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Science, technology and innovation in Europe

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Inhaltsverzeichnis

This pocketbook gives an overview of science, technology and innovation (STI) statistics. All the statistical data and indicators are based on sources available at Eurostat. Only the most relevant indicators have been selected so as to give an overall statistical picture of science, technology and innovation in Europe and of how the EU stands in relation to its partners.

Eurostat has been collecting STI data for many years to meet the needs of policymakers and the scientific community. Science, technology and innovation statistics were acknowledged by the Commission in 2010 to be closely linked to the EU's policy activities. Innovation indicators are seen as a key element in terms of the Innovation Union initiative and the European Research Area (ERA) in generating progress under the various Europe 2020 strategy priorities. Europe 2020 sets out a vision of Europe's social market economy for the 21st century, aiming to turn the EU into a smart, sustainable and inclusive economy that delivers high levels of employment, productivity and social cohesion.

This publication is by no means exhaustive: it is a showcase for the main available data sets. Any other sources that have been used are acknowledged beneath each table or graph.

The focus is on the EU-27 and the candidate countries. However, for the purposes of international comparison, Liechtenstein, Norway, Switzerland, China, Japan, Russia, South Korea, the United States and other countries are included wherever the data are available.

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

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

The first part is divided into government budget appropriations or outlays on R&D (GBAORD — Chapter 1) and R&D expenditure (Chapter 2).

Part 2 sets out data on R&D personnel (Chapter 3) and human resources in science and technology (HRST — Chapter 4).

Part 3 features 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 the various 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 2010). However, the reference database is updated regularly as new data are received, so data that are more recent may differ from those available at the time of publishing.

Statistical symbols and abbreviations

b	Break in series
e	Estimate
f	Forecast
p	Provisional
r	Revised value
s	Eurostat estimate
u	Unreliable data
:	Data not available
:c	Confidential data
:u	Extremely unreliable data
-	Not applicable or real zero
%	Percentage
0	Less than fifty percent of the unit used
1 000s	Thousands
2005	Calendar year (e.g. from 1.1.2005 to 31.12.2005)
2005/06	Academic year (e.g. from 1.9.2005 to 31.8.2006)
2001–2006	Period of several calendar years (e.g. from 1.1.2001 to 31.12.2006)

Abbreviations

AGR	Annual Growth Rate
AAGR	Average Annual Growth Rate
BERD	Business Enterprise intramural expenditure on R&D
BES	Business enterprise sector
CC	Candidate countries
CIS 2006	Community Innovation Survey 2006
CLFS/LFS	(Community) Labour Force Survey
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
EHT	Employment in high- and medium-high-tech sectors
EPO	European Patent Office
ESA	European System of Accounts
EU/EU-25/EU-27	European Union (25/27 Member States)
EU-15	European Union (15 Member States)
EUR	Euro
Eurostat	Statistical Office of the European Communities
EXP	Expenditure
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
IPC	International Patent Classification
ICT	Information and Communications Technology
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations

JPO	Japanese Patent Office
KIS	Knowledge-Intensive Services
LKIS	Less Knowledge-Intensive Services
M	Million
MS	Member States
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 Communities
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
RSE	Researchers
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

EFTA countries

IS	Iceland
LI	Liechtenstein
NO	Norway
CH	Switzerland

Candidate countries

FYROM	Former Yugoslav Republic of Macedonia
HR	Croatia
TR	Turkey

Other countries

ASIOTH	Other Asian countries

AU	Australia
BR	Brazil
CA	Canada
CN	China
HK	Hong Kong
ID	Indonesia
IL	Israel
IN	India
JP	Japan
MX	Mexico
MY	Malaysia
PH	Philippines
RU	Russia
SG	Singapore
TH	Thailand
US	United States

I

Investing in R&D

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

Government budget appropriations or outlays on research and development (GBAORD) are funds allocated to R&D in central government or federal budgets and therefore mean budget provisions, not actual expenditure.

In 2009, GBAORD expressed as a percentage of GDP stood at 0.74 % in the EU-27. Despite being up on 2008, it was still below the levels recorded by its main economic partners: the United States (0.99 %, 2008 data) and Japan (0.75 %). From 2008 to 2009, the most significant increase in GBAORD as a share of GDP was in South Korea.

In 2009, there were wide disparities in GBAORD as a share of GDP between the Member States, ranging from 1.13 % in Finland to 0.20 % in Latvia. Finland was the only Member State where this figure was above 1 %, followed at world level by Iceland (1.05 %) and South Korea (1.02 %). A further eight Member States recorded GBAORD levels above the EU-27 average (0.74 %): Denmark, Portugal, Sweden, Germany, Austria, the Netherlands, France and Slovenia.

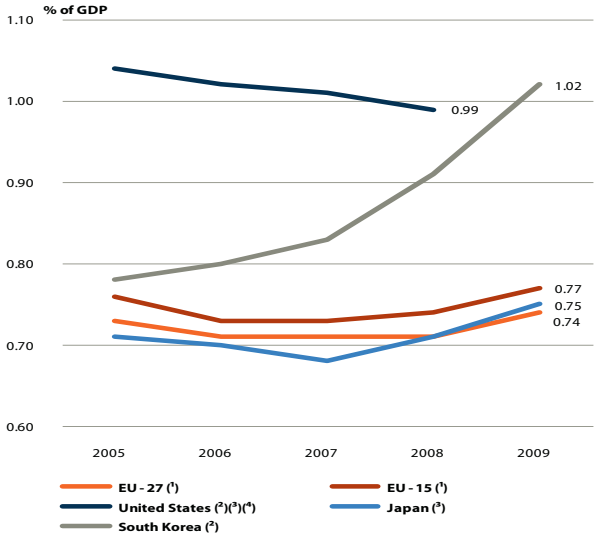
Government budget appropriations or outlays on R&D are distributed by socio-economic objectives, depending on the purpose of the R&D programmes or projects, on the basis of the Nomenclature for the analysis and comparison of scientific programmes and budgets (NABS 2007).

In 2009 the main socio-economic objective within the EU-27 was 'general advancement of knowledge: R&D financed from general university funds (GUF)', which accounted for 31.8 % of total GBAORD, followed by 'general advancement of knowledge: R&D financed from other sources than GUF' (17.5 %), 'industrial production and technology' (9.7 %) and 'health' (8.2 %).

In Japan, 'general advancement of knowledge: R&D financed from GUF' was also the foremost objective, accounting for 34.2 % of total GBAORD, while in the United States more than half of GBAORD (56.6 %, 2008 data) was allocated to 'defence'.

At country level, the two socio-economic objectives linked to 'general advancement of knowledge' accounted for the largest shares of total GBAORD in 24 Member States. 'Industrial production and technology' was the top objective in Belgium, 'education' in Lithuania and 'health' in Luxembourg.

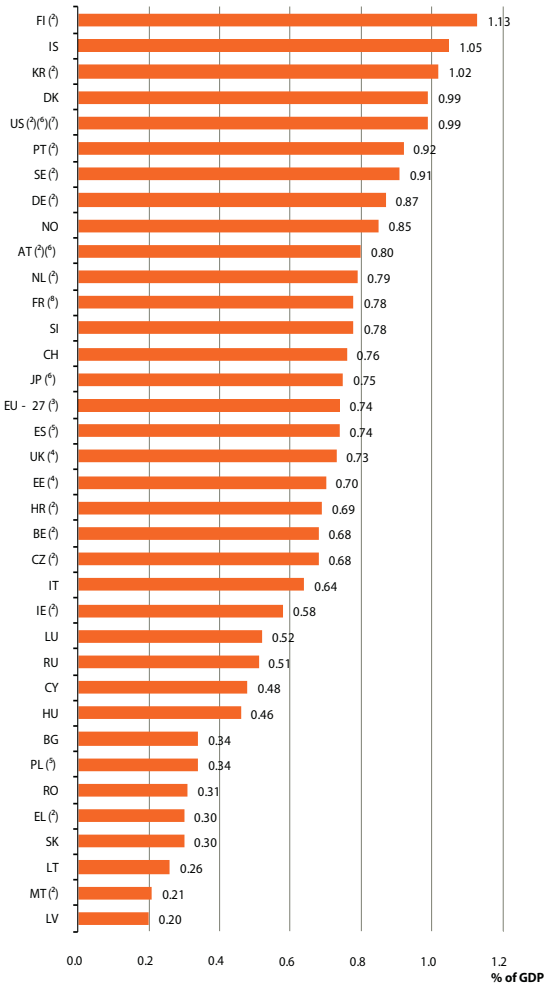
Figure 1.1: Total GBAORD as a percentage of GDP, EU-27, EU-15, Japan, South Korea and the United States, 2005–2009



(1) Eurostat estimate.
(2) KR (2008 and 2009) and US (2008): provisional data.
(3) Federal or central government only.
(4) 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 (online data code: gba_nabsfin07), OECD-MSTI for KR, JP and US

Figure 1.2: Total GBAORD as a percentage of GDP, EU-27 and selected countries, 2009 ([1])



([1]) Exceptions to the reference year 2009: 2007: EL; 2008: CH and US.
([2]) Provisional data.
([3]) Eurostat estimate.
([4]) National estimate.
([5]) Break in series.
([6]) Federal or central government only.
([7]) Total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).
([8]) Underestimated or based on underestimated data.

Source: Eurostat (online data code: gba_nabsfin07), OECD-MSTI for JP, KR and US

Table 1.3 (Part I): Total GBAORD in EUR million and by socio-economic objectives (NABS 2007) as a percentage of total, EU-27 and selected countries, 2009 (1)

	Total GBAORD 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	87 605 s	1.8 s	2.9 s	5.4 s	3.9 s	3.8 s	9.7 s	8.2 s
BE	2 291 p	0.6 p	2.5 p	7.4 p	1.9 p	1.7 p	34.6 p	1.8 p
BG	118	1.1	1.5	0.4	3.1	2.2	2.8	2.2
CZ	939 p	1.8 p	2.5 p	1.6 p	3.7 p	3.3 p	13.9 p	6.4 p
DK	2 200	0.5	2.6	1.9	0.7	3.1	9.4	7.9
DE (2)	20 851 p	2.0 ip	3.1 ip	5.1 ip	1.8 ip	3.9 ip	12.7 ip	4.7 ip
EE	96 e	1.2 e	4.4 e	1.2 e	9.3 e	3.1 e	9.9 e	13.7 e
IE	929 p	0.1 p	1.5 p	0.0 p	0.5 p	3.6 p	14.5 p	5.3 p
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	7 828 b	1.9 b	5.0 b	1.6 b	6.4 b	3.4 b	11.4 b	11.8 b
FR (2)	14 928 i	1.0 i	2.5 i	13.7 i	9.3 i	6.2 i	2.0 i	7.4 i
IT	9 778	2.8	3.2	7.4	2.4	4.1	13.5	10.3
CY	81	0.4	0.8	0	0.9	0	0.9	7.2
LV	38	2.2	7.5	1.5	7.8	7.8	10.4	7.1
LT	70	0	4.4	0	0	0.4	0.1	1.1
LU	196	0.8	3.2	0.3	3.4	1.8	5.2	22.1
HU	429	0.1	2.9	0.1	6.4	2.1	11.5	11.4
MT	12 p	0	2.2	0	1.6	0.1	0	0.1
NL	4 527 p	0.9 p	0.4 p	3.4 p	3.9 p	3.0 p	10.8 p	4.2 p
AT (2)	2 203 ip	1.7 ip	2.5 ip	0.4 ip	1.0 ip	1.9 ip	14.5 ip	3.2 ip
PL	1 052 b	1.3	3.6	1.6	3.7	4.1 b	19.4	7.9 b
PT	1 483	3.0	2.2	0.3	6.6	1.4	6.8	10.5
RO	360	1.9	7.9	3.5	10.7	6.7	18.7	12.5
SI	277	1.2	3.3	0.4	2.6	1.0	28.2	3.8
SK	190	1.5	2.8	0.4	2.2	2.0	6.5	5.8
FI	1 928 p	1.2 p	1.5 p	1.6 p	2.2 p	9.9 p	23.0 p	5.8 p
SE (2)	2 662 ip	0.6 p	1.8 p	0.7 p	5.8 p	4.2 p	4.3 p	0.9 p
UK	11 341 e	2.7 e	2.8 e	2.2 e	1.3 e	0.7 e	0.6 e	17.4 e
IS	91	:	0.4	:	3.5	2.3	1.3	8.2
NO	2 313	1.9	2.7	2.4	2.4	3.4	7.6	14.5
CH	2 621	0.1 i	0.4 i	0.4 i	0.2 i	0.7 i	0.4 i	0.5 i
HR	314 p	1.2 p	1.2 p	0 p	2.2 p	0.5 p	1.2 p	2.2 p
JP (2)	27 343 i	1.9 i	1.0 i	7.2 i	4.1 i	13.2 i	8.4 i	4.0 i
KR (2)	5 994 ip	2.2 p	3.3 p	3.2 p	1.5 p	7.6 p	26.9 p	6.1 p
RU (2)	4 792 i	:	0.1	22.1	0.7	2.1	8.2	2.7
US (2)	96 827 ip	0.7 ip	0.5 ip	8.2 ip	1.0 ip	1.7 ip	0.4 ip	22.2 ip

(1) Exceptions to the reference year 2009: 2007: EL, 2008: PT, CH and US.
(2) Flag 'i':
DE: unrevised breakdown not adding to the revised total;
FR: the sum of the breakdown does not add to the total. Total GBAORD and 'Defence' are underestimated or based on underestimated data. 'Education' and 'Culture, recreation, religion and mass media' are included elsewhere; 'Political and social systems, structures and processes' includes other classes.
AT, JP and US: federal or central government only.
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).
SE, RU and KR: the sum of the breakdown does not add to the total.

Source: Eurostat (online data code: gba_nabsfin07), OECD-MSTI for KR, JP and US

Table 1.3 (Part II): Total GBAORD in EUR million and by socio-economic objectives (NABS 2007) as a percentage of total, EU-27 and selected countries, 2009 ([1])

	Total GBAORD 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	87 605 s	3.7 s	1.2 s	1.2 s	2.7 s	31.8 s	17.5 s	6.2 s
BE	2 291 p	1.4 p	0.3 p	2.1 p	3.5 p	16.6 p	25.4 p	0.2 p
BG	118	19.5	4.8	0.4	0.8	10.0	50.8	0.6
CZ	939 p	4.6 p	0.4 p	0.7 p	1.0 p	27.3 p	30.4 p	2.3 p
DK	2 200	3.4	2.8	1.6	2.7	44.4	18.5	0.5
DE ([2])	20 851 p	3.1 ip	1.0 ip	1.1 ip	1.9 ip	37.4 ip	17.2 ip	5.7 ip
EE	96 e	7.6 e	2.1 e	4.2 e	3.5 e	0	38.7 e	1.0 e
IE	929 p	12.3 p	3.7 p	0.0 p	1.7 p	24.9 p	31.9 p	0.0 p
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	7 828 b	8.1 b	1.2 b	1.4 b	1.5 b	25.6 b	17.8 b	2.8 b
FR ([2])	14 928 i	1.9 i	: i	: i	1.7 i	24.6 i	19.6 i	6.8 i
IT	9 778	3.4	3.2	1.5	8.6	31.7	7.3	0.7
CY	81	10.8	3.7	1.3	0.2	31.6	42.1	0.0
LV	38	16.0	2.2	2.6	0.4	:	34.0	0.4
LT	70	0	92.6	0	0.9	0.4	0	0.1
LU	196	0.4	3.8	0.7	20.3	16.2	21.9	0
HU	429	8.7	0.2	0.9	1.5	27.7	26.0	0.6
MT	12 p	8.0	0.2	0.6	2.0	85.2	0.5	0
NL	4 527 p	5.0 p	0.3 p	0.4 p	3.6 p	44.3 p	18.1 p	1.8 p
AT ([2])	2 203 ip	1.7 ip	1.2 ip	0.5 ip	1.4 ip	57.0 ip	12.9 ip	0.0 ip
PL	1 052 b	4.2 b	1.0	1.1	9.9 b	16.4 b	22.3 bi	3.4
PT	1 483	5.8	0.8	2.3	1.3	31.6	27.2	0.2
RO	360	7.7	4.7	1.1	1.4	:	19.8	3.4
SI	277	3.3	0.3	3.6	2.8	4.1	36.1	9.4
SK	190	6.0	1.5	4.0	1.4	27.6	34.0	4.4
FI	1 928 p	5.2 p	0.4 p	0.5 p	4.5 p	25.4 p	17.0 p	1.8 p
SE ([2])	2 662 ip	1.5 p	0.5 p	0.2 p	2.1 p	61.7 p	6.0 p	8.4 p
UK	11 341 e	2.7 e	0.7 e	2.0 e	1.9 e	23.8 e	19.8 e	21.4 e
IS	91	17.8	:	:	53.7	12.8	:	:
NO	2 313	7.5	0.7	0.8	4.9	34.1	12.5	4.5
CH	2 621	1.8 i	0.2 i	0.2 i	1.3 i	62.0	27.4	0.6 i
HR	314 p	1.0 p	0.1 p	1.3 p	1.8 p	53.9 p	33.3 p	0.1 p
JP ([2])	27 343 i	3.8 i	0.2 i	0.4 i	0.4 i	34.2 i	17.7 i	3.7 i
KR ([2])	5 994 ip	6.4 p	:	:	:	:	23.6 ip	17.2 p
RU ([2])	4 792 i	2.2	3.1	0.2	0.1	:	:	:
US ([2])	96 827 ip	1.7 ip	0.3 ip	0 ip	0.5 ip	0 i	6.1 ip	56.6 ip

([1]) Exceptions to the reference year 2009: 2007: EL, 2008: PT, CH and US.
([2]) Flag 'i':
DE: unrevised breakdown not adding to the revised total.
FR: the sum of the breakdown does not add to the total. Total GBAORD and 'Defence' are underestimated or based on underestimated data. 'Education' and 'Culture, recreation, religion and mass media' are included elsewhere; 'Political and social systems, structures and processes' includes other classes.
AT, JP and US: federal or central government only.
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).
SE, RU and KR: the sum of the breakdown does not add to the total.

Source: Eurostat (online data code: gba_nabsfin07), OECD-MSTI for KR, JP and US

2

R&D expenditure

In 2008, R&D intensity (i.e. R&D expenditure as a percentage of GDP) in the EU-27 stood at 1.90 %, up 1.85 % on 2007, but still below the 3 % target set for 2010 by the Lisbon strategy. The 3 % target will be maintained for the next ten years as one of the five key targets of the Europe 2020 strategy. R&D intensity in the EU was well below Japan (2007: 3.44 %), South Korea (2007: 3.21 %) and the United States (2008: 2.76 %), but slightly higher than China (2007: 1.44 %).

Among the EU Member States, only Sweden (3.75 %) and Finland (3.73 %) exceeded the EU goal of devoting 3 % of GDP to R&D and also outperformed Japan, the United States and South Korea. Though Denmark (2.72 %), Austria (2.67 %) and Germany (2.63 %) did not achieve the 3 % goal, they were well above the EU-27 average.

R&D expenditure in the EU-27 increased by an average of 3.3 % a year between 2003 and 2008, reaching EUR 237 billion in 2008. Germany, France, Italy and the United Kingdom together accounted for more than half of the EU-27 total.

The business enterprise sector (BES) was the largest of the four main institutional sectors of R&D performance in 2008, accounting for 63.9 % of EU-27 R&D expenditure. The higher education sector (HES) and government sector (GOV) followed, with shares of 22.4 % and 12.7 % respectively.

In the EU-27, 55.0 % of R&D expenditure was financed by the BES and 33.5 % by GOV. 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 BES: Luxembourg (76.0 %), Finland (70.3 %) and Germany (67.9 %).

