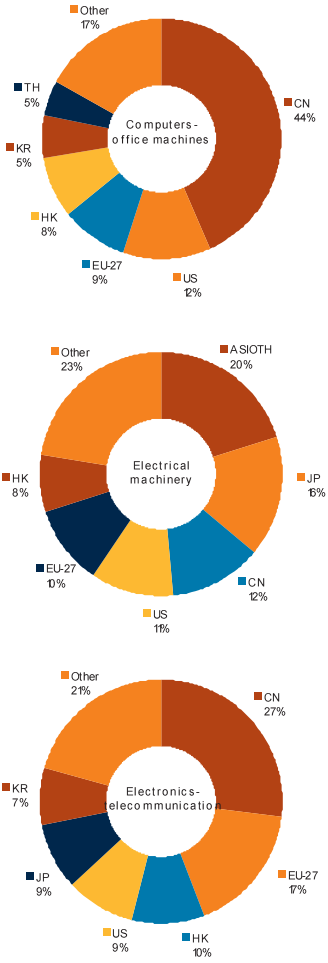
Source: Eurostat (htec_trd_group)

Figure 7.12: World shares (export) of "Aerospace", "Armament" and "Chemistry", EU-27 and main exporters — 2007



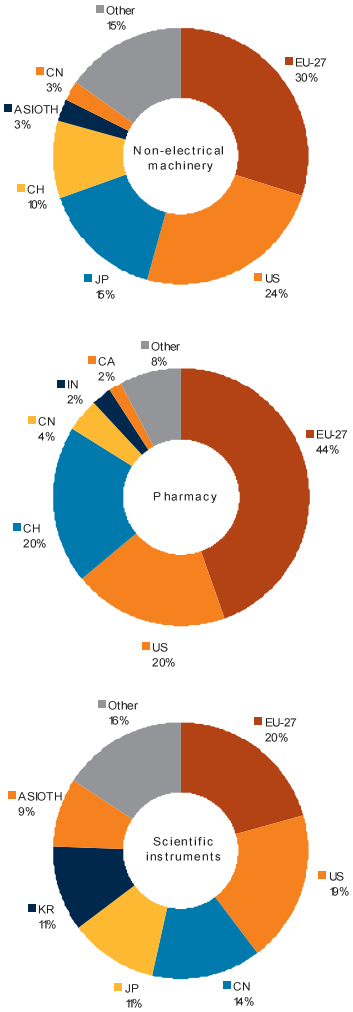
Note:
EU-27 excluding intra-EU trade.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_weu)

Figure 7.13: World shares (export) of "Computers-office machines", "Electrical machinery" and "Electronics-telecommunication", EU-27 and main exporters — 2007



Note:
EU-27 excluding intra-EU trade.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_weu)

Figure 7.14: World shares (export) of "Non-electrical machinery", "Pharmacy" and "Scientific instruments", EU-27 and main exporters — 2007



Note:
EU-27 excluding intra-EU trade.
CN excluding HK.
ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.
Source: Eurostat (htec_trd_weu)

Table 7.15: Statistics on employment in high-technology manufacturing sector, EU-27 and selected countries — 2008

	Total in 1000's	% of total employment	% of women	AAGR 2003-2008
EU-27	2 358 s	1.1 s	35.3 s	0.4 s
BE	33	0.8	33.4	2.1
BG	18	0.6	53.6 u	6.7
CZ	88	1.8	46.5	9.0
DK	25	0.9	36.6	-0.9
DE	696	1.8	33.3	0.4
EE	9 u	1.3 u	:	1.1
IE	53	2.5	40.3	0.5
EL	9	0.2	27.3 u	-5.3
ES	93	0.5	30.2	1.3
FR	282	1.1	33.4	-1.5
IT	289	1.2	30.3	3.0
CY	1 u	0.1 u	:	:
LV	: u	: u	: u	:
LT	7 u	0.5 u	: u	-9.9
LU	1 u	0.3 u	: u	-5.2
HU	96	2.5	48.2	-0.5
MT	4	2.7	41.5 u	4.6
NL	60	0.7	31.4	-3.8
AT	45	1.1	34.3	-6.7
PL	103	0.7	49.4	14.3
PT	19	0.4	50.1	4.9
RO	45	0.5	40.3	1.1
SI	12	1.2	42.0	9.3
SK	42	1.7	52.8	10.5
FI	49	1.9	33.8	2.9
SE	39	0.9	34.5	-4.6
UK	240	0.8	29.8	-7.2
HR	8 u	0.5 u	50.0 u	3.8
MK	0.5	0.1	32.8	-58.2
TR	59	0.3	24.3	3.9
IS	: u	: u	: u	:
NO	17	0.7	39.7	6.6
CH	98	2.3	37.1	4.0

Note:
Exceptions to the reference year: 2007: BG, LT, PL, SI, SE and MK;
2006: CY.
Exceptions to the reference period: 2002-2007: BG, LT, SI, SE and MK;
2004-2007: PL;
2006-2007: MK.