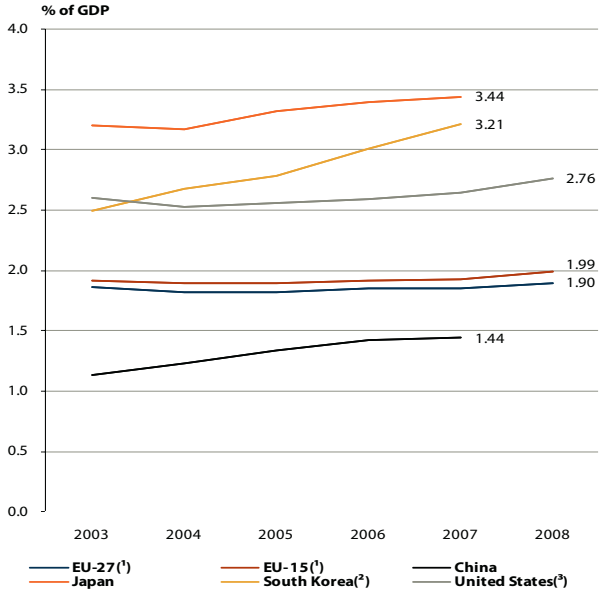
In many of the countries under review, the 'manufacturing' sector received the greatest share of business enterprise R&D expenditure. This was notably the case in Germany, Slovenia and Finland, where 88.7 %, 88.2 % and 80.0 % respectively of R&D expenditure by the BES went on manufacturing.

The breakdown of business enterprise R&D expenditure (BERD) by size class reveals that firms with more than 250 employees generally invest most in R&D. In six EU Member States, these large firms accounted for 80 % or more of BERD. In Greece, Spain, Cyprus, Latvia and Slovakia, on the other hand, large businesses accounted for less than 50 % of BERD.

In four EU Member States the R&D intensity of the leading region was above 5.0 %. Braunschweig (DE) came out top in

Germany (6.77 %), followed by East Anglia for the United Kingdom (5.72 %), Pohjois-Suomi for Finland (5.38 %) and Hovedstaden for Denmark (5.09 %). There were substantial regional disparities in all these countries.

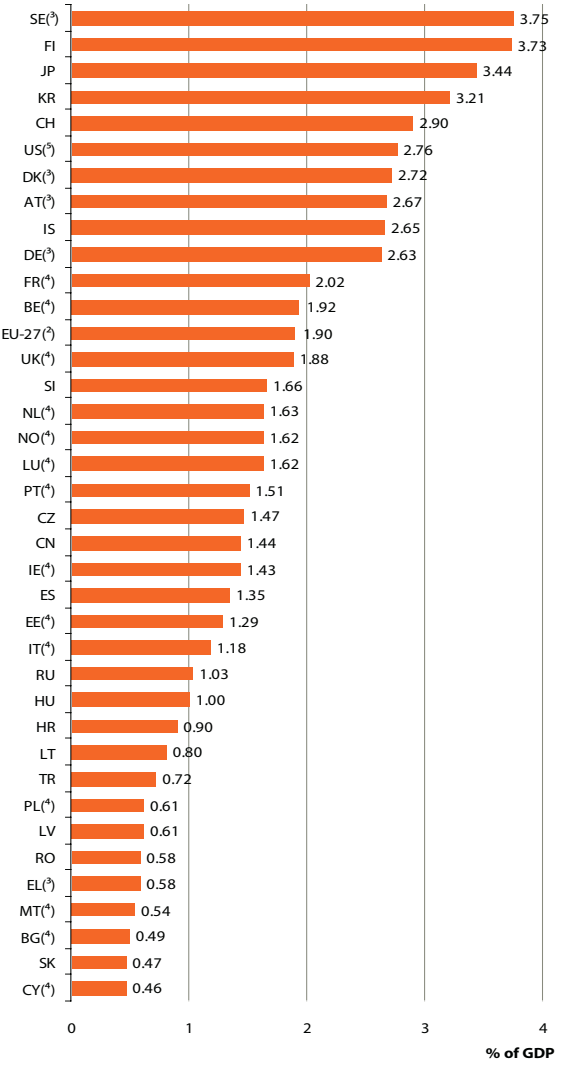
Figure 2.1: R&D intensity (R&D expenditure as % of GDP), EU-27, EU-15, China, Japan, South Korea and the United States, 2003–2008



(1) EU: Eurostat estimate.
(2) Break in series in 2007.
(3) Provisional data for 2008; excludes most or all capital expenditure.

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

Figure 2.2: R&D intensity (R&D expenditure as % of GDP), EU-27 and selected countries, 2008 (1)



(1) Exceptions to the reference year: 2007 (EL, TR, CN, KR, JP), 2004 (CH).
(2) Eurostat estimate.
(3) National estimate.
(4) Provisional data.
(5) Excludes most or all capital expenditure, provisonal data.

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

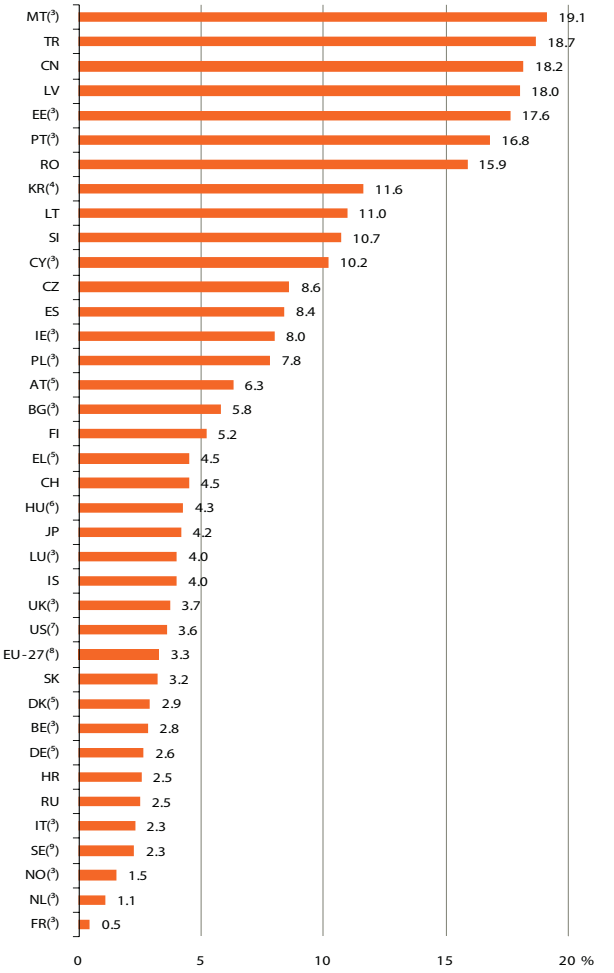
Table 2.3: R&D expenditure in EUR million by sector of performance, EU-27 and selected countries, 2008 (1)

	All sectors	Business enterprise sector	Government sector	Higher education sector	Private non-profit sector
EU-27	237 001 s	151 449 s	30 007 s	53 193 s	2 351 s
BE	6 622 p	4 560 p	569 p	1 407 p	86 p
BG	167 p	52 p	97 p	16 p	2 p
CZ	2 169	1 342	454	364	8
DK	6 338 e	4 445 e	200 e	1 664 e	30 e
DE	65 622 e	45 822 e	9 100 e	10 700 e	:
EE	208 p	90 p	24	89	4
IE	2 600 p	1 687 p	200 p	713 p	:
EL	1 311 e	353 e	281 e	661 e	17 e
ES	14 701	8 074	2 672	3 932	23
FR	39 423 p	24 837 p	6 330 p	7 780 p	475 p
IT	18 587 p	9 453 p	2 463 p	6 054	618 p
CY	79 p	18 p	18 p	37 p	7 p
LV	142	35	39	67	:
LT	258	61	60	137	:
LU	638 p	520 p	99 p	19 p	:
HU(2)	1 059	557 i	248 i	233 i	:
MT	31 p	20 p	1 p	10 p	0
NL(2)	9 686 p	5 325 p	1 256 ip	3 105 p	: i
AT	7 517 e	5 304 e	402 e	1 792 e	19 e
PL	2 194 p	679 p	775 p	738 p	2 p
PT	2 513 p	1 258 p	194 p	845 p	217 p
RO	809	242	332	234	2
SI	617	398	135	83	1
SK	305	131	100	74	0
FI	6 871	5 102	552	1 181	36
SE	12 314 e	9 119 e	547 e	2 624 e	24 e
UK	34 144 p	21 931 p	2 842 p	8 593 p	779 p
IS	272	149	49	68	7
NO	5 006 p	2 695 p	732 p	1 579 p	:
CH(2)	8 486	6 257	91 i	1 943	194
HR	426	188	107	129	1
TR	3 410	1 407	360	1 643	:
CN	35 614	25 744	6 850	3 021	:
JP	110 116	85 770	8 554	13 868	1 924
KR	24 589	18 747	2 866	2 619	357
RU	11 836	7 446	3 566	793	31
US(2)	270 660 ip	196 563 ip	28 700 ip	34 786 ip	10 611 ip

(1) Exceptions to the reference year: 2007 (EL, TR, CN, JP, KR), 2004 (CH).
(2) Flag 'i':
HU: incomplete breakdown of R&D expenditure by sector of performance;
NL: GOV sector includes PNP sector;
US and CH: GOV sector includes federal or central government only;
US: excludes most or all capital expenditure.

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

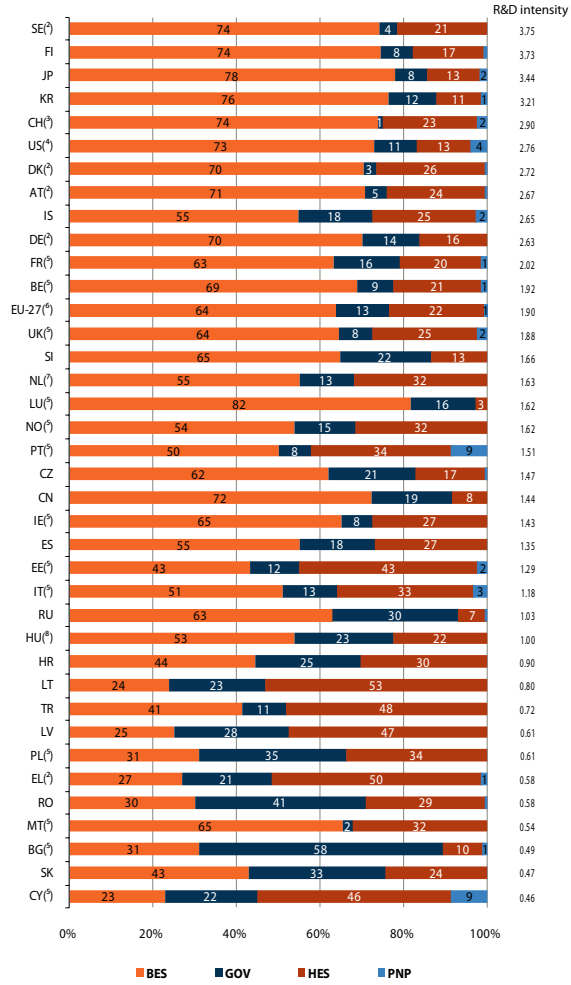
Figure 2.4: Average annual growth rate (AAGR) of R&D expenditure, EU-27 and selected countries, 2003–2008 (1)(2)



(1) Calculated on R&D expenditure in PPS at 2000 constant prices.
(2) Exceptions to the reference period 2003-2008: 2003-2007 (EL, TR, CN, KR, JP); 2000-2004 (CH).
(3) Provisional data for 2008.
(4) 2003: excludes R&D in social sciences and humanities; 2007: break in series.
(5) National estimate for 2008.
(6) 2003 defence excluded (all or mostly).
(7) Excludes most or all capital expenditure, provisional data for 2008.
(8) Eurostat estimate.
(9) 2003 underestimated or based on underestimated data, national estimates for 2008.

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

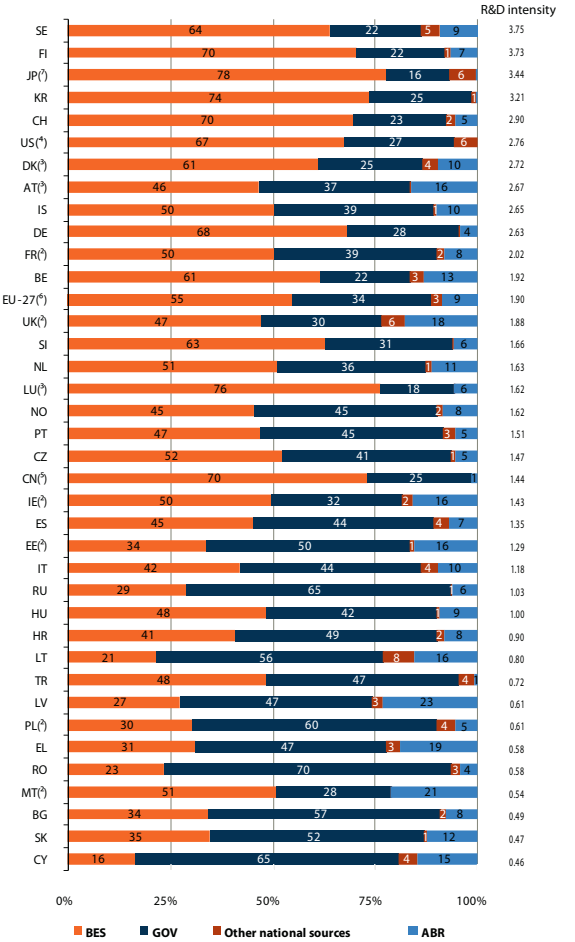
Figure 2.5: R&D expenditure by sector of performance as a percentage of total, EU-27 and selected countries ranked by R&D intensity (R&D expenditure as % of GDP), 2008 (1)



(1) Exceptions to the reference year : 2007 (EL, TR, CN, KR, JP); 2004 (CH).
(2) National estimate.
(3) GOV sector includes federal or central government only.
(4) Excludes most or all capital expenditure ; GOV sector includes federal or central government only ; provisional data.
(5) Provisional data.
(6) Eurostat estimate.
(7) GOV sector includes PNP sector: provisional data.
(8) Incomplete breakdown of R&D expenditure by sector of performance.

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

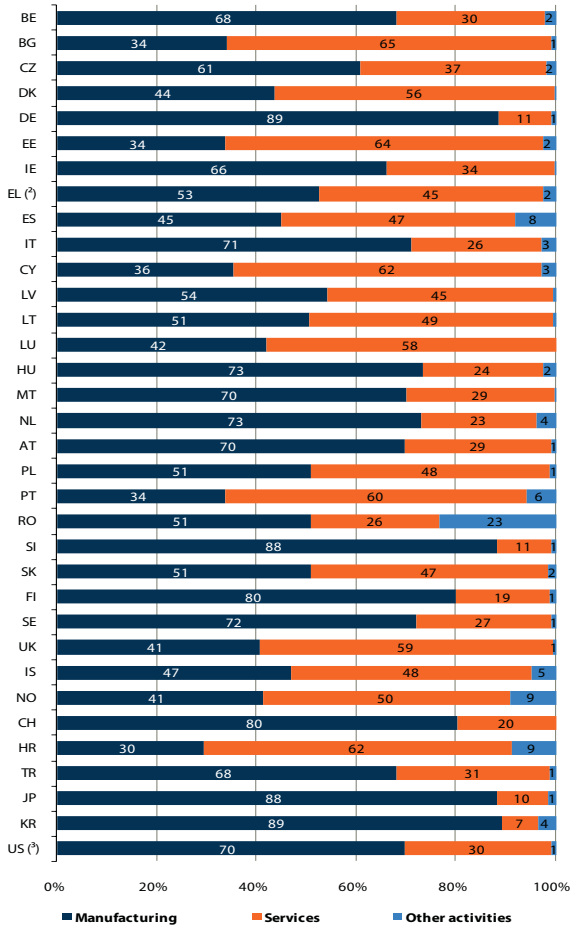
Figure 2.6: R&D expenditure by source of funds as a percentage of total, EU-27 and selected countries ranked by R&D intensity (R&D expenditure as % of GDP), 2008 ([1])



([1]) Exceptions to the reference year for R&D expenditure: 2007: (BE, BG, DE, IE, ES, IT, CY, LU, PT, SE, TR, NO, CN, KR, JP), 2005 (EL), 2004 (CH), 2003 (NL);
Exceptions to the reference year for R&D intensity: 2007 (EL, TR, CN, KR and JP), 2004 (CH).
([2]) Provisional data.
([3]) National estimate.
([4]) Excludes most or all capital expenditure, provisional data.
([5]) The sum of the breakdown does not add to the total.
([6]) Eurostat estimate.
([7]) GOV and Other national sources: national results adjusted by the Secretariat to meet Frascati Manual norms.

Source: Eurostat (online data code: rd_e_gerdtot 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, 2007 (1)



(1) Exceptions to the reference year: 2006 (IT), 2005 (IE,EL), 2004 (CH) FR: breakdown according to the principle activity of the enterprises is not available.
(2) Provisional data.
(3) Excludes most or all capital expenditure.

Source: Eurostat (online data code: rd_e_berdind), OECD-MSTI for KR, JP and US

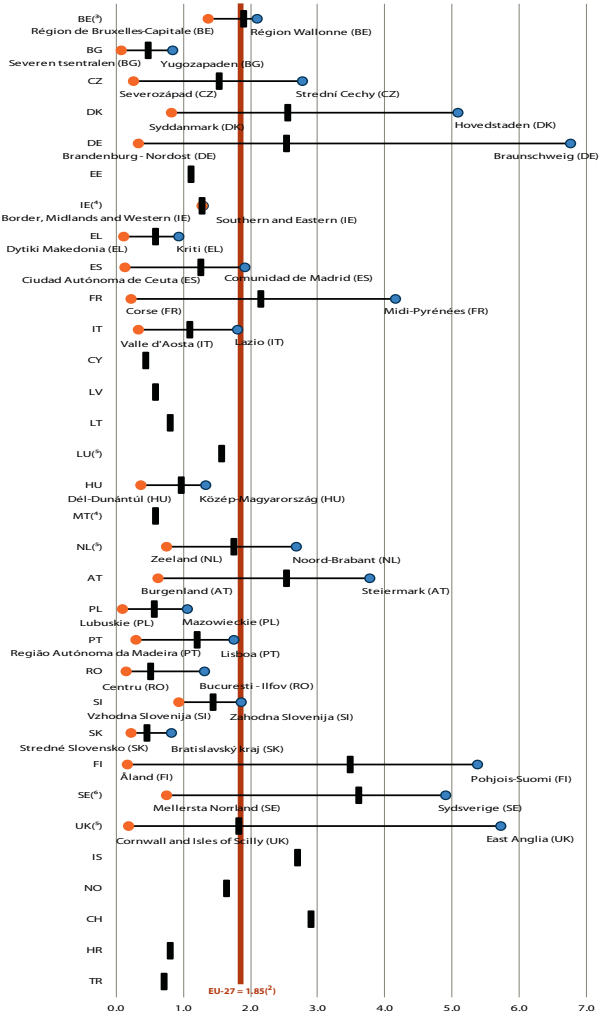
Table 2.8: Business enterprise R&D expenditure (BERD) in EUR million and by size class as a percentage of total, EU-27 and selected countries, 2007 ([1])

	Total EUR million	Less than 10 employees	Between 10 and 49 employees	Between 50 and 249 employees	More than 250 employees
EU-27	146 720 s	:	:	:	:
BE([2])	4 106	2.4 p	13.7 p	22.8 p	56.9 p
BG	43	5.6	11.6	30.9	52.0
CZ	1 211	1.9	8.0	23.1	67.0
DK	4 030	6.2	8.6	17.0	68.2
DE	43 034	0.5	2.6	7.6	89.3
EE	82	6.5	26.2	13.7	53.7
IE	1 330	2.6	17.3	26.6	53.5
EL	357	4.3	29.4	26.0	40.3
ES	7 454	4.9	20.6	28.9	45.7
FR	24 470 p	1.9	5.5	11.0	81.7
IT	6 979	1.0	4.1	11.9	83.0
CY	16	39.9	22.2	9.3	28.6
LV	41	7.9	14.4	29.4	48.3
LT	66	1.7	13.7	28.8	55.7
LU	408	:	10.3	17.9	71.8
HU	492	7.6	10.7	10.8	70.9
MT	21	:	19.0	23.9	57.1
NL	5495	:	6.8	15.4	77.5
AT	4 846	2.6	7.4	17.8	72.3
PL	535	0.6	4.8	27.9	66.7
PT	1 011	2.2	10.1	26.2	61.5
RO	272	3.5	9.9	26.6	59.9
SI	299	3.6	7.2	15.4	73.8
SK	100	2.2	9.0	45.5	43.2
FI([3])	4 513	2.4	7.3	10.3	80.0 i
SE	8 805	:	6.5	11.8	81.7
UK	23 543	2.5	3.7	11.9	81.8
NO	2 488	0.0	18.7	30.8	50.4
CH	6 257	1.2	6.8	12.4	79.5
HR([3])	141	0.4	6.7	45.5	47.5 i
JP([3])	85 770	:	:	6.4 i	93.7
KR	18 747	1.2	9.4	12.2	77.3
US([2])([3])	196 474 i	:	:	8.7 i	84.3 i

([1]) Exceptions to the reference year: 2006 (BE), 2005 (IE, EL, LU), 2004 (CH), 2003 (IT).
([2]) Incomplete breakdown of business R&D expenditure by size class.
([3]) Flag 'i':
FI and HR: includes other classes;
JP: underestimated or based on underestimated data;
US: excludes most or all capital expenditure.