Source: Eurostat (hetc_emp_nat)

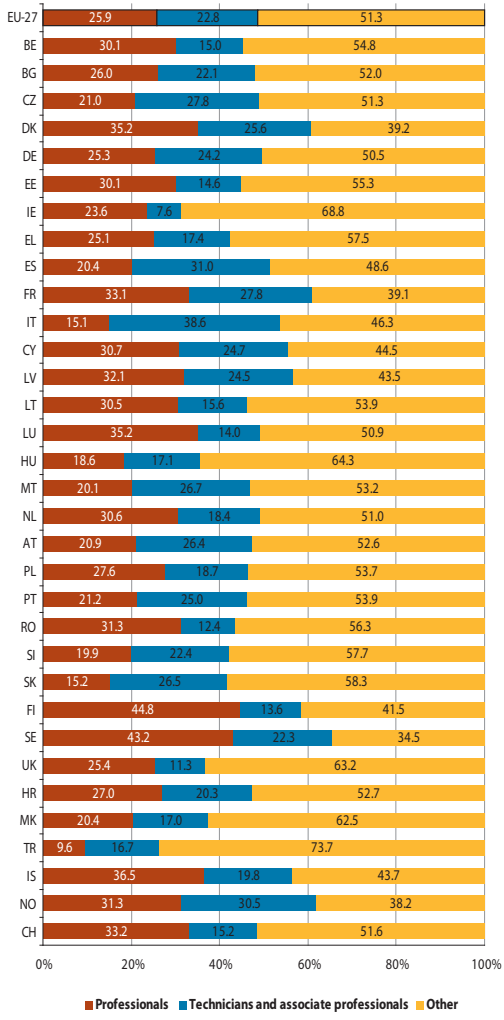
Table 7.16: Statistics on employment in knowledge-intensive services sector, EU-27 and selected countries — 2008

	Total in 1000's	% of total employment	% of women	AAGR 2003-2008
EU-27	7 314 s	3.3 s	32.6 s	2.8 s
BE	167	3.8	27.2	0.2
BG	82	2.5	45.3	1.6
CZ	153	3.1	41.9	0.5
DK	123	4.3	31.1	0.2
DE	1 303	3.4	31.1	1.8
EE	17	2.6	54.4 u	4.6
IE	80	3.8	29.9	2.8
EL	83	1.8	33.9	2.1
ES	561	2.8	31.1	6.9
FR	966	3.7	37.5	-0.7
IT	741	3.2	34.1	2.8
CY	8	2.2	31.3	5.3
LV	29	2.6	48.2	4.7
LT	35	2.3	50.4 u	7.6
LU	7	3.4	25.2	5.0
HU	127	3.3	40.8	0.6
MT	6	3.8	: u	6.6
NL	366	4.3	26.6	3.0
AT	119	2.9	27.8	-0.7
PL	390	2.6	36.2	10.2
PT	93	1.8	34.3	4.6
RO	162	1.7	43.3	3.6
SI	27	2.8	27.9	3.4
SK	67	2.8	47.5	4.1
FI	123	4.9	38.3	1.8
SE	230	5.1	31.0	2.2
UK	1 248	4.3	25.9	0.5
HR	41	2.5	36.6 u	4.4
MK	9	1.6	39.6	15.9
TR	183	0.9	20.8	4.5
IS	7	3.8	36.1	-0.7
NO	94	3.7	31.0	1.5
CH	163	3.9	31.0	-0.7

Note:
Exceptions to the reference year: 2007: BG, PL, SI, SE and MK.
Exceptions to the reference period: 2003-2007: BG, SI and SE;
2004-2007: PL;
2006-2007: MK ;
2006-2008:TR.

Source: Eurostat (hetc_emp_nat)