Source: Eurostat (online data code: rd_e_berdsize)

Figure 2.9: Regional disparities (NUTS 2 level) in R&D expenditure as a percentage of GDP, 2007 (1)



(1) Exceptions to the reference year: 2005 (EL, IT), 2004 (FR, CH), 2003 (NL).
(2) Eurostat estimate.
(3) By NUTS 1 regions.
(4) Provisional data.
(5) National estimates.
(6) In some cases R&D expenduture are allocated to the head office.

Source: Eurostat (online data code: rd_e_gerdreg)

II

Monitoring the knowledge workers

3

R&D personnel

In 2007, R&D personnel comprised 1.57 % of total employment in the EU-27 (in head count — HC). At national level, the highest figures were in Finland (3.19 %), Iceland (3.13 %) and Luxembourg (2.74 %).

In 2008, the EU-27 had 2.5 million people — full-time equivalents (FTE) — working in R&D. In EU as a whole, the business enterprise sector was the largest sectoral employer, with more than half of all R&D personnel (1.3 million FTE). The national pattern was very varies, though. In Bulgaria, the government sector employed the most R&D personnel, while the higher education sector accounted for the highest share in Estonia, Greece, Cyprus, Latvia, Lithuania, Poland, Portugal and Slovakia.

Between 2003 and 2008, R&D personnel measured in FTE grew by 3.3 % a year on average in the EU-27, though again there were substantial variations between Member States. The highest increases, of more than 10 %, were recorded by Malta (17.0 %), Portugal (14.0 %), Czech Republic (12.7 %) and Slovenia (11.2 %), while three countries reported a decline — Finland (-0.2 %), Poland (-0.6 %) and Romania (-1.7 %).

The breakdown of researchers by institutional sector reveals a complex picture across the EU-27. In the EU-27, 45.9 % of researchers (in FTE) were employed in the business enterprise sector in 2008, while 40.4 % were in the higher education sector and 12.5 % in the government sector.

R&D remains largely a male field of work: in 2007, women in R&D (35.0 %) and female researchers (31.7 %) in HC were in a minority in the EU-27. Lithuania (54.5 %), Latvia (54.3 %) and Bulgaria (50.8 %) were the only countries where women accounted for more than half of R&D personnel. In numbers of researchers, only Lithuania and Latvia reached a gender balance, with 50.4 % and 52.4 % women respectively.

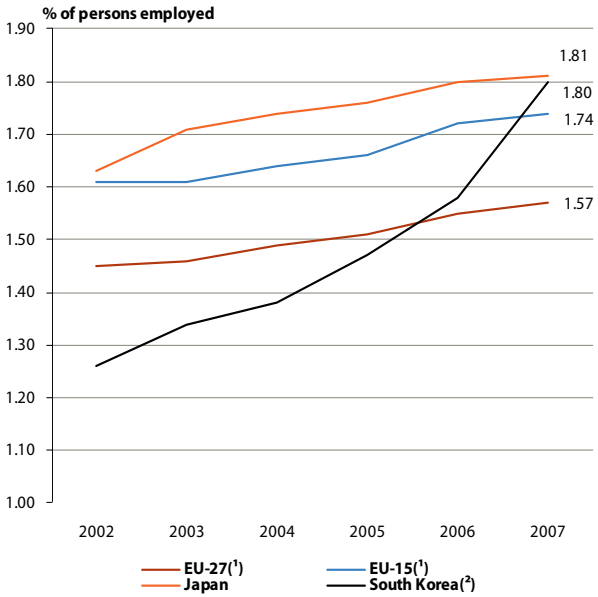
In the business enterprise sector, manufacturing accounted for the highest shares of researchers in most EU Member States. However, in Denmark, Estonia, Portugal, Slovakia and Iceland more than 60 % of BES researchers (in FTE) were employed in services.

In 2007, North Eastern Scotland (UK) was the leading European region for the share of R&D personnel in total employment, with 5.7 %. This was followed by the capital regions of Hovedstaden (DK), with 4.95 %, Praha (CZ), with

4.80 %, and Wien (AT), with 4.73 %. As we can see, capital regions were well represented among the leading regions. Apart from Trøndelag (NO) and Braunschweig (DE), the share of R&D personnel in total employment was below 4 % in all other European regions.

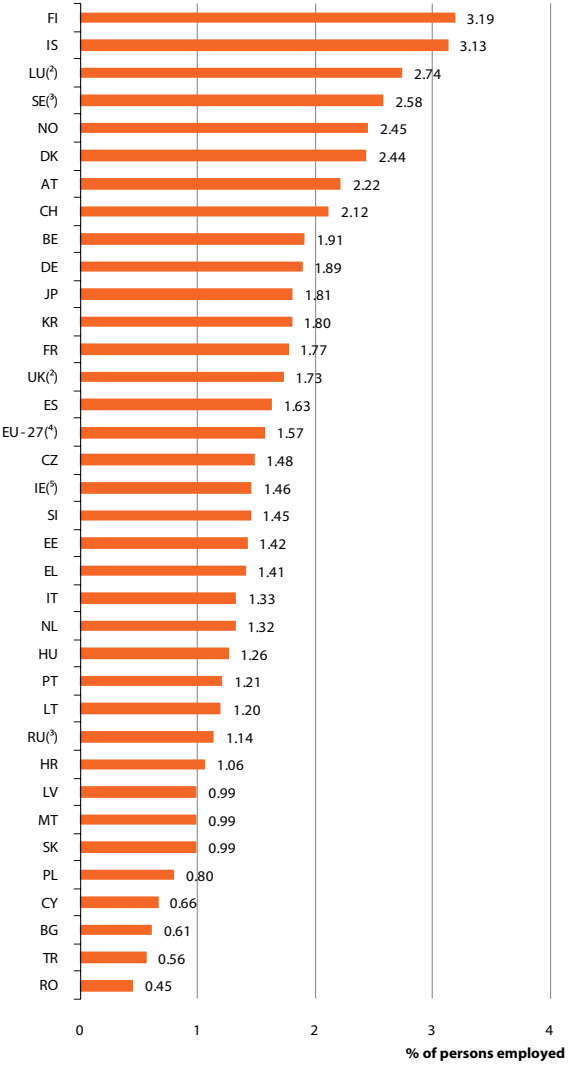
The largest discrepancy between the highest and lowest-ranking regions within a given country was in the United Kingdom (5.53 percentage points), and the smallest gap in Ireland, at 0.24 percentage points.

Figure 3.1: R&D personnel (HC) as a percentage of persons employed, EU-27, EU-15, Japan and South Korea, 2002–2007



(1) Eurostat estimate.
(2) 2002-2006 excluding R&D in social sciences and humanities; 2007 break in series.
Source: Eurostat (online data code: rd_p_perslf), OECD-MSTI for JP and KR

Figure 3.2: R&D personnel (HC) as a percentage of persons employed, EU-27 and selected countries, 2007 (1)



(1) Exceptions to the reference year: 2006 (IT), 2005 (EL), 2004 (CH), 2003 (NL).
(2) National estimate.
(3) Underestimated or based on underestimated data.
(4) Eurostat estimate.
(5) Provisional data.

Source: Eurostat (online data code: rd_p_perslf), OECD-MSTI for JP and KR

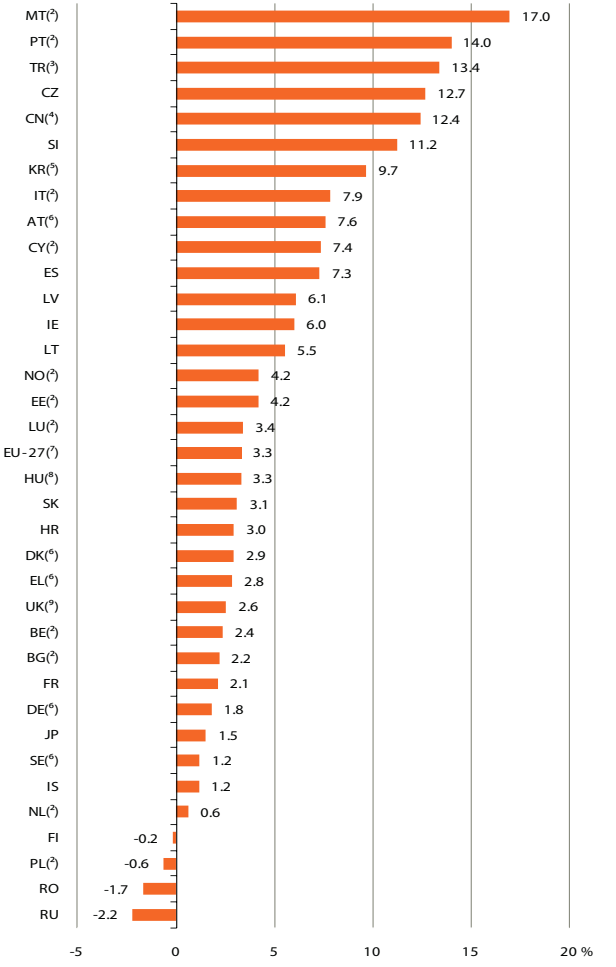
Table 3.3: R&D personnel in FTE by sector of performance, EU-27 and selected countries, 2008 (1)

	All sectors	Business enterprise sector	Government sector	Higher education sector	Private non-profit sector
EU-27	2 455 192 s	1 276 099 s	340 128 s	809 877 s	29 088 s
BE	58 733 p	33 938 p	4 032 p	20 166 p	598 p
BG	17 219 p	2 851 p	9 770 p	4 511 p	87 p
CZ	50 808	26 069	11 386	13 147	206
DK	48 096 e	31 965 e	1 755 e	14 093 e	283 e
DE	517 000 e	328 000 e	81 000 e	108 000 e	:
EE	5 086 p	1 845 p	747	2 389	105
IE	19 348	11 207 p	1 350	6 791 e	:
EL	35 629 e	11 660 e	4 584 e	19 172 e	213 e
ES	215 676	95 207 b	41 139	78 846	484
FR	372 326	213 361	50 664	102 509	5 792
IT	236 261 p	101 017 p	35 815 e	91 070 p	8 359 p
CY	1 315 p	325 p	295 e	565	130 p
LV	6 533	1 231	1 526	3 776	:
LT	12 632	1 944	2 977	7 711	:
LU	4 744 p	3 707 p	809 p	228 p	:
HU	27 403	11 373	8 050	7 980	:
MT	905 p	529 p	41 p	335 p	0
NL(2)	88 723 p	48 557 p	12 097 ip	28 069 p	: i
AT	57 494 e	40 143 e	2 700 e	14 474 e	176 e
PL	74 596 p	12 809 p	18 262 p	43 479 p	46 p
PT	49 114 p	15 279 p	4 890 p	24 128 p	4 818 p
RO	30 390	11 525	10 312	8 433	120
SI	11 594	6 205	3 260	2 106	23
SK	15 576	2 743	4 207	8 609	18
FI	56 698	33 111	7 122	15 968	497
SE	77 549 e	58 782 e	2 937 e	15 601 e	229 e
UK(2)	358 284 ip	167 685 p	17 661 p	166 116 ip	6 823 p
IS	3 117	1 481	733	808	95
NO	35 676 p	18 682 p	5 653 p	11 341 p	:
CH(2)	52 250	33 085	810 i	18 355 e	:
HR	10 583	2 575	3 354	4 640	14
TR	63 377	24 261	9 572	29 543	:
CN(2)	1 740 000 i	1 190 000 i	295 503 i	253 901 i	:
JP	937 865	620 004	63 162	240 932	13 767
KR	269 409	184 607	20 928	60 656	3 218
RU	869 772	477 284	282 929	106 816	2 744

(1) Exceptions to the reference year: 2007 (EL, FR, TR, CN, JP, KR), 2004 (CH).
(2) Flag 'i':
NL: GOV sector includes PNP sector;
UK: underestimated or based on underestimated data;
CH: federal or central government only;
CN: data do not comply with Frascati Manual recommendations.

Source: Eurostat (online data code: rd_p_persocc), OECD-MSTI for CN, JP and KR

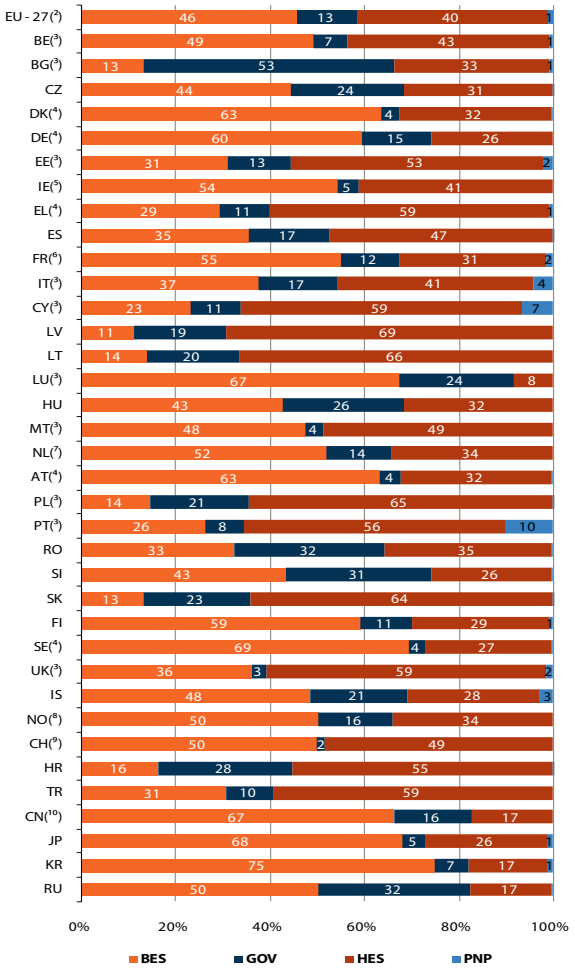
Figure 3.4: Average annual growth rate (AAGR) of R&D personnel (FTE), EU-27 and selected countries, 2003–2008 (1)



(1) Exceptions to the reference period: 2003-2007 (EL, FR, TR, CN, JP, KR), 2004-2008 (AT).
(2) 2008 provisional data.
(3) 2003: underestimated or based on underestimated data.
(4) Data do not comply with Frascati Manual recommendations.
(5) 2003 excluding R&D in social sciences and humanities; 2007 break in series.
(6) 2007, 2008: national estimate.
(7) Eurostat estimate.
(8) 2003 defence excluded (all or mostly).
(9) 2008: underestimated or based on underestimated data; provisional data; 2003: national estimate.

Source: Eurostat (online data code: rd_p_persocc), OECD-MSTI for CN, JP and KR

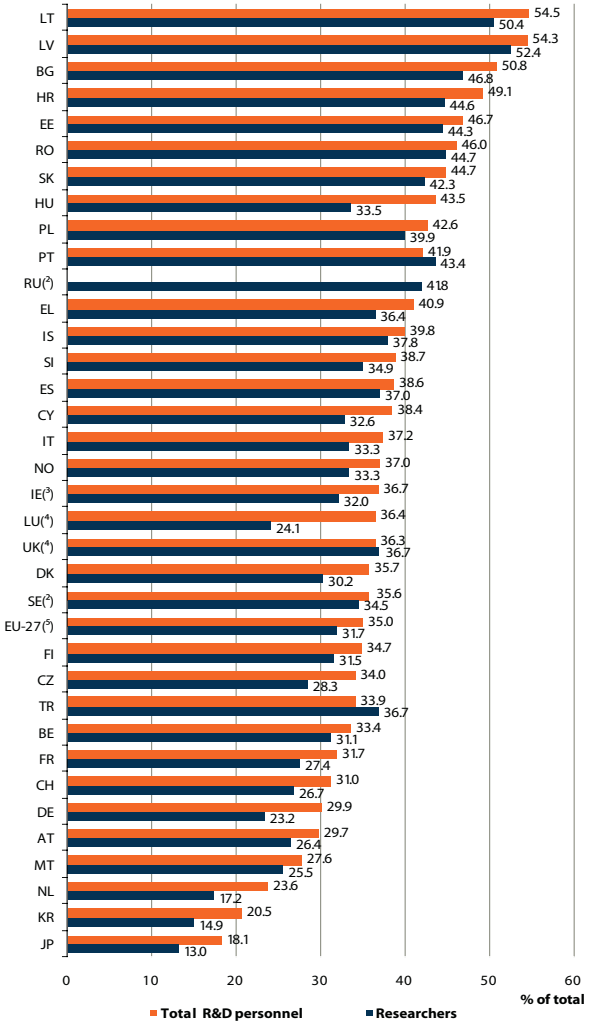
Figure 3.5: Researchers (FTE) by sector of performance as a percentage of total, EU-27 and selected countries, 2008 (1)



(1) Exceptions to the reference year: 2007 (EL, FR, TR, NO, CN, JP, KR), 2004 (CH).
(2) Eurostat estimate.
(3) Provisional data (in EE provisional data for total and BES only).
(4) National estimate.
(5) BES: provisional data;
HES: national estimate.
(6) GOV: defence excluded (all or mostly).
(7) GOV sector includes PNP sector, provisional data.
(8) BES and GOV: university graduates instead of researchers.
(9) Federal or central government only.
(10) Data do not comply with Frascati Manual recommendations.

Source: Eurostat (online data code: rd_p_persocc), OECD-MSTI for CN, JP and KR

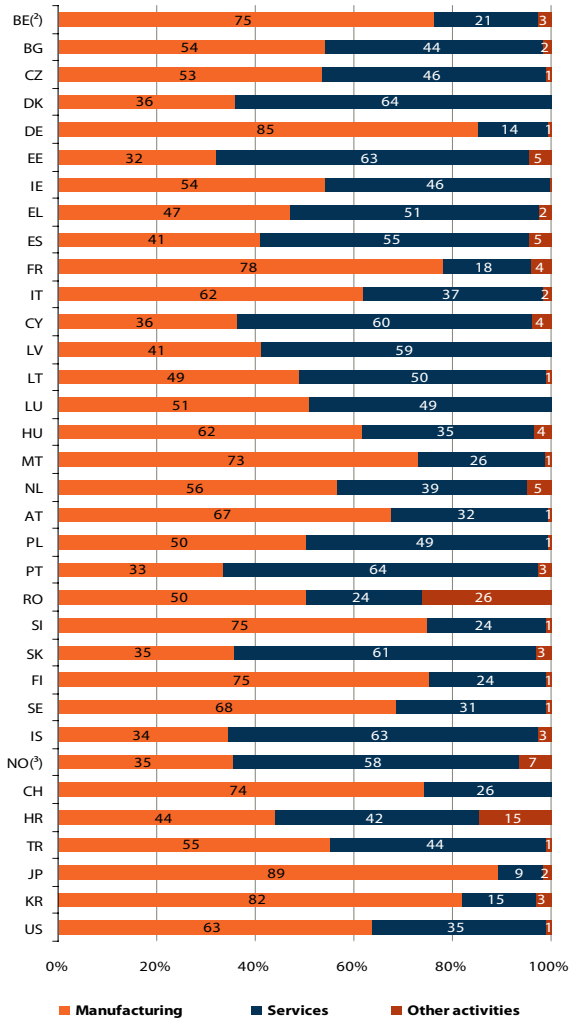
Figure 3.6: Percentage of women in total R&D personnel and among researchers (HC), EU-27 and selected countries, 2007 (1)



(1) Exceptions to the reference year: 2006 (FR, IT), 2005 (EL), 2004 (CH), 2003 (NL).
(2) Underestimated or based on underestimated data.
(3) Provisional data.
(4) National estimate.
(5) Eurostat estimate.