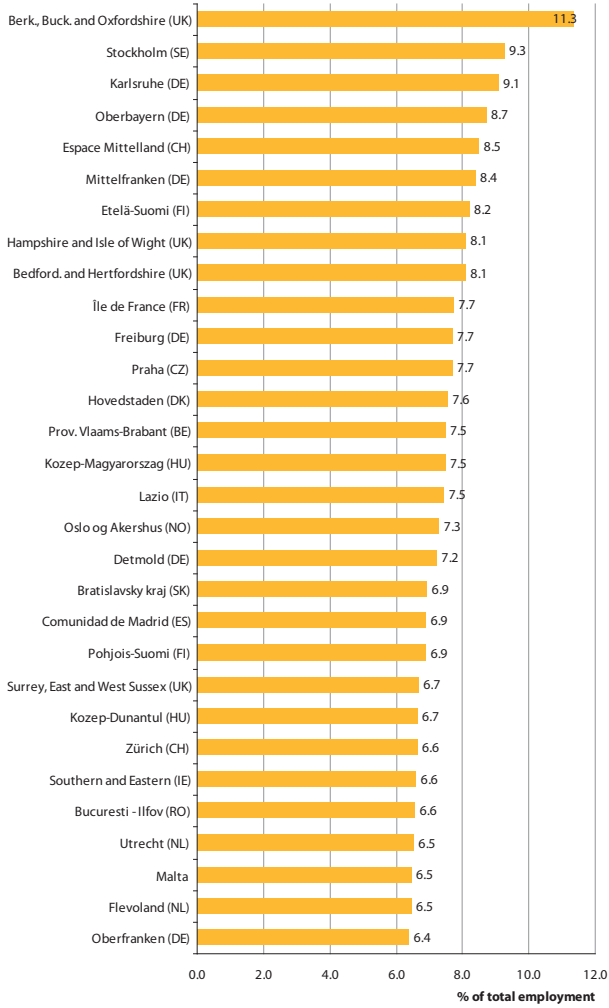
Figure 7.17: Employment in high-technology sector by type of occupation, EU-27 and selected countries — 2008



Note:
Exceptions to the reference year: 2007: BG, PL, SI, SE and MK.
EU-27: Eurostat estimation.
Unreliable data: EE, LT, MT and HR.

Source: Eurostat (hetc_emp_nisco)

Figure 7.18: Employment in high-technology sectors as a percentage of total employment, top 30 European regions — 2008



Note:
Exception to the reference year: 2007: Regions from SE.
Source: Eurostat (htec_emp_reg)

Methodological Notes

GBAORD

1. Concepts and definitions

Government budget appropriations or outlays on R&D (GBAORD) are all funds allocated to R&D in central government or federal budgets and therefore mean budget provisions, not actual expenditure. Provincial or state governments should be included where their contribution is significant. Unless otherwise stated, the data include both current and capital expenditure and cover not only government-financed R&D performed in government establishments, but also government-financed R&D in the business enterprise, private non-profit and higher education sectors as well as abroad (*Frascati Manual*, § 496). Data on actual R&D expenditure are not available in their final form until some time after the end of the budget year concerned and may well differ from the original budget provisions. Further methodological information can be found in the *Frascati Manual* (OECD, 2002).

GBAORD data are assembled by national authorities from data on public budgets. These measure government support for R&D activities or, in other words, how much priority governments give to public funding of R&D.

Eurostat collects aggregated data which are checked, processed and compared with data from other sources such as the OECD. Then, all the necessary aggregates are calculated (or estimated).

2. Sources

The basic data are forwarded to Eurostat by the national administrations of Member States and other countries. Data for South Korea, Japan and the United States are taken from the OECD's main science and technology indicators (MSTI).

3. Data compilation

Up until 2003, data on GBAORD were collected under a gentlemen's agreement. From the reference year 2004 on, data collection has been based on Commission Regulation No 753/2004 on statistics on science and technology (OJ L 118, 23.4.2004, p. 23).

4. Breakdown by socio-economic objectives

Government appropriations or outlays on R&D are broken down by socio-economic objectives on the basis of the NABS (*Nomenclature for the analysis and comparison of scientific programmes and budgets*).

NABS 2007

The latest version of the nomenclature (NABS 2007) has been applicable since reference year 2007. Before that, its earlier version (NABS 1992) was used.

Not all countries collect the data directly on the basis of the NABS. Some follow other compatible classifications (OECD, Nordforsk), which are then converted to the NABS classification (see Table 8.2 of the *Frascati Manual*).

5. Exceptions

No GBAORD data exist for Bulgaria and Luxembourg before 2000. The EU aggregates before that year therefore exclude these two countries.

No GBAORD data exist for Cyprus and Malta before 2004. The EU aggregates before that year therefore exclude these two countries.

No GBAORD data exist for Hungary before 2005. The EU aggregates before that year therefore exclude Hungary.

6. Time series

The analysis in this Pocketbook covers the period 2004 to 2008.

R&D expenditure and personnel

1. Concepts and definitions

The basic concepts, guidelines for collecting data and the classifications used in compiling statistics on research and experimental development are set out in the *Frascati Manual* (OECD, 2002). Specific details on R&D expenditure and personnel are given in Chapters 6 and 5 respectively. Regional data are collected in line with the standards defined by the *Regional Manual* (Eurostat, 1996).

Research and experimental development (R&D) activities comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and use of this stock of knowledge to devise new applications. There are two basic statistical variables in this domain, namely R&D expenditure and personnel.

R&D expenditure

Intramural expenditure is all expenditure on R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds (*Frascati Manual*, § 358).

R&D intensity

R&D intensity is R&D expenditure expressed as a percentage of GDP.

To calculate R&D intensity at national level (EEA countries), GDP from national accounts are used as reference data. At regional level, GDP data are taken from the regional accounts. Both data series are extracted from Eurostat's reference database.

Purchasing power standard (PPS)

The purchasing power standard, abbreviated as PPS, is an artificial currency unit. PPS is the technical term chosen by Eurostat for the common currency in which national accounts aggregates are expressed when they are adjusted for price level differences using purchasing power parities (PPPs). PPPs can therefore be interpreted as the exchange rate of the PPS against the euro.

One PPS can buy the same amount of goods and services in every country, whereas, due to different price levels in individual countries, different numbers of national currency units are needed to buy the same goods and services.

An economic aggregate of a given country, expressed in national currency, should be divided by the relevant purchasing power parity (PPP) in order to obtain an internationally comparable figure expressed in PPS. The PPP are scaled so that the sum of the gross domestic product (GDP) for all EU Member States is the same in both euro and PPS.

Purchasing power standard at constant year 2000 prices (PPS_KP00)

The purchasing power standard at constant year 2000 prices, abbreviated as PPS_KP00, is based on the GDP price deflator with base year 2000 and the PPPs for the year 2000. The reason for calculating this measure is to produce figures that are adjusted for price differences between countries and over time. Readers should, however, be aware that this unit is based on the relation of price levels for a set base year. Therefore the price adjustment for the different countries becomes less accurate the further away from the base year the comparison is made. For a price-adjusted comparison between countries for any given year, the simple PPS is a more accurate measure.

R&D personnel

Data on R&D personnel measure the resources going directly to R&D activities. The total R&D personnel is defined as:

'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 indirect services, such as canteen and security staff, should be excluded' (*Frascati Manual*, § 294-296).

Full-time equivalent (FTE)

A full-time equivalent corresponds to one year's work by one person. Consequently, someone who normally spends 40 % of his or her time on R&D and the rest on other activities (e.g. teaching, university administration or counselling) should be counted as only 0.4 FTE.

Personnel in head count (HC)

Head count corresponds to the number of individuals employed mainly or partly on R&D. For comparison between different regions and periods, this indicator is often used in conjunction with employment or population variables.

2. Institutional classification

R&D expenditure and 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);
- The government sector (GOV);
- The higher education sector (HES);
- The private non-profit sector (PNP).

3. Sources

The basic data are forwarded to Eurostat by the national administrations of Member States and other countries. Data for South Korea, China, Japan and the United States are taken from the OECD's main science and technology indicators (MSTI).

4. Data compilation

Up until 2003, data on R&D were collected under a gentlemen's agreement. From the reference year 2003 on, data collection has been based on Commission Regulation No 753/2004 on statistics on science and technology (OJ L 118, 23.4.2004, p. 23).

5. Geographical coverage

These data are available for the EU-27 Member States, Croatia, Turkey, Iceland, Norway, Switzerland, China, South Korea, Russia, Japan and the United States at national level and for European countries at regional level (NUTS level 2).

6. Aggregates

For both R&D expenditure and personnel, EU totals are calculated as the sum of the national data by sector. If data are missing, estimates are made for the country in question, reference period, institutional sector or relevant R&D variable, as appropriate. This method is not applied identically for the calculation of R&D personnel in head count (HC). The estimates for R&D personnel in full-time equivalents (FTE) serve as a basis for the HC calculation. An FTE/HC ratio based on available FTE and HC personnel data at national level is estimated for the EU aggregates, by institutional sector and by year. This ratio is then applied to the FTE data to calculate the EU totals in HC. EU aggregates are estimated values.

7. Time series

Data are presented for the period 2002-2007. However, data series in Eurostat's reference database are available from 1981 onwards, although availability differs, depending on the variables and institutional sectors. Not all years are complete. Therefore the figures for the latest year available for each country are analysed.

Additional information on the method used can be found in Eurostat's reference database.

Human resources in science and technology

1. Concepts and definitions

Statistics on human resources in science and technology (HRST) can improve understanding of both the demand for and supply of highly qualified personnel. The data presented in this Pocketbook focus on two main aspects: stocks and flows. The former show the needs and the current situation of the highly skilled labour force and the latter to what degree this demand is likely to be met in the future.

Human resources in science and technology are defined by the OECD *Canberra Manual* as persons who:

- have successfully completed education at the third level in an S&T field of study (ISCED '97 version, levels 5a, 5b or 6);

OR

- are not formally qualified as described above but are employed in an S&T occupation where the above-mentioned qualifications are normally required (ISCO '88, COM codes 2 or 3).

The above-mentioned educational or occupational requirements are measured by internationally harmonised standards, namely:

- the International Standard Classification of Education (ISCED), giving the level of formal education achievement;
- the International Standard Classification of Occupation (ISCO), defining the type of occupation.