Source: Eurostat (online data code: rd_p_persocc), OECD-MSTI for JP and KR

Figure 3.7: Business enterprise sector researchers in FTE by sector of activity (NACE Rev.1.1) as a percentage of total, EU-27 and selected countries, 2007 (1)

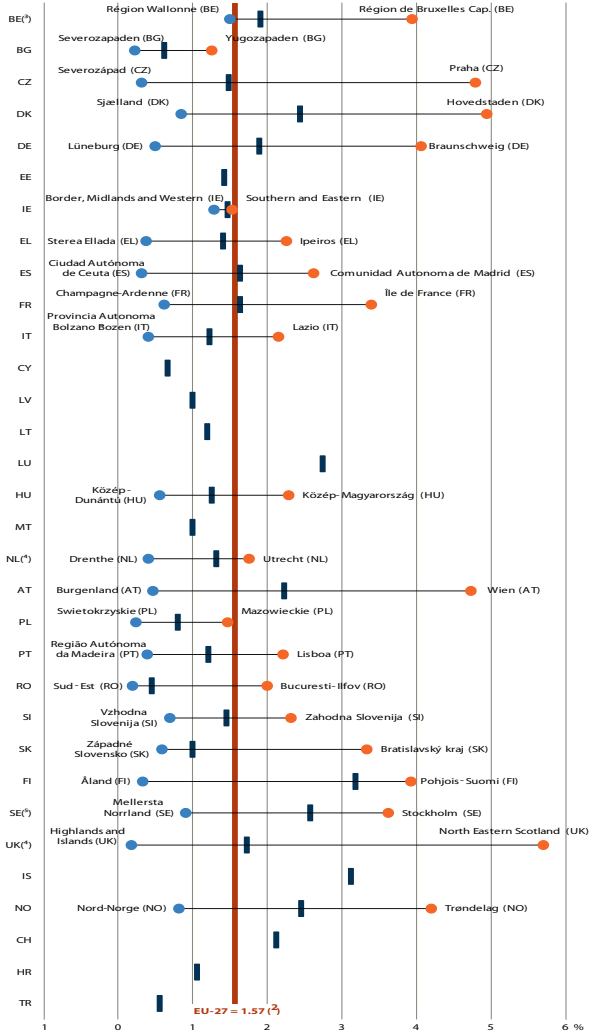


(1) Exceptions to the reference year: 2006 (BE, IT), 2005 (IE, EL, IS), 2004 (CH)
(2) Provisional data; breakdown does not equal to the total.
(3) University graduates instead of researchers.

Source: Eurostat (online data code: rd_p_bempocc), OECD-MSTI for JP, KR and US

UK: confidential data.

Figure 3.8: Regional disparities (NUTS 2 level) in R&D personnel (HC) as a percentage of persons employed, EU-27 and selected countries, 2007 ([1])



([1]) Exceptions to the reference year: 2005 (EL, IT), 2004 (CH), 2003 (NL), 2001 (FR).
([2]) Eurostat estimate.
([3]) By NUTS 1 regions.
([4]) National estimate.
([5]) In some cases R&D personnel is allocated to the head office.

Source: Eurostat (online data code: rd_p_persreg)

Human resources in science and technology (HRST)

4

Statistics on human resources in science and technology (HRST) monitor supply and demand for highly qualified persons. Stocks and flows are the main statistics for HRST.

In 2008, close to one third (29.8 %) of the EU population aged 20–29 years was in tertiary (i.e. higher) education. Although the percentage varied form country to country, it was above 20 % in all EU Member States except Malta and Luxembourg. Finland ranked highest, with 49.0 %, followed by Greece (46.5 %) and Lithuania (40.7 %).

At EU level, about a quarter of tertiary-education students chose science and engineering (S&E) as their main field of study, representing 7.3 % of the population aged 20–29 years.

In the EU-27, 55.3 % of students in higher education were women in 2008, yet women accounted for only 30.1 % of science and engineering students. The student population grew on average by 4.2 % a year between 2003 and 2008, but the number of students in S&E rose more slowly (3.3 %).

In terms of HRST stocks, the EU had more than 91 million highly qualified knowledge workers in 2009. Of these, 68 million were considered as HRST by virtue of education (HRSTE), 61.7 million by virtue of occupation (HRSTO) and 38.1 million by virtue of both education and occupation (HRSTC). In the EU-27, women accounted for more than 50 % in all HRST categories.

In the EU-27, the HRST population increased at an average rate of 2.8 % a year between 2004 and 2009. This was even higher than the increase in the total labour force over the same period (1.1 %), and held true for all EU-27 Member States except Austria and Bulgaria.

In 2009, HRSTE accounted for 28.8 % of the active population aged 25–64 years in the EU27. Finland had the largest proportion of HRSTE (41.3 %), followed by Norway (39.9 %), Ireland (39.9 %), Belgium (39.2 %) and Estonia (38.2 %).

In 2009, the distribution of HRSTC by age group was fairly even, with around one third of all HRSTC aged 25–34, one third aged 35–44 and the last third aged 45–64. However, some countries, such as Malta and Turkey, recorded a large proportion of HRSTC aged 25–34 years, whereas Croatia and Germany had a large share of HRSTC aged 45–64 years.

The composition of the HRSTO population varied considerably in the countries studied: 'professionals' accounted for 73.4 % of HRSTO in Ireland, with the EU average standing at 47.6 %. In contrast, 'technicians and associate professionals' represented 67.0 % of HRSTO in the Czech Republic.

Unemployment rates were generally significantly higher among non-HRST than among HRST. Although the rates for both categories remained comparable in the EU-27 between 2000 and 2009, substantial variations were noted in some countries. In Bulgaria, the unemployment rate dropped from 5.0 % (2000) to 2.4 % (2009) for HRST, and from 20.6 % (2000) to 8.8 % (2009) for non-HRST. In contrast, the opposite trend was observed in Ireland, where unemployment rates increased significantly for both categories.

In 2009, Praha (CZ) was the leading region for the proportion of HRSTO in the labour force, with 50.6 %. 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 30 leading regions in terms of HRSTO as a share of labour force. Some countries had several regions in the top 30, including Germany (with 9 regions), Switzerland (6), the Netherlands (4) and Sweden (2). All other countries had one region only.

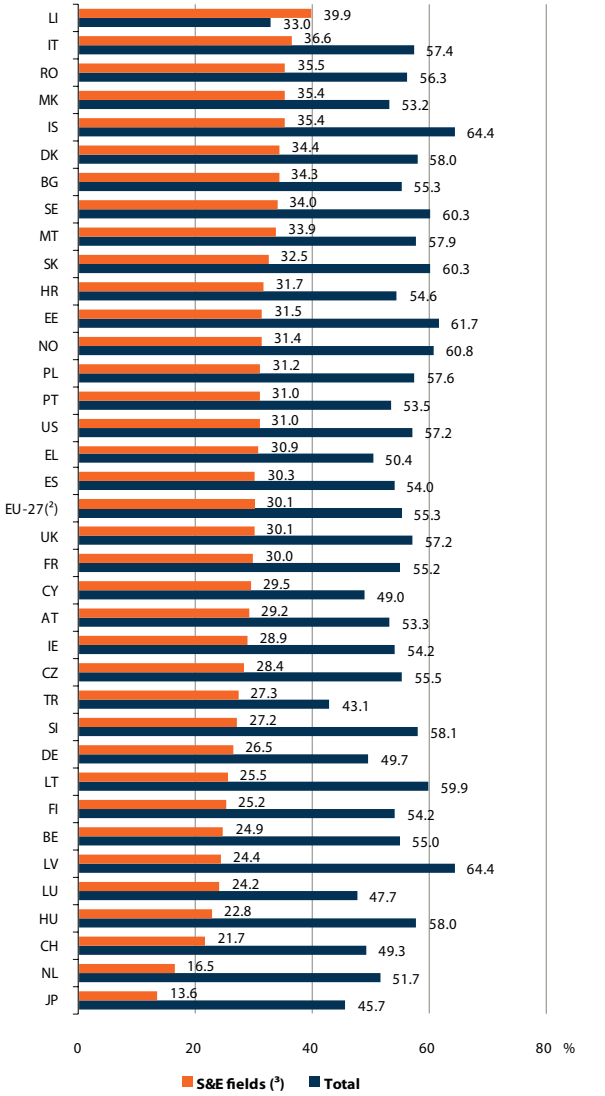
Table 4.1: Students participating in tertiary education, total and selected field of study, proportion of population aged 20–29 and proportion of all tertiary students, EU-27 and selected countries, 2008

	All fields		S&E (1)		Science, mathematics and computing	Engineering, manufacturing and construction
	Total number	As a % of population aged 20-29	As a % of population aged 20-29	As a % of all tertiary students	As a % of all tertiary students	As a % of all tertiary students
EU-27	19 040 142	29.8	7.3	24.3	10.3	14.1
BE	401 652	30.1	4.8	16.0	6.6	9.4
BG	264 463	29.6	7.2	24.5	5.0	19.5
CZ	392 540	26.2	6.9	26.4	10.8	15.7
DK	230 707	37.2	6.7	18.0	8.2	9.8
DE	2 245 138	23.3	7.2	31.0	15.2	15.8
EE	68 168	33.9	7.7	22.6	9.6	13.0
IE	178 518	23.8	6.0	25.3	12.5	12.8
EL	637 623	46.5	14.2	30.6	13.6	17.0
ES	1 781 019	29.0	8.0	27.6	9.9	17.7
FR	2 164 538	28.5	7.2	25.3	12.3	13.0
IT	2 013 856	30.1	6.9	22.9	7.6	15.3
CY	25 688	22.4	3.9	17.5	9.8	7.7
LV	127 760	36.6	5.8	15.8	4.8	11.0
LT	204 767	40.7	9.5	23.5	5.5	18.0
LU	2 979	5.1	1.3	24.7	16.2	8.5
HU	413 715	30.5	5.9	19.3	6.9	12.5
MT	9 472	16.6	2.9	17.2	9.4	7.8
NL	602 286	30.8	4.4	14.3	6.2	8.1
AT	284 791	27.2	7.0	25.5	11.6	13.9
PL	2 165 980	36.9	7.9	21.3	8.9	12.4
PT	376 917	26.8	8.0	29.8	7.5	22.3
RO	1 056 622	31.3	6.9	22.0	5.6	16.5
SI	115 445	39.7	9.6	24.1	5.9	18.1
SK	229 477	25.3	5.9	23.4	8.4	15.0
FI	309 648	49.0	17.6	35.9	10.9	24.9
SE	406 879	36.3	9.0	24.7	8.9	15.8
UK	2 329 494	28.7	6.1	21.1	12.9	8.2
IS	16 631	36.7	5.9	16.2	7.6	8.5
NO	212 672	36.1	5.8	16.0	8.5	7.5
CH	224 469	24.0	5.4	22.7	9.9	12.7
HR	143 410	29.2	6.8	23.4	7.9	15.4
MK	65 504	20.1	4.7	23.4	10.7	12.7
TR	2 532 622	21.7	4.5	20.5	7.6	13.0

(1) S&E = science, mathematics, computing + engineering, manufacturing and construction.

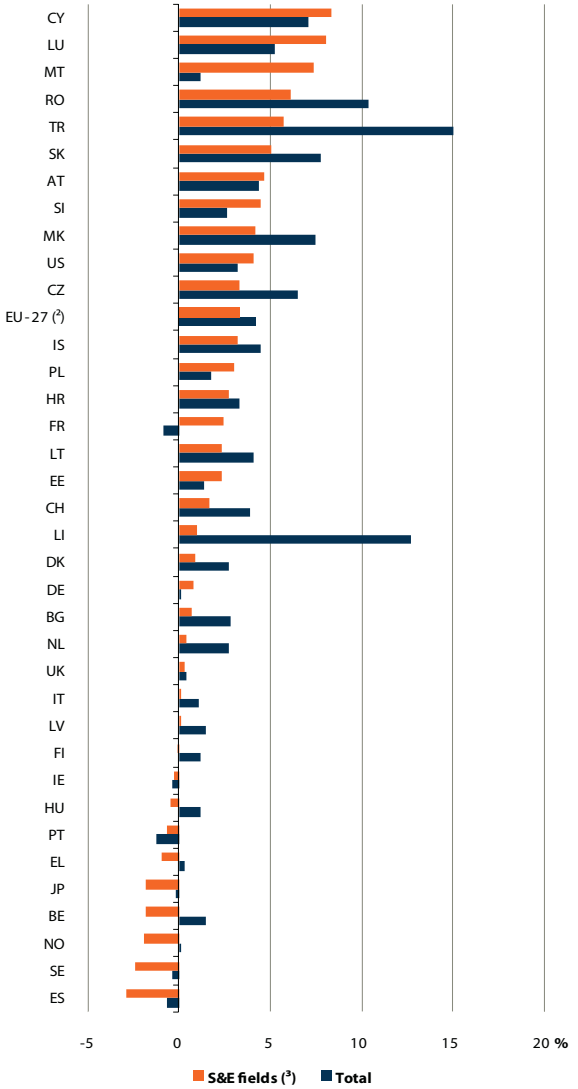
Source: Eurostat (online data code: hrst_fl_tepart)

Figure 4.2: Share of female students in tertiary education in all fields and in science and engineering (S&E), EU-27 and selected countries, 2008 (1)



(1) Exceptions to the reference year: 2007 (EL).
(2) Eurostat estimate.
(3) S&E = science, mathematics, computing + engineering, manufacturing and construction.
Source: Eurostat (online data code: educ_enrl5)

Figure 4.3: Annual average growth rates (AAGR) of tertiary students in all fields and in science and engineering (S&E), EU-27 and selected countries, 2003-2008 (1)



(1) Exceptions to the reference period: 2004-2007 (EL), 2006-2008 (FR, LU), 2005-2008 (US).
(2) Eurostat estimate.
(3) S&E = science, mathematics, computing + engineering, manufacturing and construction.

Source: Eurostat (online data code: educ_enrl5)

Table 4.4: Stocks of HRST and HRSTC, 25–64 years old, total and percentage of women, EU-27 and selected countries, 2009 (1)

	HRST		HRSTC	
	Total in 1 000's	% of women	Total in 1 000's	% of women
EU - 27 (2)	91 653 s	51.2 s	38 090 s	52.4 s
BE	2 336	50.3	992	52.9
BG	1 128	59.6	541	65.1
CZ	1 946	51.8	626	47.0
DK	1 344	51.9	655	57.9
DE	17 450	47.9	7 075	45.1
EE	300	65.0	114	74.6
IE	936	53.1	367	54.5
EL	1 608	49.6	799	51.2
ES	8 944	49.3	3 819	51.8
FR	11 934	51.5	4 932	53.3
IT	8 627	50.4	2 952	52.8
CY	167	49.7	75	49.3
LV	424	64.4	176	70.5
LT	649	61.6	292	71.2
LU	99	46.5	55	43.6
HU	1 490	59.1	623	58.3
MT	50	46.0	20	50.0
NL	3 994	48.8	1 813	48.2
AT	1 507	45.3	499	48.7
PL	5 841	59.6	2 691	61.1
PT	1 201	53.7	572	60.8
RO	2 232	54.0	1 078	53.5
SI	395	55.7	175	60.6
SK	845	57.4	307	55.0
FI	1 309	56.1	598	59.0
SE	2 197	52.1	1 100	58.3
UK	12 698	49.9	5 144	51.6
IS	76	56.6	35	57.1
NO	1 186	51.9	663	55.2
CH	2 143	44.1	920	39.3
HR	538	52.8	256	57.8
MK	204	50.5	81	50.6
TR	4 837	37.3	1 758	40.3

(1) Exceptions to the reference year: 2008 (LU).
(2) Eurostat estimate.

Source: Eurostat (online data code: hrst_st_ncat)

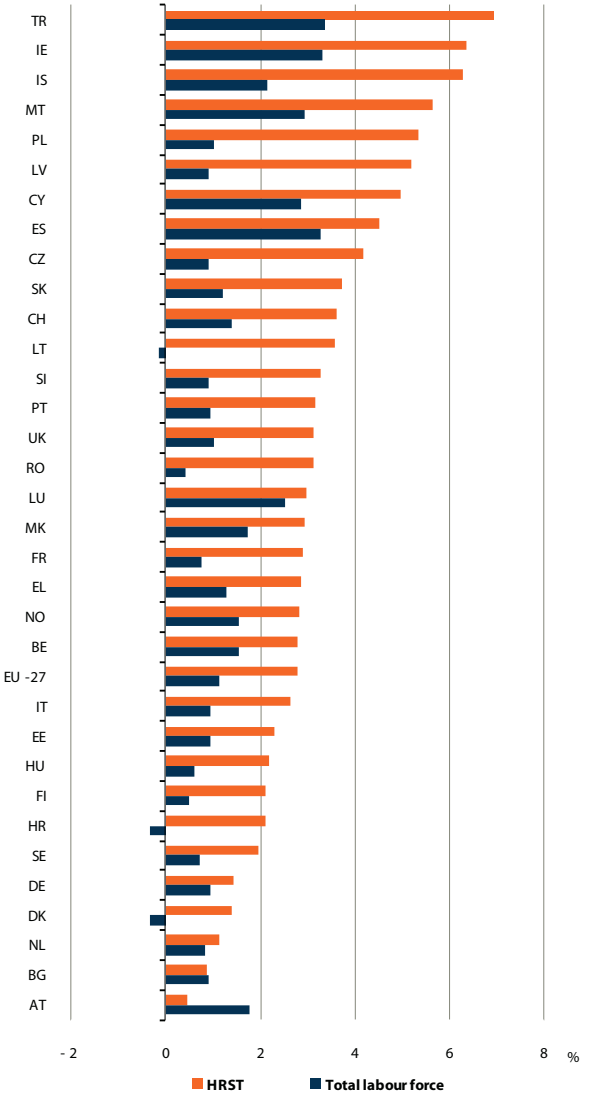
Table 4.5: Stocks of HRSTE and HRSTO, 25–64 years old, total and percentage of women, EU-27 and selected countries, 2009 (1)

	HRSTE		HRSTO	
	Total in 1 000's	% of women	Total in 1 000's	% of women
EU-27 (2)	68 016 s	51.6 s	61 727 s	51.5 s
BE	1 943	52.7	1 385	48.8
BG	967	61.0	702	61.8
CZ	948	47.6	1 625	52.4
DK	978	54.5	1 021	53.3
DE	11 670	43.2	12 855	50.6
EE	256	65.6	157	71.3
IE	848	54.0	455	52.5
EL	1 391	50.1	1 016	50.1
ES	8 069	50.2	4 695	49.7
FR	9 131	54.4	7 735	49.3
IT	4 836	55.4	6 743	47.9
CY	148	50.7	93	47.3
LV	318	65.4	282	66.7
LT	552	60.7	389	70.2
LU	73	46.6	81	45.7
HU	1 104	57.2	1 009	60.7
MT	31	51.6	40	42.5
NL	2 891	47.3	2 916	50.0
AT	875	44.5	1 130	47.4
PL	4 469	59.0	4 063	61.3
PT	873	59.9	900	52.2
RO	1 584	50.8	1 726	56.6
SI	272	58.5	298	56.0
SK	489	53.2	663	59.4
FI	1 092	57.7	815	56.2
SE	1 594	56.8	1 704	51.6
UK	10 615	51.4	7 227	49.0
IS	53	54.7	57	57.9
NO	938	54.2	911	51.9
CH	1 522	38.9	1 541	46.5
HR	392	55.6	402	53.2
MK	165	49.7	120	51.7
TR	4 062	40.3	2 533	34.5

(1) Exceptions to the reference year: 2008 (LU).
(2) Eurostat estimate.

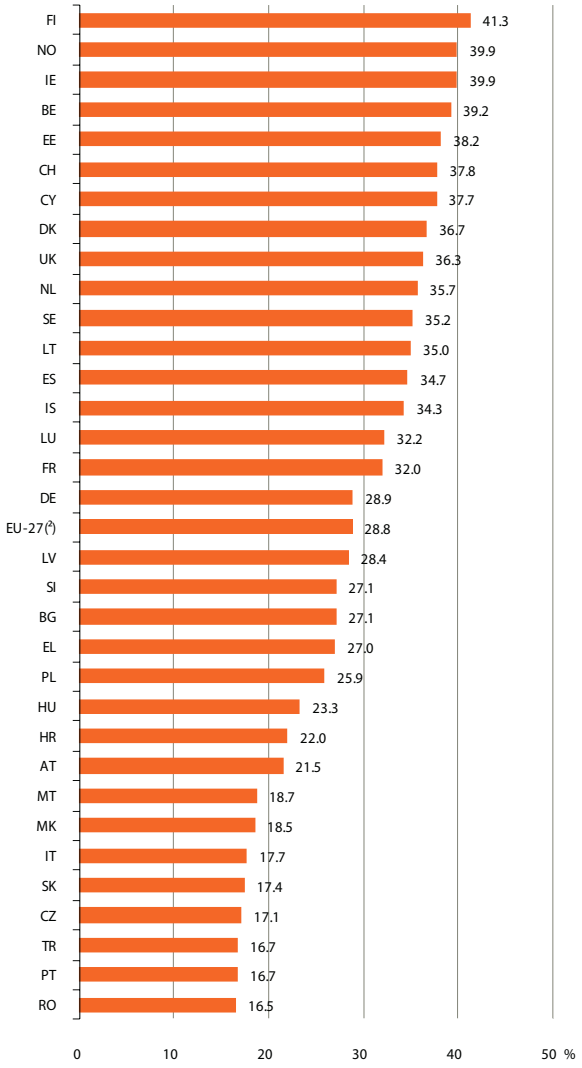
Source: Eurostat (online data code: hrst_st_ncat)

Figure 4.6: Annual average growth rate (AAGR) of HRST and of total labour force, EU-27 and selected countries, 2004–2009 ([1])



([1]) Exceptions to the reference period: in HRST: 2004-2008 (LU); in HRST and labour force: 2006-2009 (MK and TR).
Source: Eurostat (online data code: hrst_st_ncat and lfsa_agan)

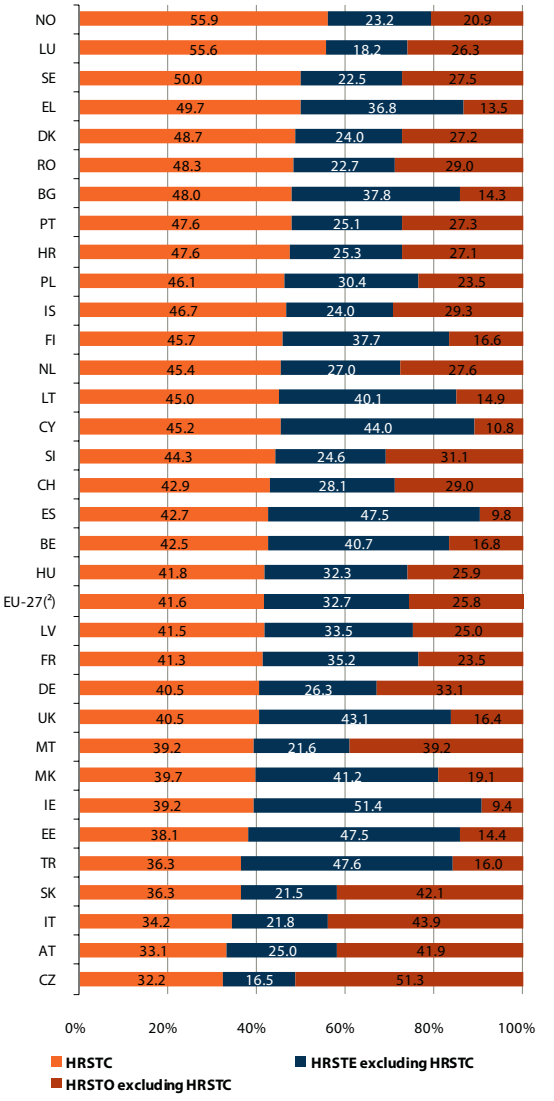
Figure 4.7: HRSTE aged 25–64 as a percentage of active population, EU-27 and selected countries, 2009 (1)



(1) Exception to the reference year: 2008 (LU).
(2) Eurostat estimate.

Source: Eurostat (online data code: hrst_st_ncat)

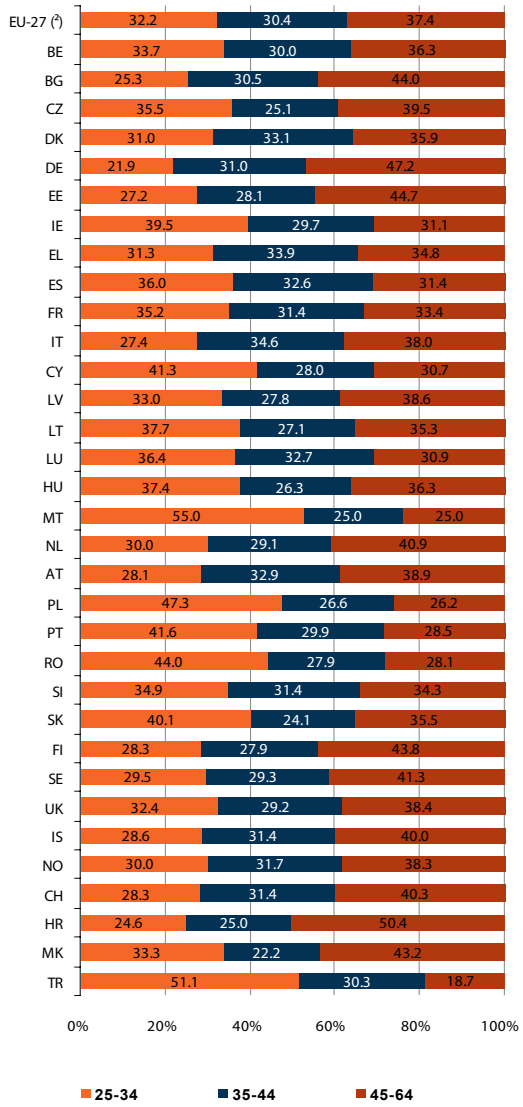
Figure 4.8: Distribution of HRST by category, EU-27 and selected countries, 2009 (1)



(1) Exceptions to the reference year: 2008 (LU).
(2) Eurostat estimate.

Source: Eurostat (online data code: hrst_st_ncat)

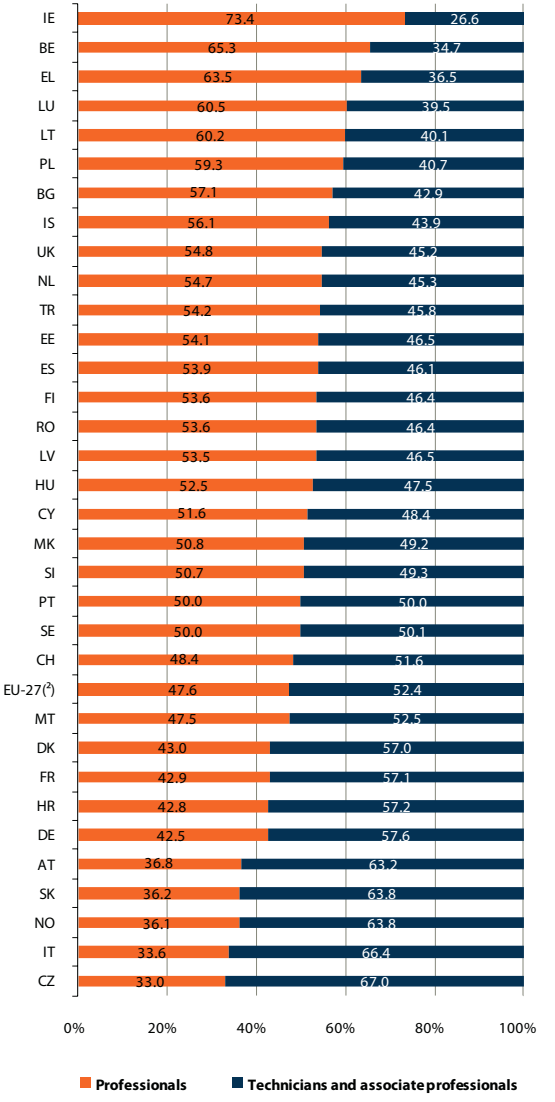
Figure 4.9: HRSTC by age group, EU-27 and selected countries, 2009 (1)



(1) Exceptions to the reference year: 2008 (LU).
(2) Eurostat estimate.

Source: Eurostat (online data code: hrst_st_ncat)

Figure 4.10: HRSTO aged 25–64 by occupation, EU-27 and selected countries, 2009 ([1])



([1]) Exceptions to the reference year: 2008 (LU).
([2]) Eurostat estimate.

Source: Eurostat (online data code: hrst_st_nocc)

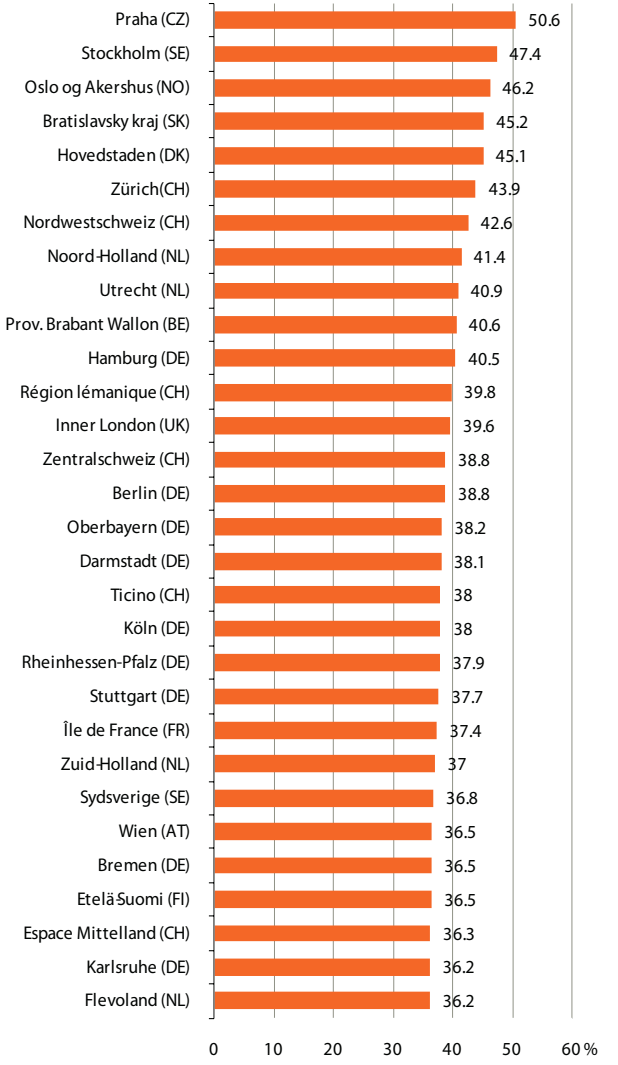
Table 4.11: Percentage of unemployment among HRST and non-HRST, EU-27 and selected countries, 2000 and 2009 ([1])

	2000		2009	
	HRST	Non-HRST	HRST	Non-HRST
EU-27 ([2])	3.2	12.1	3.6	12.3
BE	2.6	10.0	3.6	11.7
BG	5.0	20.6	2.4	8.8
CZ	1.2	12.0	1.1	10.0
DK	1.7	6.0	2.7	8.7
DE	2.6	11.3	2.2	11.8
EE	3.8 bu	18.7 bu	5.1	20.4
IE	1.4	5.7	6.1	15.9
EL	6.6	12.7	6.3	10.9
ES	9.3	15.9	8.4	23.7
FR	4.0	13.4	4.2	13.3
IT	2.6	13.8	2.8	10.3
CY	2.4	6.3	4.0	6.3
LV	4.7	18.3	5.9	23.8
LT	8.9	21.7	4.9	19.8
LU	: u	: u	1.7 u	7.6 u
HU	0.8	8.8	2.7	13.5
MT	: u	: u	: u	: u
NL	1.0 b	3.8 b	1.6	5.7
AT	1.2	6.1	1.2	6.9
PL	2.9 b	20.4 b	3.2	10.7
PT	1.7 u	4.3 u	4.6	11.0
RO	2.0	8.1	3.0	8.0
SI	1.3 u	9.2 u	2.1 u	8.2 u
SK	2.1	25.0	2.3	16.4
FI	3.8 b	16.7 b	3.2	12.6
SE	2.1	7.9	3.1	12.4
UK	1.9	7.5	3.5	10.5
IS	: u	: u	2.6	10.9
NO	1.9	4.3	1.3	4.4
CH	0.7	4.2	1.8	6.5
HR	6.5	17.9	3.6 u	11.3 u
MK	15.8 b	41.3 b	16.8	36.5
TR	5.9 b	8.9 b	8.7	13.5

([1]) Exceptions to the reference year 2000: 2002 (HR), 2006 (MK, TR); Exceptions to the reference year 2009: 2008 (LU).
([2]) EU-27 in 2009 does not include LU.

Source: Eurostat (online data code: hrst_st_nunesex)

Figure 4.12: Top 30 regions in the EU and selected countries ranked according to the percentage of HRSTO in the labour force (NUTS level 2), 2009



Source: Eurostat (online data code: hrst_st_rcat)

III

Productivity and competitiveness

5

Innovation

Community Innovation Surveys

The Community Innovation Survey (CIS) is designed to monitor innovation activity in Europe. It makes it easier to understand the innovation process and analyses the effects of innovation on the economy (including competitiveness, employment, economic growth and trade patterns).

The first pilot survey was run in 1993 and was repeated every four years. Community legislation has increased the frequency from four to two years, starting from 2004. However, only part of the survey is compulsory ([1]): a full survey is conducted every four years and a reduced one every two years in between the main ones. Six CIS have been launched so far. The latest one had 2008 as reference year and its results are available on Eurostat's reference database (EUROBASE).

In the interests of comparability across countries, Eurostat, in close cooperation with the EU Member States, developed a standard core questionnaire starting with the 2000/01 collection round, with an accompanying set of definitions and methodological recommendations. Further work on harmonising methodologies and questionnaires has enabled spatial and time comparisons of data to be made, starting with the 2004 survey round. At each survey round improvements were made and new concepts were developed and added.

CIS 2008 collected information about **product** and **process innovations, organisational** and **marketing innovation** and other key variables over the three-year period 2006 to 2008 inclusive. Most of the questions covered new or significantly improved goods or services or the use of new or significantly improved processes, logistics or distribution methods. It produced a broad set of indicators on innovation activities, innovation expenditure, public funding, sources of information for innovation, innovation cooperation, innovation objectives, organisational and marketing innovations and innovations with environmental benefits.

CIS 2008 was carried out in all 27 Member States, plus Croatia, Turkey (NACE Rev. 1.1), Iceland and Norway. As for previous editions, Eurostat devised the harmonised survey questionnaire and the survey methodology in close cooperation with the participating countries. The result is a satisfactory level of harmonisation regarding data input and data production.

([1]) See Commission Regulation (EC) No 1450/2004 and derogations.

In contrast to previous CIS surveys based on NACE Rev.1.1, CIS 2008 used the NACE Rev.2 classification of economic activities, in accordance with Annex IV of Commission Regulation No 973/2007. The latest edition of CIS also introduced a new exhaustive definition of innovation that includes organisational and marketing innovation, in line with the third edition of the Oslo Manual. In the CIS 2008 tabulation, a distinction was made between enterprises with technological (PP) and non-technological (NPP) innovation; this was for the purposes of comparability with previous data collections, since fewer questions in the harmonised questionnaire are related to organisational and marketing innovation than to product and process innovation.

Two major changes were made in the CIS 2008 questionnaire compared to the 2006 version:

First, the CIS 2006 questions on hampering factors and intellectual property rights were not included in the CIS 2008 questionnaire. This resulted from the decision to only include certain questions (for which responses change slowly over time) every four years instead of every two. The purpose was to keep the questionnaire short and allow the addition of one-off modules on topics of policy relevance. Second, the CIS 2008 questionnaire included an optional one-page module on eco-innovation.

The changes in the CIS 2008 questionnaire were based on the need to comply with the third revision of the Oslo Manual. This was achieved by giving greater weight to organisational and marketing innovation. However, the question on innovation expenditure was still limited to product and process innovation in order to maintain continuity with earlier versions of the CIS.

Some results of CIS 2008

In the EU-27 (excluding Greece), 51.6 % of enterprises in industry and services reported innovation activity between 2006 and 2008. Of the EU-27 Member States, the highest figures were recorded in Germany (79.9 %), Luxembourg (64.7 %), Belgium (58.1 %), Portugal (57.8 %) and Ireland (56.5 %). The lowest rates were observed in Latvia (24.3 %), Poland (27.9 %), Hungary (28.9 %), Lithuania (30.3 %) and Bulgaria (30.8 %).

In 2008, 39.8 % of enterprises in the EU-27 (excluding Greece and the United Kingdom) were considered innovative in terms of technological innovation, one percentage point more than in 2006.

In most countries, the proportion of innovative enterprises was generally higher in manufacturing than in services. The opposite was true in Luxembourg, Hungary and Portugal.

Over 2006–2008, one third of innovative enterprises in the EU-27 cooperated with other enterprises, universities or public research institutes, while the remaining two thirds relied only on internal resources. The highest proportions of innovation cooperation were found in Denmark (56.8 %), Cyprus (51.4 %), Belgium (48.8 %) and Estonia (48.6 %), and the lowest in Romania (13.8 %), Italy (16.2 %), Bulgaria and Latvia (both 16.6 %). In the EU-27, 11.2 % of innovative enterprises teamed up with a partner in the EU-27, EFTA or the candidate countries, 3.2 % joined forces with a partner in the United States and 1.8 % cooperated with a partner in India or China. Innovation cooperation with a European partner was highest in Slovenia (35.0 %), Estonia (33.3 %), Belgium (29.5 %), Luxembourg (27.9 %), Slovakia (25.8 %) and Finland (26.4 %), and lowest in Spain and Italy (both 4.4 %), Bulgaria and Ireland (both 5.6 %) and Germany (7.2 %). Finland (11.1 %), Sweden (11.2 %), Belgium (9.4 %) and Luxembourg (8.7 %) recorded the highest shares of cooperation with US partners. Sweden (7.3 %), Finland (6.7 %) and Belgium (5.8 %) also reported the highest shares of cooperation with partners in India or China.

With the exception of Cyprus, innovative enterprises in the EU-27 were more often engaged in in-house R&D than in external R&D.

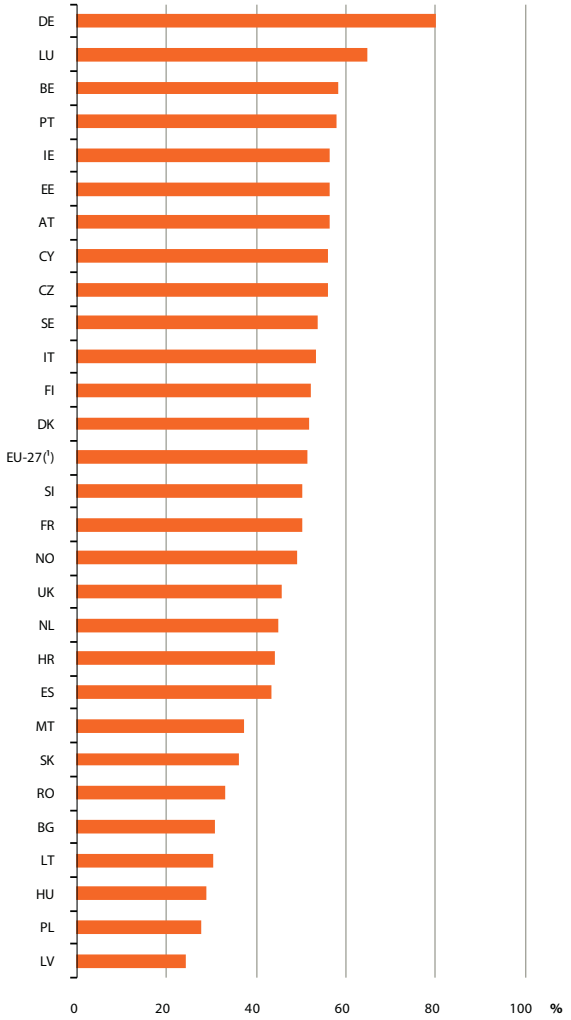
When questioned about the objectives of innovation, more than half of innovative enterprises in the EU-27 mentioned the improvement of the quality of goods and services and increase of a range of goods and services. Around 39.6 % of them pointed to gaining market shares and entry into new markets.