Note that 'science' in its broad sense means knowledge and that this is the meaning used in the Canberra Manual. This means that 'S&T fields of study' includes all such fields of study. According to the OECD Canberra Manual, the seven broad S&T fields of study are: natural sciences, engineering and technology, medical sciences, agricultural sciences, social sciences, humanities and other fields (*Canberra Manual*, § 71).

For further information, see Eurostat's reference database (http://epp.eurostat.ec.europa.eu) under 'Science and technology/ Human Resources in Science & Technology'.

Stocks and inflows provide information on the number of HRST at a particular point in time. Stock data relate not only to the employment status but also to the occupational and educational profiles of individuals in the year in question.

HRST stock data and the indicators derived from them are extracted and built up from data from the EU labour force survey (EU LFS). The EU LFS is based on a sample of the population. All results comply with Eurostat guidelines on sample-size limitations and are therefore not published if the degree of sampling error is likely to be high or are flagged as unreliable if the degree of reliability is too low.

Note that the population surveyed excludes anyone under the age of 15 or over the age of 74, partly because no-one under 15 will fulfil either of the requirements for being classified as HRST and partly for data quality reasons.

HRST — Human resources in science and technology

- persons who have successfully completed education at the third level (ISCED '97 version, levels 5a, 5b or 6); or
- are not formally qualified as described above but are employed in an S&T occupation where the above-mentioned qualifications are normally required (ISCO '88, COM codes 2 or 3).

HRSTO — Human resources in science and technology — occupation

- persons employed in an S&T occupation (ISCO '88, COM codes 2 or 3).

HRSTE — Human resources in science and technology — education

- persons who have successfully completed education at the third level (ISCED '97 version, levels 5a, 5b or 6).

HRSTC — Human resources in science and technology — core

- persons who have successfully completed education at the third level (ISCED '97 version, levels 5a, 5b or 6); and
- are employed in an S&T occupation (ISCO '88, COM codes 2 or 3).

SE — Scientists and engineers

- persons employed in 'physical, mathematical and engineering' occupations or in 'life science and health occupations' (ISCO '88, COM codes 21 and 22).

HRSTU — Human resources in science and technology — unemployed

- persons who have successfully completed education at the third level (ISCED '97 version, levels 5a, 5b or 6) but are unemployed.

NHRSTU — Unemployed non-HRST

- persons who have no education at the third level and are unemployed.

HRST inflows are the number of people who fulfil none of the conditions for inclusion in HRST at the beginning of a period but gain at least one of them during the period. The number of graduates from a country's higher education system is the main inflow into the national stock of HRST.

HRST education inflow data are extracted from the Eurostat education database, building on data from the Unesco/OECD/Eurostat questionnaire on education, which is based on the ISCED classification. Note that European education systems differ and that there might be some duplication of degrees for some countries.

This Pocketbook includes the following totals and sub-totals (ISCED 1997 version):

Total: Sum of all fields of study.

Science and engineering (S&E):

Science covers the following fields of education: life sciences, physical sciences, mathematics and statistics and computing (codes 42, 44, 46 and 48).

Engineering groups together the following fields of education: engineering and engineering trades, manufacturing and processing, architecture and building (codes 52, 54 and 58).

2. Time series

Data are available in many countries from 1994 onwards, but there are differences between them and some years are missing. Note that the availability of data in this domain of NewCronos also depends on their reliability. The guidelines on the sample size reliability of the data established by the EU LFS are applied to the HRST database. Therefore, breakdowns for which quality levels are considered insufficient are flagged as either not available or unreliable.

3. Sources

For further information, see Eurostat's SDDS metadata (http://epp.eurostat.ec.europa.eu) under 'Science and technology/ Human Resources in Science & Technology'.

Innovation

1. Concepts and definitions

1.1 Community innovation survey

At European level, the **Community innovation survey (CIS)** data are the main source of information for studying innovation drivers and company behaviour in relation to innovation.

The **Community innovation survey (CIS)** is a survey of innovation activity in enterprises covering EU Member States, candidate countries, Iceland and Norway.

The data are collected on a two-yearly basis (from 2004 onwards). The latest survey (CIS 2006) was carried out in 27 Member States, candidate countries and Norway in 2007, based on the reference year 2006. This was not a full data collection because some of the variables were voluntary under Commission Regulation No 1450/2004. The next full survey will be CIS 2008.

In order to ensure comparability across countries, Eurostat, in close cooperation with the EU Member States, used the same standard core questionnaires for CIS 2006 as for the earlier CIS 4, accompanied by a set of definitions and methodological recommendations.

CIS 2006 is based on the *Oslo Manual* (2nd edition, 1997), which gives methodological guidelines and defines the concept of innovation, and on Commission Regulation No 1450/2004.

1.2 *Oslo Manual* 1997

Innovation: means a new or significantly improved product (goods or services) introduced to the market or a new or significantly improved process introduced within an enterprise. Innovations are based on the results of new technological developments, new combinations of existing technology or other knowledge acquired by the enterprise.

Enterprises engaged in innovation activity (propensity to innovate) means enterprises that introduce new or significantly improved products (goods or services) to the market or enterprises that implement new or significantly improved processes. Innovations are based on the results of new technological developments, new combinations of existing technology or other knowledge acquired by the enterprise. The term covers all types of innovator, i.e. product innovators, process innovators and enterprises with only ongoing and/or abandoned innovation activities.

Product innovation means introduction to the market of new goods or services or of goods or services with significantly improved capabilities, such as improved software, user-friendliness, components or sub-systems.

Process innovation means introduction of a new or significantly improved production process, distribution method or support activity for goods or services. Purely organisational innovations are excluded.

Organisational innovation means introduction of new or significant changes in a firm's structure or management methods that are intended to improve the firm's use of knowledge, the quality of its goods and services or the efficiency of its workflows.

Marketing innovation means introduction of new or significantly improved designs or sales methods to increase the appeal of goods and services or to enter new markets.

2. Statistical units

The main statistical unit for CIS 2006 was the **enterprise**.

The target population for CIS 2006 was the total population of enterprises (with 10 or more employees) engaged primarily in mining and quarrying (NACE 10-14), manufacturing (NACE 15-37), electricity, gas and water supply (NACE 40-41), wholesale trade (NACE 51), transport, storage and communication (NACE 60-64), financial intermediation (NACE 65-67), computer and related activities (NACE 72), architectural and engineering activities (NACE 74.2) and technical testing and analysis (NACE 74.3).

3. Type of survey

Most countries carried out CIS 2006 by means of a stratified sample survey, while a number used a census or a combination of the two.

The economic activities covered by this Pocketbook are based on the NACE Rev. 1.1 classification. The six sectors used are:

- All NACE — Core NACE (NACE sections C, D, E, I and J and NACE divisions 51, 72, 74.2 and 74.3);
- Total industry (excluding construction), which includes mining and quarrying (NACE C), manufacturing (NACE D) and electricity, gas and water supply (NACE E);
- Manufacturing, which means NACE D;
- Services — Core G_to_K (NACE sections I and J and NACE divisions 51, 72, 74.2 and 74.3);
- K: Core coverage (NACE 72, 74.2 and 74.3), which focuses on computer and related activities and other business activities;
- 74 Core: Other business services (NACE 74.2 and 74.3), which focuses on architectural and engineering activities (NACE 74.2) and technical testing and analysis (NACE 74.3).

The CIS 2006 data are organised in the Eurostat reference database following broadly the same structure as the questionnaire.

4. Reference period

CIS 2006 covered the three-year period from the beginning of 2004 to the end of 2006, taking 2006 as the reference year.

All the countries covered collected data for this observation period.

Patents

1. Concepts and definitions

A patent is a legal title granting the holder the exclusive right to make use of an invention for a limited area and time. An invention needs to fulfil three criteria in order to be granted a patent: (1) novelty, (2) inventive step and (3) industrial applicability. All patent applications and patents granted are published. They provide a useful indicator of innovative developments in all areas of technology and can indicate the level of innovative activity in a particular market, region or country.

2. Sources

Since 2007 Eurostat has been producing EPO and USPTO data almost exclusively on the basis of the **EPO Worldwide Statistical Patent Database**. This database, also known as 'PATSTAT', was developed by the EPO in 2005, drawing on its collection and knowledge of patent data.

Because of these changes, data shown on the Eurostat webpage are no longer fully comparable with data previously disseminated.

EPO patent applications by priority year

In 2007 Eurostat also decided to revise its method for calculating indicators, based on EPO patent applications by priority year. All direct patent applications to the EPO (EPO-direct) are taken into account, but in the case of PCT applications (i.e. applications following the procedure laid down by the Patent Cooperation Treaty or PCT) to the EPO only those that have entered the regional phase are counted. As PCT patent applications in the international phase designating the EPO are no longer included in the calculation of patent applications to the EPO, the figures shown are lower. A similar method is also applied by the OECD. Nevertheless, patent data produced by Eurostat and the OECD may still not be exactly the same. Differences can be explained by the fact that the data sources used and the date of extraction of the data could differ.

USPTO patents granted by priority year

The similar method applied by both Eurostat and the OECD is also reflected in the calculation of indicators for patents granted by the USPTO. Once again, there are differences that could be explained by the fact that the data sources are not exactly the same and by the date of data extraction.

Triadic patent families by earliest priority year

A patent family is defined as a set of patents taken out in various countries to protect the same invention, i.e. related patents are combined into a single record to create a single patent family. A patent is a member of a triadic patent family if — and only if — it has been applied for and filed at the European Patent Office (EPO) and the Japan Patent Office (JPO) and has been granted by the United States Patent and Trademark Office (USPTO). Patent families, as opposed to patents, are intended to improve international comparability (the home advantage is eliminated and the values of the patents are more homogeneous).