When queried about environmental innovation, the existence of environmental regulations or taxes was the leading reason for innovation in eleven countries. In eight countries, the foremost reason was the need to comply with voluntary codes or agreements on environmental good practice within the sector. In the Netherlands and Finland, current or

expected market demand from customers for environmental innovations was the main motivation.

In this publication, the majority of tables and figures present the data as a percentage of firms with innovation activities (including product, process, ongoing or abandoned, organisational and marketing innovations). However, in some tables and figures (fig 5.5, tab 5.6, fig 5.7, tab 5.8 and tab 5.10), the indicators are based on the number of enterprises with technological innovation (product, process, ongoing or abandoned), i.e. disregarding organisational or marketing innovations.

Figure 5.1: Enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation) as a percentage of all enterprises, EU-27 and selected countries, 2008

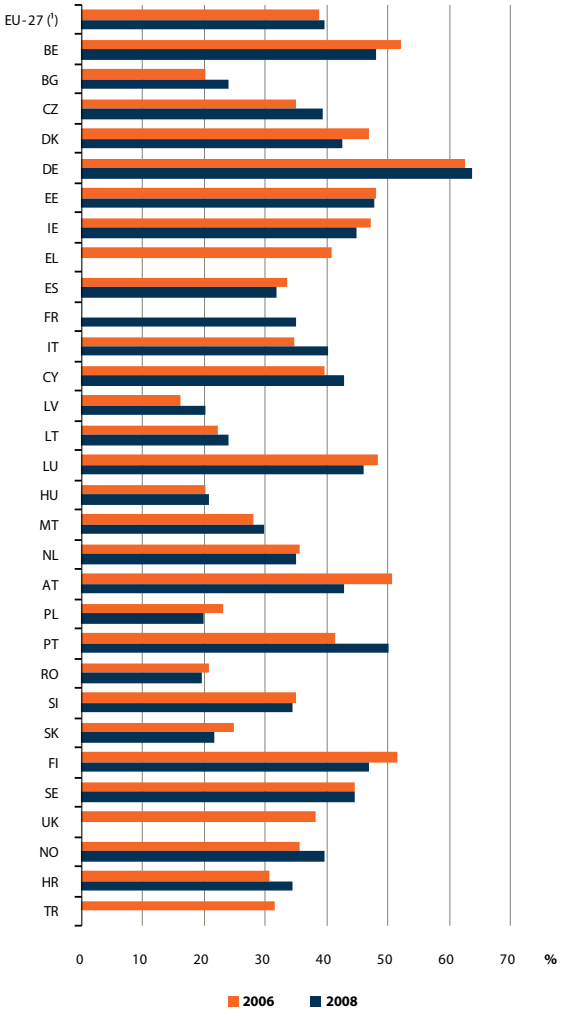


(1) EU-27 excluding EL.

Source: Eurostat (online data code: inn_cis6_type)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).

Figure 5.2: Enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation in CIS 2006 and CIS 2008, EU-27 and selected countries

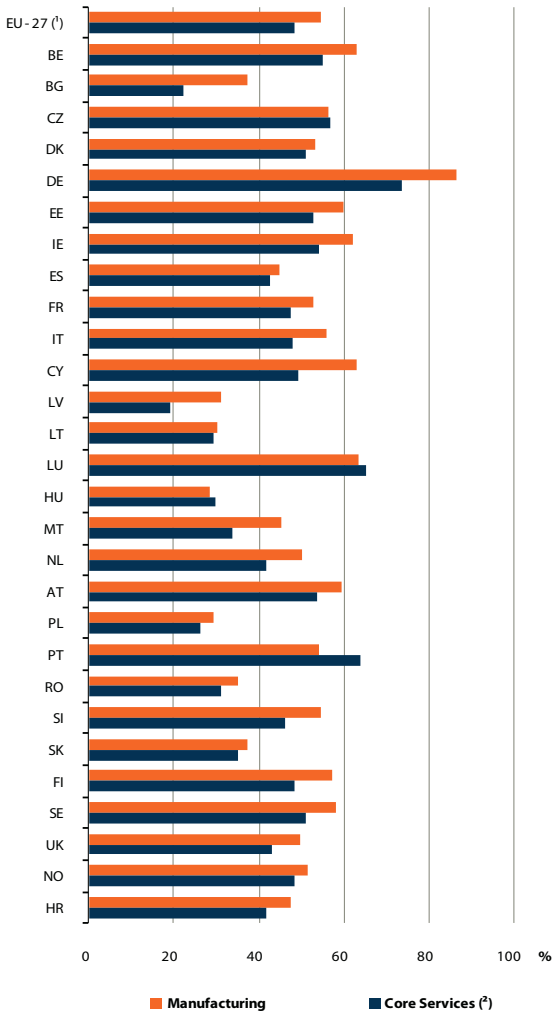


(1) CIS 2008: EU-27 excluding EL and UK.
CIS 2006: EU-27 excluding FR.

Source: Eurostat (online data code: inn_cis5_prod and inn_cis6_type)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.

Figure 5.3: Innovative enterprises as a percentage of all enterprises, by main NACE group, EU-27 and selected countries, 2008 (based on new definition of innovation)

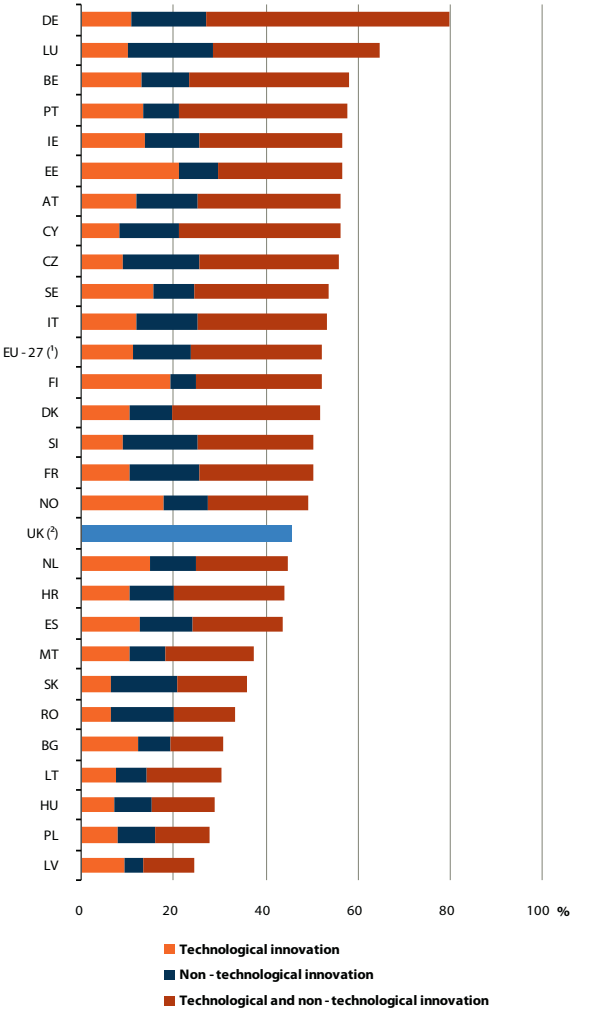


(1) EU-27 excluding EL.
(2) Innovation core services activities include NACE Rev.2 codes: G46, H, J58, J61, J62, J63, K and M71.

Source: Eurostat (online data code: inn_cis6_type)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).
EL: data not available.

Figure 5.4: Innovative enterprises by type of innovator, as percentage of all enterprises, EU-27 and selected countries, 2008

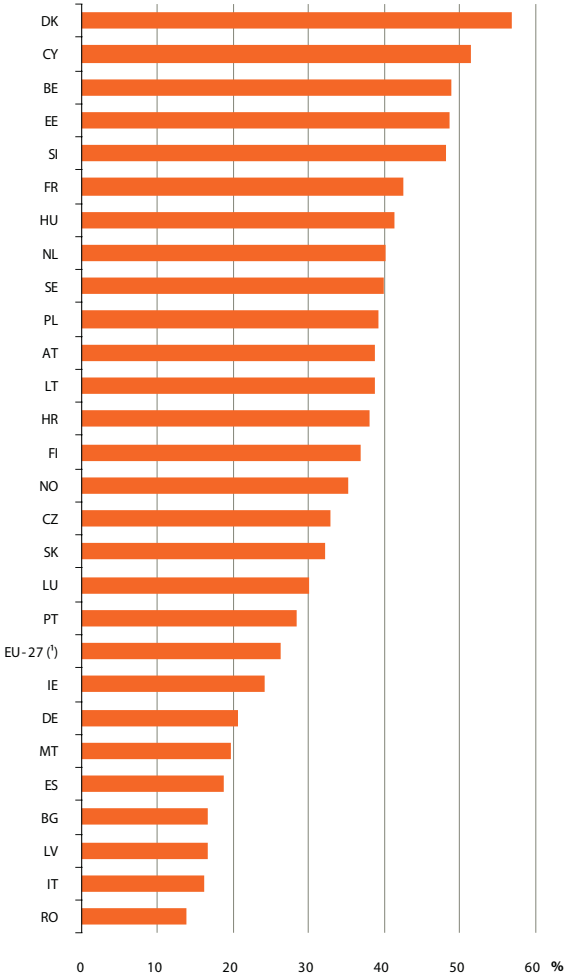


(1) EU-27 excluding EL and UK.
(2) UK: the breakdown by type of innovator is missing.

Source: Eurostat (online data code: inn_cis6_type)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).
EL: data not available.

Figure 5.5: Enterprise with any type of co-operation as a percentage of innovative enterprises, EU-27 and selected countries, 2008



(1) EU-27 excluding EL and UK.

Source: Eurostat (online data code: inn_cis6_coop)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.
EL and UK: data not available.

Table 5.6: Co-operation arrangements on innovation activities by location, as a percentage of innovative enterprises, 2008

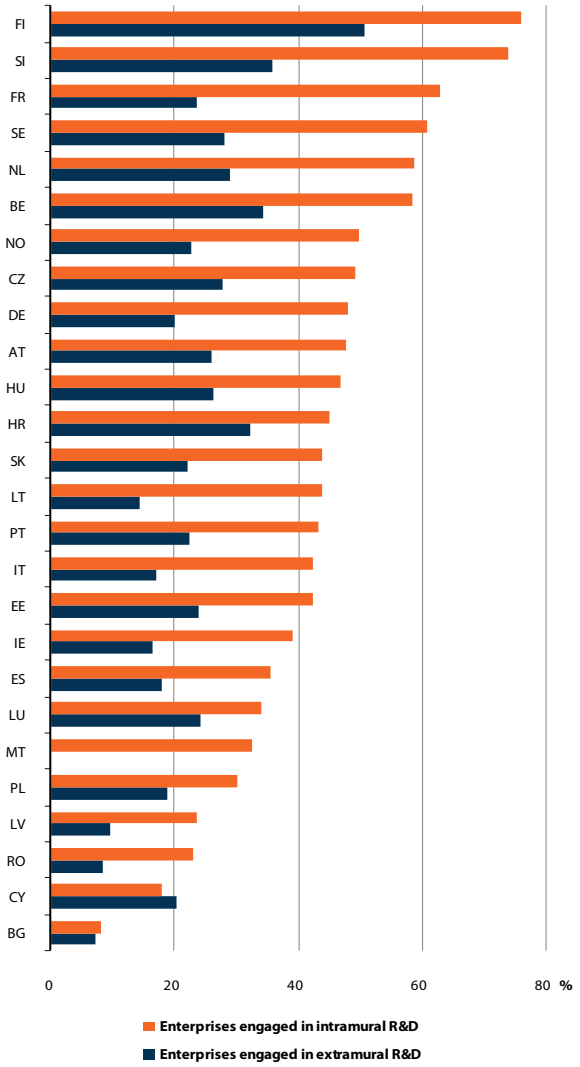
	Enterprises engaged in any type of innovation co-operation				
	national	within other Europe	within the US	within other partner countries	with China or India
EU-27 (1)	24.2	11.2	3.2	2.6	1.8
BE	41.8	29.5	9.4	7.9	5.8
BG	14.4	5.6	1.1	1.7	0.5
CZ	29.1	19.8	2.8	2.8	2.0
DK	:	:	:	:	:
DE	19.9	7.2	2.4	1.5	1.3
EE	34.0	33.3	2.7	3.2	1.4
IE	19.3	5.6	2.5	15.9	2.8
EL	:	:	:	:	:
ES	17.7	4.4	1.0	0.9	0.4
FR	39.1	15.9	5.2	4.0	2.4
IT	14.8	4.4	1.3	0.7	0.8
CY	46.7	24.9	3.6	6.6	3.2
LV	9.3	12.0	1.2	3.6	0.1
LT	35.3	19.9	4.5	5.8	2.6
LU	24.7	27.9	8.7	6.3	3.7
HU	38.9	16.7	3.1	2.5	2.7
MT	11.7	15.7	3.1	3.6	2.0
NL	36.3	21.1	7.4	5.1	3.1
AT	33.6	23.9	3.1	2.6	1.8
PL	35.8	18.8	4.2	3.8	2.0
PT	27.0	11.8	1.8	2.4	1.1
RO	12.9	7.6	1.4	0.6	0.8
SI	45.0	35.0	6.6	8.9	4.1
SK	27.0	25.8	4.0	4.8	3.5
FI	36.4	26.4	11.1	7.6	6.7
SE	37.7	24.8	11.2	8.6	7.3
UK	:	:	:	:	:
NO	31.7	16.1	4.3	2.9	2.2
HR	35.6	13.5	2.3	0.7	1.1

(1) EU-27 excluding DK, EL and UK.

Source: Eurostat (online data code: inn_cis6_coop)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.

Figure 5.7: Number of innovative enterprises doing intramural and extramural R&D as a percentage of innovative enterprises by country, 2008



Source: Eurostat (online data code: inn_cis6_exp)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.
DK, EL and UK: data not available.

Table 5.8: Innovation objectives during 2006–2008 (as high important) as a percentage of innovative enterprises

	Increase range of goods or services	Replace outdated products or processes	Enter new markets	Increase market share	Improve quality of goods or services	Improve flexibility for producing goods or services	Increase capacity for producing goods or services	Improve health and safety	Reduce labour costs per unit output
EU-27 (1)	52.2	34.5	39.6	42.4	56.6	33.9	31.7	24.9	28.1
BE	48.4	32.4	27.1	39.8	48.7	28.1	25.7	16.1	21.1
BG	30.7	24.9	29.7	29.6	35.8	16.7	18.4	23.4	18.2
CZ	46.7	34.9	24.0	32.2	47.0	27.3	24.0	18.5	28.8
DK	25.0	27.7	23.8	33.4	30.3	18.8	18.5	11.1	30.0
DE	54.3	34.6	46.1	42.5	54.7	36.5	28.5	21.0	26.5
EE	36.5	35.8	24.1	32.3	50.8	31.1	33.9	18.7	21.3
IE	46.3	31.8	40.5	48.4	48.8	30.9	28.7	23.7	38.9
EL	:	:	:	:	:	:	:	:	:
ES	33.7	26.3	25.7	28.7	42.3	31.4	35.9	20.4	22.1
FR	56.3	35.1	40.9	47.9	49.7	25.0	25.7	20.8	22.7
IT	43.7	26.9	27.0	28.2	50.0	24.9	27.1	28.0	18.3
CY	63.4	66.4	45.1	62.0	77.3	64.4	61.4	40.5	37.0
LV	12.2	9.3	11.3	8.9	12.6	7.4	10.3	8.0	6.9
LT	30.3	26.4	26.5	32.8	42.8	26.6	27.7	17.6	28.3
LU	68.8	36.9	47.5	59.5	69.5	44.4	34.6	29.5	20.5
HU	62.1	46.5	56.1	61.3	65.7	49.6	37.2	34.8	27.8
MT	41.6	22.3	31.0	34.0	45.7	29.4	27.4	19.3	27.4
NL	32.4	18.6	28.1	34.2	36.3	21.7	17.5	11.3	14.7
AT	55.1	41.4	42.8	49.4	62.5	37.1	28.3	18.0	21.3
PL	50.5	37.8	36.1	42.3	54.3	26.7	36.9	27.8	25.5
PT	42.0	34.5	39.8	44.5	58.3	38.6	39.7	35.2	41.0
RO	50.0	34.4	35.5	34.1	55.5	30.6	32.2	27.5	24.4
SI	79.0	48.8	45.3	61.2	73.6	42.9	41.9	34.3	54.6
SK	45.5	27.8	22.5	34.7	50.1	32.0	26.5	21.9	15.6
FI	41.2	29.3	29.6	37.9	43.0	30.2	23.7	13.1	30.2
SE	43.9	32.0	28.3	45.2	45.2	28.3	25.5	16.1	34.1
UK	:	:	:	:	:	:	:	:	:
NO	49.3	39.1	36.6	60.8	71.6	37.7	34.5	49.2	37.6
HR	47.3	42.2	30.5	31.1	56.8	38.6	32.7	20.2	28.3

(1) EU-27 excluding EL and UK.

Source: Eurostat (online data code: inn_cis6_obj)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.

Table 5.9: Enterprises with organisational or marketing innovation as a percentage of all enterprises, EU-27 and selected countries, 2008

	Enterprise introduced organisational and/or marketing innovations	Enterprise introduced organisational innovation	Enterprise introduced marketing innovation
EU-27 (1)	40.1	31.0	26.6
BE	45.0	35.3	29.5
BG	18.4	15.2	10.5
CZ	47.0	34.0	35.6
DK	41.5	33.3	28.8
DE	69.0	50.3	55.7
EE	35.2	25.5	23.2
IE	42.6	32.3	27.0
EL	:	:	:
ES	30.9	27.0	15.5
FR	39.8	33.8	20.9
IT	41.2	31.1	27.1
CY	48.0	39.0	33.0
LV	14.9	10.0	11.0
LT	22.6	17.5	17.8
LU	54.6	45.0	35.1
HU	21.9	14.6	15.4
MT	26.9	18.9	18.1
NL	29.9	21.3	18.3
AT	44.3	34.9	27.3
PL	20.1	14.1	13.9
PT	44.5	36.3	30.8
RO	26.8	19.8	11.0
SI	41.2	29.8	29.9
SK	29.7	20.1	20.1
FI	33.0	24.7	21.7
SE	38.0	28.7	24.0
UK	31.5	27.5	17.8
NO	31.4	20.1	21.7
HR	33.9	24.6	25.5

(1) EU-27 excluding EL.