Data on triadic patent families are presented by priority year, i.e. the year when the first international patent was filed. This exacerbates the disadvantage of traditional patent counts in terms of timeliness. The latest available data are therefore for 2002 only.

3. Reference year (or date)

All patent statistics from Eurostat are shown by priority date, i.e. the date of filing of the first patent application anywhere in the world. This date is chosen in order to be closest to the date of the invention as patent procedures always take several years. The drawback of this choice is that the data on USPTO patents granted have declined in recent years, due to administrative delays between the priority date and the grant date. To a lesser extent, this is also the case for the EPO data.

4. Counting patents with multiple inventors from different countries

Eurostat has chosen the fractional counting method. This means that if an invention was patented by inventors from several different countries, the individual contributions of each country are taken into account in order to eliminate multiple counting of the same patent. For example, a joint invention patented by one French, one American and two German residents will be counted as ¼ of a patent for France, ¼ for the US and ½ a patent for Germany.

5. International patent classification

On 1 January 2006 the eighth edition of the International Patent Classification (IPC) entered into force. The World Intellectual Property Organisation (WIPO), a specialised agency of the United Nations, is responsible for updating the IPC. The IPC is a comprehensive subject classification system applied to all patents by the patent-issuing authorities.

The IPC is a comprehensive subject classification system applied to all patents by the patent-issuing authorities. The IPC is a hierarchical system divided into sections, classes, subclasses and groups. Each IPC code is a combination of letters and numbers relating to the different categories of the system. A patent can have either only one IPC code or more.

Biotechnology sector

The OECD defines biotechnology as 'the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services'. The choice of the IPC subclasses used for this sector is based on the OECD definition.

High-technology groups in the International Patent Classification (IPC)

AVI	Aviation;
CAB	Computer and automated business equipment;
CTE	Communication technology;
LSR	Lasers;
MGE	Micro-organisms and genetic engineering;
SMC	Semi-conductors.

Nanotechnology

In contrast to the data on the other fields listed above, patent applications concerning nanotechnology are not based directly on aggregation of patent applications with the same IPC codes. The EPO introduced 'Y01N' tags to label nanotechnology in its databases because, due to the interdisciplinary nature of the field, it was too difficult to retrieve these specific patent data from the available databases. The Y01N code is not static, but is constantly being updated and improved as new aspects of this young technology emerge.

Co-patenting

Data on co-patenting applications to the EPO and patents granted by the USPTO are available at national level, based on the inventor's and also the applicant's country of residence as follows:

- Total patents in the declaring country;
- Single inventors/applicants;
- Co-patents involving inventors/applicants from the declaring country;
- Co-patents involving inventors/applicants from the declaring country and one or more EU Member States;
- Co-patents involving inventors/applicants from the declaring country, one or more EU Member States and one or more non-EU countries;
- Co-patents involving inventors/applicants from the declaring country and one or more non-EU countries.

Patent citations

Total number of publications cited in patents: the total number equals the number of patent publications to which the identified citation in patents to the EPO corresponds.

EU patents: patent applications to the EPO that have only EU inventors (applicants).

Number of citations referring to non-EU patent publications: The citations in the patent applications to the EPO filed by only EU inventors (applicants) are identified along with the corresponding patent publications. The cited patent publications with at least one EU inventor (applicant) and those with only non-EU inventors (applicants) are determined.

High-technology

1. Sources and definitions

1.1. Venture capital investment

Venture capital investment (VCI) is defined as private equity raised for investment in companies. Buyouts generate funds to enable an enterprise to acquire another enterprise, product line or business.

Data are broken down into two investment stages:

- early stage (seed + start-up); and

- expansion and replacement (expansion and replacement capital).

Buyout data are also considered in parallel with these two stages and include management buyouts, management buy-ins, leverage buyouts and venture purchases of quoted shares.

The basic data are provided by the European Private Equity and Venture Capital Association (EVCA). For further information on venture capital, see: http://www.evca.com.

For all further details, see also the Eurostat metadata on high-technology on Eurostat's reference webpage.

1.2. High-tech enterprises

Data on high-tech enterprises and indicators derived from them are extracted and built up from the structural business statistics (SBS).

Number of enterprises includes all units active during at least part of the reference period.

Turnover means the total invoiced by the unit surveyed during the reference period, which corresponds to market sales of goods or services supplied to third parties.

Value added at factor cost means the gross income from operating activities after adjusting for operating subsidies and indirect taxes.

Production value measures the amount actually produced by the unit, based on sales, including changes in stocks and the resale of goods and services.

For all further details, see the Eurostat metadata on high technology on Eurostat's reference webpage.