Source: Eurostat (online data code: inn_cis6_mo)

Table 5.10: Innovative enterprises that received public financial support for innovation activities, as a percentage of innovative enterprises, EU-27 and selected countries, 2008

	Enterprise that received any public funding	Public funding received from			
		Local or regional authorities	Central government (1)	European Union	6th or 7th Framework Programme
EU-27	:	:	:	:	:
BE	22.3	16.7	7.7	4.4	2.7
BG	9.5	0.5	5.7	5.0	0.7
CZ	17.1	4.3	8.9	8.0	3.1
DK	:	:	:	:	:
DE	19.2	9.3	8.1	4.1	2.7
EE	13.1	1.9	8.6	5.7	0.9
IE	:	:	:	:	:
EL	:	:	:	:	:
ES	26.4	17.7	12.9	1.7	1.1
FR	16.7	9.4	12.0	4.8	1.7
IT	31.4	19.7	12.5	3.7	0.7
CY	33.7	2.9	30.9	6.1	2.1
LV	11.9	:	1.8	11.6	2.0
LT	13.4	2.3	6.2	8.5	4.2
LU	21.1	5.9	17.5	4.8	3.7
HU	27.5	1.3	19.0	13.0	1.0
MT	22.3	:	17.8	6.6	2.0
NL	27.8	7.2	22.8	4.7	2.6
AT	40.0	22.1	30.7	8.5	2.6
PL	17.7	3.4	5.4	11.7	3.0
PT	12.8	1.5	9.8	4.4	2.0
RO	9.7	2.9	4.8	5.4	1.9
SI	24.0	2.1	17.6	11.9	3.7
SK	14.0	0.6	5.7	10.3	1.7
FI	34.8	7.7	29.2	6.7	2.2
SE	:	:	:	:	:
UK	:	:	:	:	:
HR	27.9	5.6	24.4	1.7	0.4

(1) Including central government agencies or ministries.

Source: Eurostat (online data code: inn_cis6_pub)

Innovative enterprises mean enterprises with technological innovation (product, process, ongoing or abandoned), regardless organizational or marketing innovation.

Table 5.11: Environmental benefits from the production of goods or services within the enterprise, as a percentage of innovative enterprises, 2008

	Environmental benefits from the production of goods or services within the enterprise					
	Reduced material use per unit of output	Reduced energy use per unit of output	Reduced CO2 'footprint' (total CO2 production) by your enterprise	Replaced materials with less polluting or hazardous substitutes	Reduced soil, water, noise, or air pollution	Recycled waste, water, or materials
EU-27	:	:	:	:	:	:
BE	22.8	30.3	26.6	25.7	28.8	35.7
BG	11.6	13.6	6.0	10.0	10.5	8.6
CZ	28.6	33.1	17.1	20.1	27.0	41.3
DK	:	:	:	:	:	:
DE	38.8	46.4	38.5	25.5	41.7	41.2
EE	27.4	11.7	13.4	22.3	10.0	10.6
IE	28.2	33.5	33.1	30.9	27.1	54.3
EL	:	:	:	:	:	:
ES	:	:	:	:	:	:
FR	27.6	28.2	21.0	26.5	24.7	38.8
IT	13.0	16.5	13.4	15.3	23.8	25.8
CY	10.8	13.6	8.6	8.2	13.5	13.2
LV	19.9	23.5	11.5	19.7	27.9	14.3
LT	29.3	29.3	20.7	25.6	21.3	18.2
LU	20.8	24.8	27.1	26.6	22.6	41.4
HU	31.8	36.3	17.3	29.4	27.6	26.1
MT	23.0	27.0	13.7	19.8	12.5	27.8
NL	17.1	21.1	15.9	22.3	19.3	21.5
AT	26.9	30.7	25.1	27.4	30.9	23.6
PL	23.5	25.3	16.1	24.9	28.2	23.7
PT	37.8	41.5	31.5	41.3	46.2	58.5
RO	31.3	32.8	22.7	21.1	31.5	32.3
SI	:	:	:	:	:	:
SK	20.2	23.7	9.2	19.5	21.9	29.3
FI	32.0	32.9	25.9	24.0	22.8	32.2
SE	24.0	28.6	23.7	24.2	23.0	21.8
UK	:	:	:	:	:	:
HR	28.8	32.7	18.1	30.4	39.2	36.1

Source: Eurostat (online data code: inn_cis6_eco)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).

Table 5.12: Environmental benefits from the after sales use of a good or service by the end user, as a percentage of innovative enterprises, 2008

	Environmental benefits from the after sales use of a good or service by the end user		
	Reduced energy use	Reduced air, water, soil or noise pollution	Improved recycling of product after use
EU-27	:	:	:
BE	27.0	20.8	24.0
BG	8.8	8.1	6.1
CZ	30.7	27.5	29.7
DK	:	:	:
DE	44.0	35.5	30.8
EE	15.0	10.2	10.4
IE	33.1	23.8	37.1
EL	:	:	:
ES	:	:	:
FR	23.9	17.6	17.7
IT	23.5	23.5	23.3
CY	5.4	6.1	5.6
LV	21.7	27.9	12.6
LT	22.9	20.0	18.7
LU	30.1	18.3	29.2
HU	19.1	16.9	13.4
MT	19.8	6.9	16.9
NL	19.8	15.9	13.8
AT	28.9	23.1	17.2
PL	24.8	25.3	17.0
PT	39.1	38.8	41.8
RO	30.3	29.6	20.1
SI	:	:	:
SK	26.2	21.0	19.0
FI	33.0	20.3	22.2
SE	28.1	23.6	18.5
UK	:	:	:
HR	32.6	36.1	31.2

Source: Eurostat (online data code: inn_cis6_eco)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).

Table 5.13: Motivation to introduce an environmental innovation, as a percentage of innovative enterprises, 2008

	Existing environmental regulations or taxes on pollution	Environmental regulations or taxes that you expected to be introduced in the future	Availability of government grants, subsidies or other financial incentives for environmental innovation	Current or expected market demand from your customers for environmental innovations	Voluntary codes or agreements for environmental good practice within your sector
EU-27	:	:	:	:	:
BE	20.1	16.3	7.8	13.6	26.1
BG	8.6	5.4	2.4	4.0	5.2
CZ	40.6	26.8	9.5	13.6	24.3
DK	:	:	:	:	:
DE	20.8	19.0	7.7	18.3	18.8
EE	24.1	19.3	4.4	17.2	26.3
IE	27.2	19.9	9.1	25.3	28.5
EL	:	:	:	:	:
ES	:	:	:	:	:
FR	24.0	15.0	6.4	17.6	23.9
IT	22.9	16.3	12.8	13.0	14.8
CY	7.2	5.3	3.1	3.9	13.1
LV	19.1	11.3	8.3	13.6	34.0
LT	39.3	31.8	12.5	26.8	24.5
LU	10.1	11.4	4.4	15.0	43.2
HU	41.3	34.5	4.1	31.9	32.8
MT	23.8	23.8	8.1	11.3	13.3
NL	10.5	9.2	6.7	13.8	12.7
AT	:	:	:	:	:
PL	24.1	16.1	4.9	12.7	13.3
PT	31.6	18.3	7.0	21.9	42.0
RO	37.6	20.4	9.3	17.6	17.7
SI	:	:	:	:	:
SK	37.0	27.3	4.7	11.7	18.9
FI	15.8	17.8	6.2	30.3	29.1
SE	8.4	12.3	2.7	14.7	15.1
UK	:	:	:	:	:
HR	35.7	28.0	8.4	19.6	30.3

Source: Eurostat (online data code: inn_cis6_ecomot)

Innovative enterprises mean enterprises with innovation activity (product, process, ongoing or abandoned, organisational and marketing innovation).

6

Patents

In 2007, Germany submitted the largest number of patent applications to the EPO among the EU-27 Member States (23 929), followed by France (8 421), the United Kingdom (5 422) and Italy (5 107). In terms of patent applications per million inhabitants, Sweden was in the lead (298), closely followed by Germany (291) and Finland (251).

At world level the highest numbers of patent applications were recorded in the US (31 908), Japan (20 657) and Korea (5 607).

At EU level, the number of patent applications to the EPO increased by an average of 2.7 % a year between 2002 and 2007. Over the same period, patenting activity rose in every EU Member State except in the United Kingdom.

In 2007, the majority of 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, Spain, Cyprus, Malta, Portugal and the United Kingdom specialised in 'Human necessities' (IPC section A). 'Performing operations; transporting'(section B) was the most prominent section for patenting in the Czech Republic, Germany, Greece, France, Italy, Luxembourg, Austria and Poland, whereas 20 % or more of patent applications from Belgium, Latvia and Lithuania were on 'Chemistry; metallurgy' (section C). By contrast, patenting was generally less frequent for 'Textiles; paper' (section D), 'Fixed constructions' (section E) and 'Mechanical engineering (section F). In Bulgaria, Ireland, the Netherlands and Romania the biggest share of patent applications to the EPO concerned 'Physics' (section G). Applications related to 'Electricity' (section H) were predominant in Estonia, Hungary, Slovakia, Finland and Sweden. The majority of patent applications were submitted by the business enterprise sector, accounting for half or even three quarters of all applications in all countries except Greece and Lithuania.

High-tech applications to the EPO as a percentage of the total varied significantly. Shares of over 50 % were posted by South Korea (61.3 %), China (56.4 %), Estonia (52.7 %) and Finland (51.6 %).

Biotechnology is another fertile field for patent applications, albeit one of the smaller fields overall. Estonia was in the lead on biotechnology patenting, with 18.6 % of all Estonia's patent applications being in this field. At EU level, only 4.3 % of all

patent applications related to biotechnology inventions.

In 2009, Eurostat published for the first time new indicators on nanotechnology and energy technology patent applications. Nanotechnology is a field of research that is still in its infancy and is small in terms of patenting. Nevertheless, in 2006, the EU-27 accounted for 37 % of all nanotechnology patent applications to the EPO, followed by the United States (32 %), and Japan (18 %).

In 2006, the EU-27 made 4 347 patent applications on energy technologies to the EPO. Among the energy technologies subcategories, '*traditional engines*' represented more than a half of those patents, '*lightning*' accounted for 11 % and '*heat exchange*' and '*solar energy*' patents each represented 7 % of the total. Patents on '*geothermal energy*', '*stirling engines*', '*biofuels*', '*waste heat recovery*' and '*biomass*' accounted for no more than 1 %. Most of the patent applications on energy technologies were submitted by Germany (48 %), France (14 %), the United Kingdom (9 %), Italy (8 %) and the Netherlands (5 %).

In terms of foreign ownership of domestic inventions the EU-27, considered as an entity, ranked fourth among countries with the lowest rate of foreign ownership, with 13 %, behind South Korea and Japan (3 % each) but ahead of the United States, Taiwan or Switzerland. In the EU Member States, more than 50 % foreign ownership was registered in Romania, Malta, Slovakia, Hungary, Bulgaria and Estonia, and below 20 % in Germany and Finland. 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 co-patents, involving several applicants from the same country.

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

In 2006, the top thirty NUTS 2 regions in terms of patent applications per million inhabitants featured 16 in Germany, four in Sweden, three in Austria, two each in Finland and France, and one each in the Netherlands, Belgium and Luxembourg.

Table 6.1: Patent applications to the EPO, total number, per million inhabitants and AAGR, EU-27 and selected countries, 2002–2007 (1)

	Total		Per million inhabitants		AAGR 2002-2007
	2002	2007	2002	2007	
EU-27	50 462	57 725	104	117	2.7
BE	1 287	1 472	125	139	2.7
BG	15	29	2	4	14.7
CZ	88	162	9	16	13.1
DK	935	1 057	174	194	2.5
DE	21 503	23 929	261	291	2.2
EE	6	23	4	17	32.6
IE	224	288	57	67	5.2
EL	74	109	7	10	8.0
ES	938	1 451	23	33	9.1
FR	7 321	8 421	119	132	2.8
IT	4 168	5 107	73	86	4.1
CY	7	9	9	11	6.3
LV	6	19	3	8	25.2
LT	3	8	1	2	25.2
LU	61	110	137	230	12.6
HU	120	173	12	17	7.5
MT	4	8	10	20	15.8
NL	3 442	3 656	214	223	1.2
AT	1 269	1 797	157	217	7.2
PL	81	146	2	4	12.4
PT	41	121	4	11	24.1
RO	11	21	1	1	13.2
SI	76	103	38	51	6.3
SK	24	42	5	8	11.7
FI	1 257	1 323	242	251	1.0
SE	2 002	2 719	225	298	6.3
UK	5 500	5 422	93	89	-0.3
IS	35	28	123	91	-4.6
LI	26	31	785	895	3.7
NO	377	515	83	110	6.4
CH	2 641	3 224	364	429	4.1
HR	37	32	8	7	-2.8
MK(2)	:	1	:	0	:
TR	60	220	1	3	29.6
AU	988	917	50	43	-1.5
CA	1 754	2 377	56	72	6.3
CN	548	2 118	0	2	31.1
IL	889	1 303	140	188	7.9
IN	432	545	0	0	4.8
JP	20 218	20 657	159	162	0.4
KR	2 260	5 607	47	116	19.9
RU	180	281	1	2	9.3
TW	486	1 004	22	44	15.6
US	31 171	31 908	108	106	0.5

(1) 2007 estimated.
(2) MK: 2006.

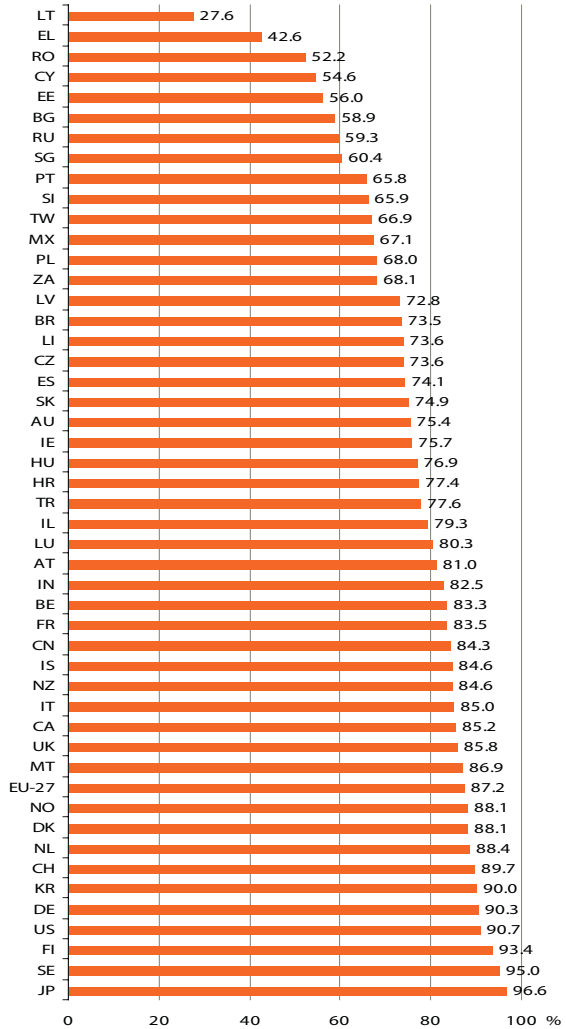
Source: Eurostat (online data code: pat_ep_ntot)

Table 6.2: Breakdown of patent applications to the EPO by IPC section as a percentage of total, EU-27 and selected countries, 2006

	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	21.2	12.2	1.9	4.7	12.0	14.7	16.6
BE	17.8	19.6	25.9	2.0	5.1	4.9	10.9	13.9
BG	16.3	18.4	4.9	1.5	3.7	13.5	36.1	5.5
CZ	16.8	19.1	17.8	2.8	4.9	15.2	8.7	14.7
DK	29.9	12.1	15.0	0.4	4.7	12.5	11.5	13.9
DE	13.5	24.8	12.2	2.1	4.4	14.7	13.9	14.5
EE	26.4	8.9	9.6	0.0	0.0	0.0	13.2	41.9
IE	24.0	12.7	9.4	0.6	3.8	5.9	25.7	17.8
EL	17.5	22.6	10.6	1.9	5.1	13.4	11.6	17.2
ES	23.0	21.2	16.0	1.5	6.9	10.6	8.9	12.0
FR	17.4	20.0	11.4	1.3	4.1	10.9	15.8	19.1
IT	20.5	27.1	9.8	3.5	6.3	13.1	9.4	10.3
CY	38.2	22.8	2.7	0.0	0.0	13.6	20.5	2.3
LV	15.2	7.1	63.2	0.0	6.0	5.6	0.0	3.0
LT	17.3	0.0	55.1	0.0	10.3	0.0	0.0	17.3
LU	6.3	29.7	15.2	0.3	3.0	23.5	12.6	9.5
HU	16.4	12.8	19.4	0.2	4.0	5.8	17.6	23.9
MT	26.1	14.0	5.9	0.0	13.1	26.1	0.0	14.8
NL	19.9	13.8	12.9	1.1	4.1	6.7	22.7	18.8
AT	16.5	20.1	10.4	2.3	8.7	11.2	11.2	19.7
PL	14.9	17.3	12.3	1.9	11.2	14.2	13.9	14.3
PT	24.7	10.3	10.7	1.1	8.4	10.7	11.9	22.3
RO	24.1	7.8	0.8	0.0	3.5	25.8	26.7	11.3
SI	46.9	7.4	24.4	1.0	3.6	5.9	6.1	4.7
SK	8.0	22.1	24.0	3.3	2.5	14.8	1.0	24.3
FI	9.8	13.0	6.1	3.2	4.3	5.6	19.4	38.6
SE	17.4	18.6	6.9	2.0	3.2	9.8	14.4	27.8
UK	21.0	14.4	13.6	0.6	4.4	9.5	18.7	17.7
IS	49.4	8.4	11.3	0.0	3.4	3.4	20.6	3.4
LI	26.6	45.8	2.1	0.0	3.4	12.6	3.4	6.0
NO	16.5	17.0	15.1	0.8	9.7	9.1	20.7	11.2
CH	24.1	21.0	12.9	2.1	3.8	7.2	17.7	11.2
HR	36.2	2.9	23.3	0.0	0.0	7.0	5.5	25.1
TR	17.8	9.5	5.0	13.5	5.2	22.7	9.4	16.9
AU	31.1	14.2	13.4	0.1	8.1	6.4	18.0	8.7
CA	16.9	10.2	11.4	0.4	2.1	5.6	26.6	26.8
CN	12.0	7.2	8.2	0.8	1.3	4.7	10.3	55.6
IL	33.9	7.6	12.3	0.2	1.7	3.7	22.8	17.9
IN	29.9	4.8	39.0	0.6	0.4	3.4	11.9	10.1
JP	9.7	17.0	13.2	1.0	0.6	9.8	23.2	25.4
KR	7.0	6.0	6.4	2.4	0.6	6.9	25.5	45.2
RU	23.4	9.1	25.0	1.0	2.4	9.1	15.2	14.8
TW	15.3	17.4	4.9	1.2	2.5	7.9	20.1	30.6
US	25.1	11.0	15.5	0.8	1.6	6.2	20.3	19.5

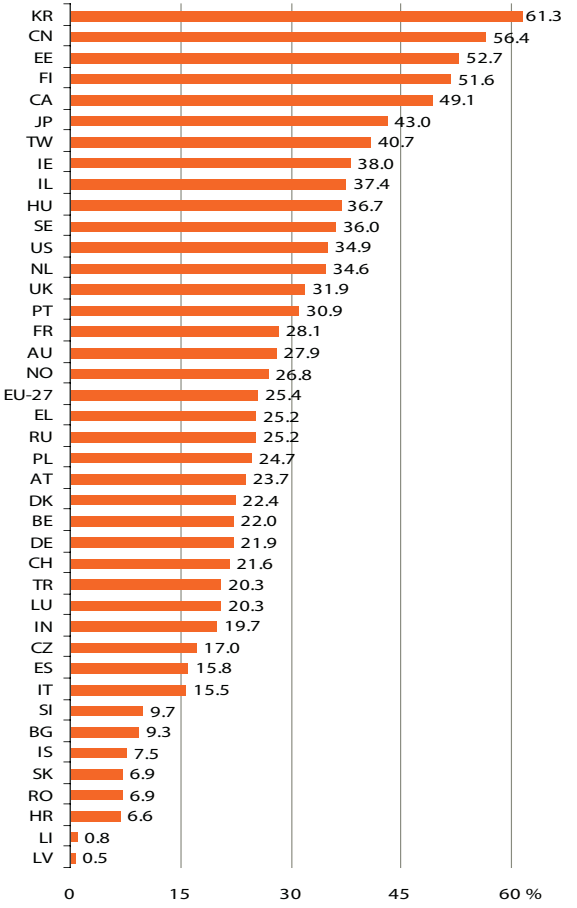
Source: Eurostat (online data code: pat_ep_nipc)

Figure 6.3: Patent applications submitted by business enterprise sector (BES) as a percentage of total, EU-27 and selected countries, 2006



Source: Eurostat (online data code: pat_ep_nic)

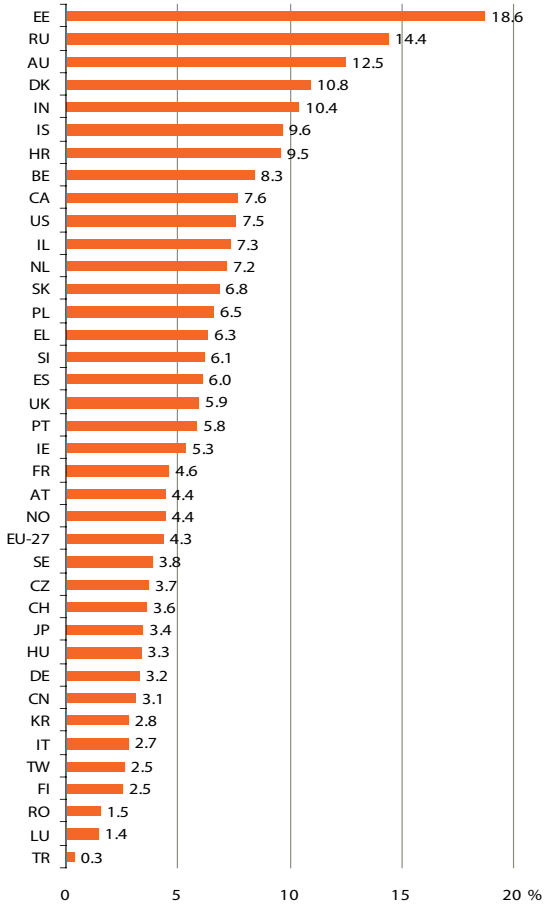
Figure 6.4: ICT patent applications to the EPO as a percentage of total, EU-27 and selected countries, 2006



Source: Eurostat (online data code: pat_ep_nict)

Cut-off: at least 10 patent applications.