1.3. High-tech trade

Data on high-tech trade are extracted from the **COMEXT** database, Eurostat's database of official statistics on EU external trade and trade between EU Member States.

Trade data reported by other countries are extracted from the UN Statistical Office's **Comtrade** database and included in the **COMEXT** database as a separate dataset.

Note that the data in this Pocketbook therefore come from two different sources employing partly different methods. For more information regarding external trade methods, see: http://epp.eurostat.ec.europa.eu.

High-technology product groups are defined on the basis of the R&D intensity of products measured by the concepts developed by the OECD, i.e. R&D expenditure/total sales covering six countries. These can be classified into nine groups: aerospace, computers/office machines, electronics/telecommunications, pharmacy, scientific instruments, electrical machinery, chemistry, non-electrical machinery and armament.

1.4. Employment in high-tech

Data on employment in high-tech and indicators derived from them are extracted and built up from the EU labour force survey (EU LFS).

For further details, see the Eurostat metadata on high technology on Eurostat's reference webpage.

2. Definition of high-tech and knowledge-intensive services sectors

2.1. High-tech manufacturing industries

Eurostat and the OECD use the following breakdown of manufacturing industry based on global technological intensity (R&D expenditure/value added) and NACE Rev. 1.1 at 3-digit level. Owing to restrictions of the data source, a different but derived classification based on NACE at 2-digit level was used for data on employment and earnings in high-tech, the difference being that the 3-digit codes listed below are included in their 2-digit level group (e.g. 24.4 is included in 24, etc.):

High technology

24.4 Manufacture of pharmaceuticals, medicinal chemicals and botanical products; 30 Manufacture of office machinery and computers; 32 Manufacture of radio, television and communication equipment and apparatus; 33 Manufacture of medical, precision and optical instruments, watches and clocks; 35.3 Manufacture of aircraft and spacecraft.

Medium-high technology

24 Manufacture of chemicals and chemical products, excluding 24.4 Manufacture of pharmaceuticals, medicinal chemicals and botanical products; 29 Manufacture of machinery and equipment n.e.c.; 31 Manufacture of electrical machinery and apparatus n.e.c.; 34 Manufacture of motor vehicles, trailers and semi-trailers; 35 Manufacture of other transport equipment, excluding 35.1 Building and repairing of ships and boats and excluding 35.3 Manufacture of aircraft and spacecraft.

Medium-low technology

23 Manufacture of coke, refined petroleum products and nuclear fuel; 25 to 28 Manufacture of rubber and plastic products; basic metals and fabricated metal products; other non-metallic mineral products; 35.1 Building and repairing of ships and boats.

Low technology

15 to 22 Manufacture of food products, beverages and tobacco; textiles and textile products; leather and leather products; wood and wood products; pulp, paper and paper products, publishing and printing; 36 to 37 Manufacturing n.e.c.

2.2. Knowledge-intensive and less knowledge-intensive services

Following a similar approach to that taken for manufacturing, Eurostat defines the following as knowledge-intensive services (KIS) or less knowledge-intensive services (LKIS):

Knowledge-intensive services (KIS)

61 Water transport; 62 Air transport; 64 Post and telecommunications; 65 to 67 Financial intermediation; 70 to 74 Real estate, renting and business activities; 80 Education; 85 Health and social work; 92 Recreational, cultural and sporting activities.

High-tech KIS

64 Post and telecommunications; 72 Computer and related activities; 73 Research and development.

Market KIS (excluding financial intermediation and high-tech services) 61 Water transport; 62 Air transport; 70 Real estate activities; 71 Renting of machinery and equipment without operator and of personal and household goods; 74 Other business activities.

Financial KIS

65 to 67 Financial intermediation.

Less knowledge-intensive services (LKIS)

50 to 52 Motor trade; 55 Hotels and restaurants; 60 Land transport; transport via pipelines; 63 Supporting and auxiliary transport activities; activities of travel agencies; 75 Public administration and defence; compulsory social security; 90 Sewage and refuse disposal, sanitation and similar activities; 91 Activities of membership organisations n.e.c.; 93 Other service activities; 95 Activities of households as employers of domestic staff; 99 Extra-territorial organisations and bodies.

Market services minus KIS

50 to 52 Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; 55 Hotels and restaurants; 60 Land transport; transport via pipelines; 63 Supporting and auxiliary transport activities; activities of travel agencies.

European Commission

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This publication is a compendium of data available at Eurostat, but it is by no means exhaustive: it is a showcase for the main available data sets.

The focus is on the EU-27 and the candidate countries. However, to allow international comparisons, data for Iceland, Liechtenstein, Norway, Switzerland, China, Japan, Russia and the United States are included when available.

The pocketbook is divided into seven chapters, including: Government budget appropriations or outlays on R&D (GBAORD), R&D expenditure, R&D personnel and human resources in science and technology (HRST), statistics on innovation, patents and high-technology.

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