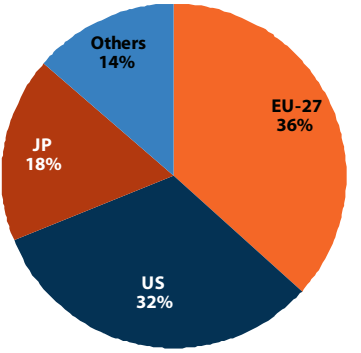
Figure 6.5: Biotechnology patent applications to the EPO as a percentage of total, EU-27 and selected countries, 2006



Source: Eurostat (online data code: pat_ep_nbio)

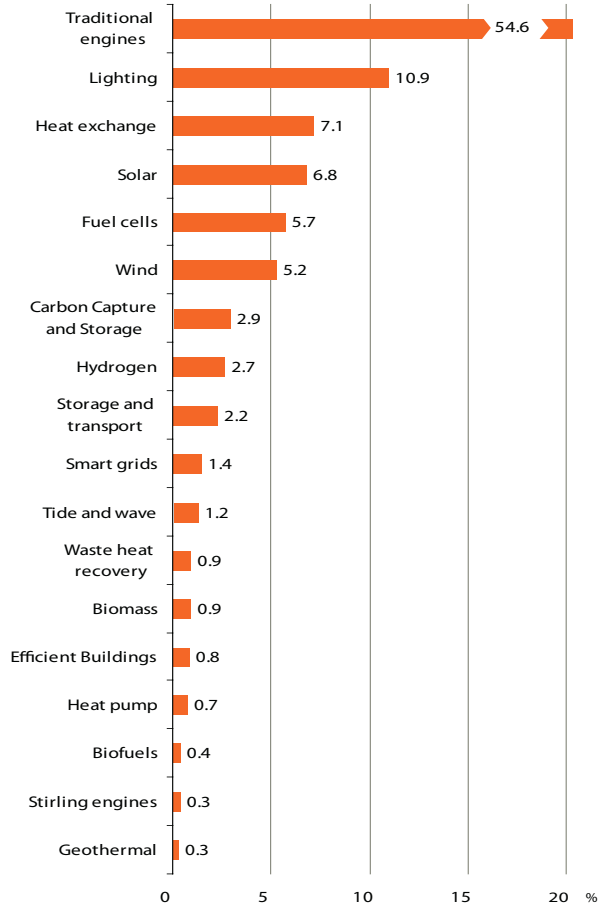
Cut-off: at least 10 patent applications.

Figure 6.6: Distribution of nanotechnology patent applications to the EPO, EU-27, Japan and United States and others, 2006



Source: Eurostat (online data code: pat_ep_nnano)

Figure 6.7: Energy technologies PCT applications designated to the EPO at EU-27 level by energy technology as percentage of total, 2006



Source: Eurostat (online data code: pat_ep_nrgpct)

Table 6.8 (Part I): Patent applications to the EPO on energy technologies EU-27 and selected countries, 2006

	Biofuels	Biomass	Carbon Capture and Storage	Efficient Buildings	Fuel cells	Geothermal	Heat pump	Heat exchange	Hydrogen
EU-27	14	48	81	44	209	17	27	324	97
BE	2	1	1	1	1	2	:	4	:
CZ	:	:	:	2	:	:	1	1	:
DK	2	:	3	1	10	:	1	6	2
DE	:	19	41	22	114	10	13	161	41
IE	:	1	:	1	:	:	:	:	:
EL	:	2	:	:	2	:	:	:	:
ES	:	1	1	1	3	:	:	9	2
FR	:	1	14	4	14	:	3	49	15
IT	1	2	2	5	18	1	:	26	8
LU	:	:	:	0	:	:	:	5	:
NL	6	7	7	3	8	:	:	16	20
AT	:	1	2	2	4	:	2	7	1
PL	:	:	:	:	:	:	:	4	:
FI	:	:	1	2	2	2	3	4	:
SE	:	:	4	:	7	1	2	20	1
UK	3	14	6	:	28	1	2	13	8
NO	1	:	6	:	2	:	1	2	:
CH	:	:	4	2	2	1	:	6	5
TR	:	:	:	:	:	:	:	2	1
AU	:	:	3	2	1	1	:	3	:
CA	1	1	8	1	25	1	:	12	3
CN	:	:	3	:	4	:	1	6	2
IL	:	2	1	:	2	:	:	3	2
IN	:	:	0	:	:	:	:	5	1
JP	2	4	21	:	247	:	6	62	36
KR	:	:	3	:	55	:	1	9	8
RU	:	:	0	:	:	1	:	3	2
TW	:	:	:	:	6	1	:	4	1
US	5	23	60	12	128	2	4	76	52

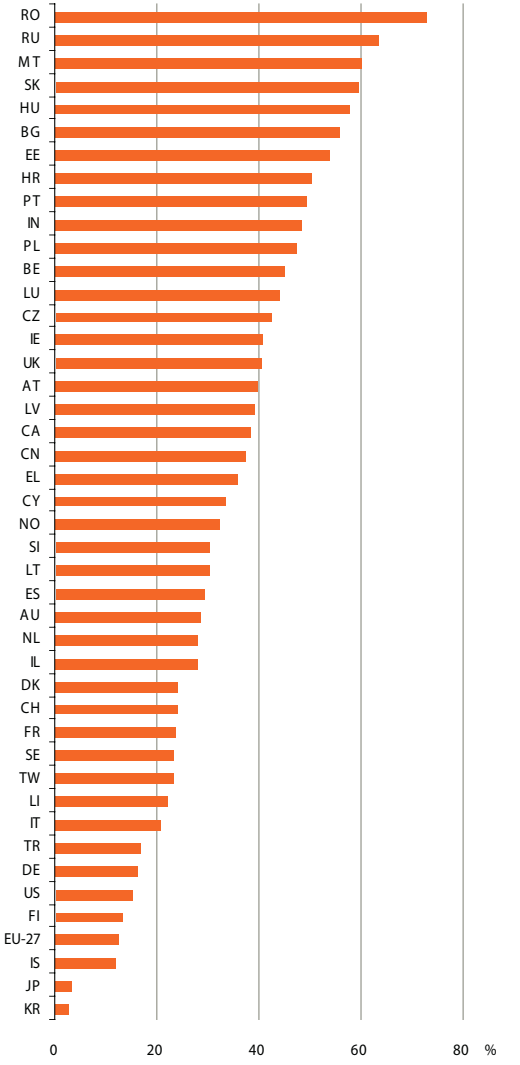
Source: Eurostat (online data code: pat_ep_nrg)

Table 6.8 (Part II): Patent applications to the EPO on energy technologies EU-27 and selected countries, 2006

	Lighting	Stirling engines	Smart grids	Solar	Storage and transport	Traditional engines	Tide and wave	Waste heat recovery	Wind	Energy technologies
EU-27	484	7	72	236	94	2 507	38	40	198	4 347
BE	9	:	1	2	1	28	2	1	:	51
CZ	1	:	3	:	:	7	:	:	:	15
DK	8	:	1	2	1	26	:	2	54	107
DE	182	1	23	124	32	1 310	5	23	69	2 096
IE	6	:	1	:	:	:	2	:	:	11
EL	1	:	1	1	:	8	2	:	1	17
ES	22	:	2	23	:	21	4	:	18	101
FR	55	2	8	12	24	409	4	0	5	603
IT	57	:	9	10	12	209	2	4	10	366
LU	:	:	:	:	1	8	:	:	1	15
NL	74	:	5	35	10	48	:	3	13	234
AT	23	:	3	10	3	58	:	2	2	116
PL	1	:	:	:	:	6	:	:	:	11
FI	6	:	2	1	1	18	2	:	6	45
SE	8	1	9	3	1	106	1	2	2	161
UK	30	3	5	7	6	239	15	3	14	379
NO	1	:	:	1	10	9	3	:	2	37
CH	10	:	2	7	:	87	1	7	1	126
TR	:	:	:	2	:	6	:	:	:	11
AU	3	1	1	3	2	21	5	0	3	43
CA	19	:	1	12	7	55	1	2	6	137
CN	23	:	:	12	:	18	1	:	8	73
IL	:	:	1	2	1	11	2	:	2	27
IN	1	:	1	:	:	9	:	:	:	17
JP	113	4	12	252	11	1 196	1	12	10	1 910
KR	37	:	2	53	4	38	:	7	4	205
RU	3	:	:	1	1	8	1	:	2	22
TW	15	:	:	8	1	18	:	:	:	52
US	158	5	40	154	32	961	5	11	28	1 697

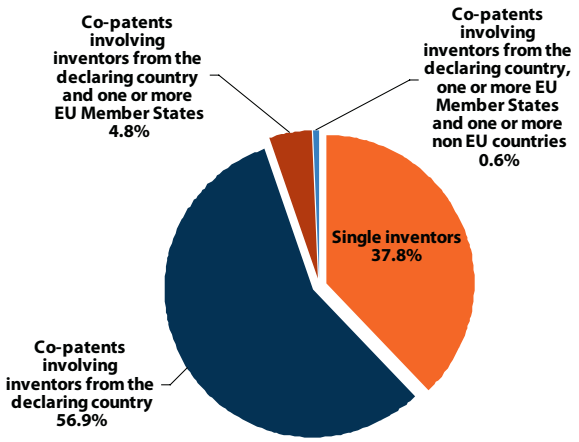
Source: Eurostat (online data code: pat_ep_nrg)

Figure 6.9: Foreign ownership of domestic inventions in patent applications to the EPO as a percentage of total, EU-27 and selected countries, 2006



Source: Eurostat (online data code: pat_ep_nfgn)

Figure 6.10: EU co-patenting at the EPO according to inventors' country of residence (as a percentage), 2006



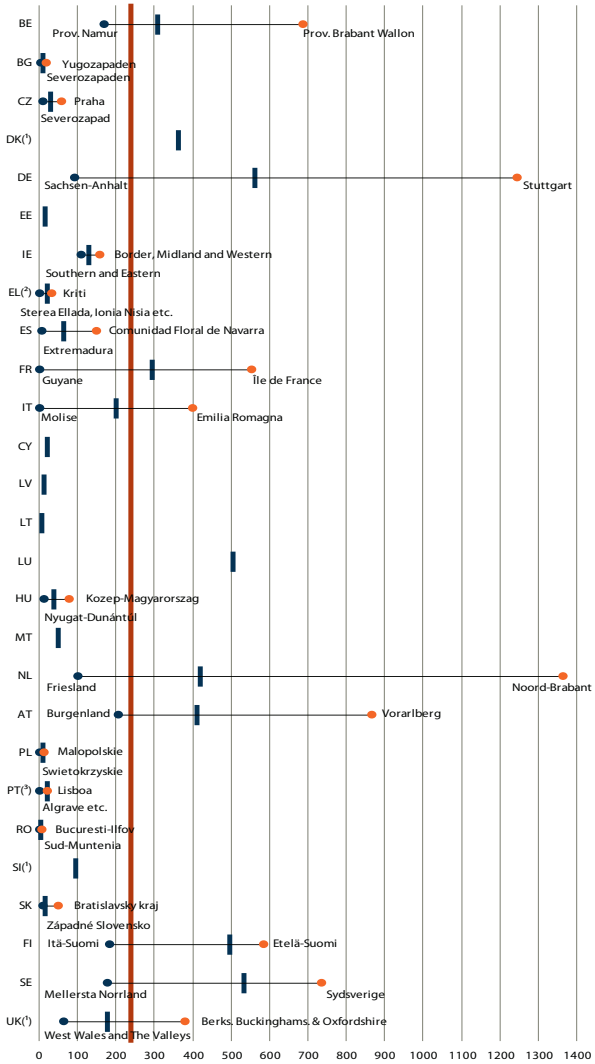
Source: Eurostat (online data code: pat_ep_cpi)

Table 6.11: EU patent citations referring to non-EU and EU patent publications, 1991–2007

	Number of citations in EU patents referring to non-EU patent publications	Number of citations in EU patents referring to EU patent publications
1991	5 720	7 647
1992	5 145	6 722
1993	4 615	6 380
1994	4 497	5 948
1995	4 303	5 618
1996	4 552	5 889
1997	4 356	5 992
1998	4 255	5 890
1999	4 244	5 809
2000	3 711	5 082
2001	3 015	4 696
2002	2 403	3 995
2003	2 097	3 570
2004	1 495	3 003
2005	898	2 160
2006	323 p	1 199 p
2007	52 p	192 p

Source: Eurostat (online data code: pat_ep_cta)

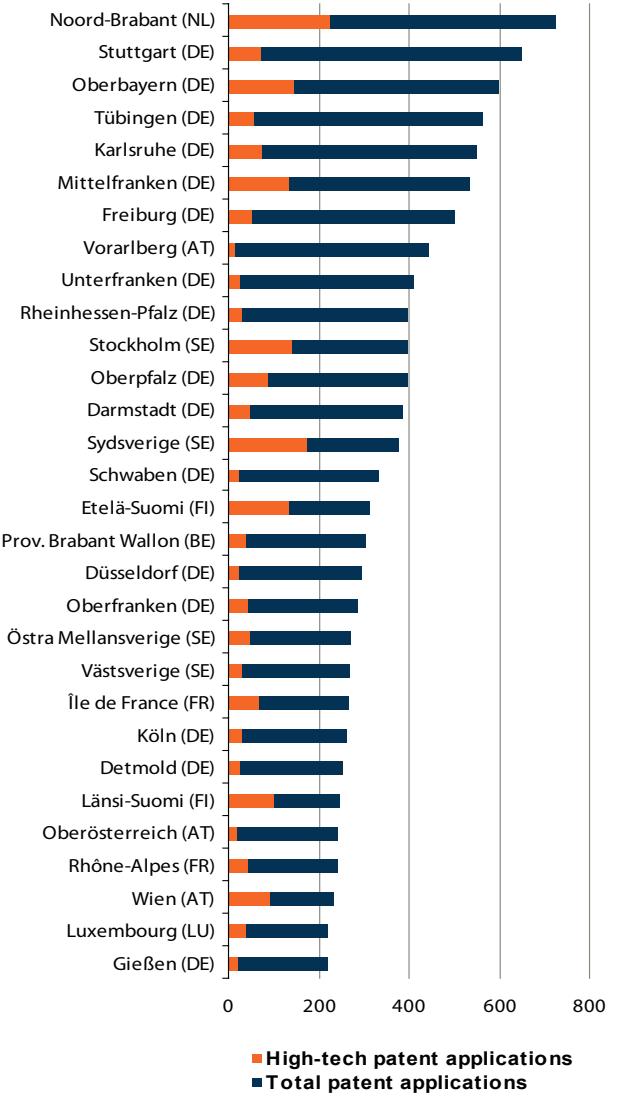
Figure 6.12: Regional disparities (NUTS 2 level) in patent applications to the EPO, EU-27, 2006



(1) 2006 Labour force data missing for Danish and Slovenian regions and for UKM5 and UKM6.
(2) EL: Anatoliki Makedonia, Thraki and Dytiki Makedonia also no patent applications in 2006.
(3) PT: Região Autónoma dos Açores (PT) and Região Autónoma da Madeira (PT) also no patent applications in 2006.

Source: Eurostat (online data code: pat_ep_rtot)

Figure 6.13: Top 30 regions in terms of total patent applications to the EPO and share of high-tech patent applications, per million inhabitants, 2006



Source: Eurostat (online data code: pat_ep_rtot and pat_ep_rtec)

7

High Technology

In 2009, venture capital investment (VCI) at early stage in the EU-15 amounted to almost EUR 1.9 billion, or 0.02 % of GDP. This was far below the EUR 11.2 billion (0.10 % of GDP) invested in buyouts and the EUR 8.1 billion (0.07 % of GDP) for VCI at expansion and replacement stage. Early-stage VCI was highest in Germany, at EUR 0.4 billion, while VCI at expansion and replacement stage and in the form of buyouts was highest in the United Kingdom, at EUR 2.7 billion and EUR 5.7 billion respectively.

In 2007, Italy had the most high-tech manufacturing enterprises (30 785) in the EU. However, Germany ranked first in terms of turnover, production value and value added in high-tech manufacturing, followed by France.

The United Kingdom was the leading EU Member State in the high-tech KIS sector, with 128 717 enterprises, and also ranked first in terms of turnover, production value, value added and gross investment in tangible goods.

In 2008, China led the world market in terms of high-tech exports, with a share of 21.5 %, followed by the EU-27 (16.7 %) and the United States (14.1 %). The EU-27 and China were in the lead in terms of high-tech imports, with 18.5 % and 17.2 % respectively of the world market, followed closely by the United States with 16.3 %.

At EU level, the high-tech trade balance was negative in 2008, with imports some EUR 29.5 billion higher than exports. Within the EU-27, Germany was the leading exporter of high-tech products, with 8.2 % of the world market, followed by the Netherlands (4.7 %) and France (4.5 %).

In a majority of EU Member States, intra-EU trade in high-tech products was higher than extra-EU trade. Portugal, Malta, Sweden and, to a lesser extent, France, Italy and the United Kingdom exported more to countries outside the EU.

In terms of global export shares, the EU-27 was in the lead in numerous product groups such as 'Aerospace', 'Chemistry', 'Non-electrical machinery', 'Pharmacy' and 'Scientific instruments', whereas the United States ranked first only in 'Armament'. China was the world's foremost exporter in the 'Computers-office machines' and 'Electronics and telecommunication' product groups, while other Asian countries were leading exporters of 'Electrical machinery'.

In 2009, 5.7 million people were employed in the high-tech KIS sector in the EU-27, whereas fewer than 2.4 million were employed in the high-tech manufacturing sector. Employment in high-tech manufacturing decreased by 6.0 % between 2008 and 2009, while employment in high-tech KIS dropped by 0.1 %. Female workers in the EU-27 were under-represented in both high-tech KIS (31.1 %) and hightech manufacturing (37.7 %).

In all countries, the share of tertiary-educated people was higher in the high-tech sectors than in all sectors. In Spain and Lithuania, the tertiary-educated population accounted for more than two thirds of high-tech employment, while the EU average stood at 52.7 %.

In 2009, capital regions and the surrounding areas were often ranked high for employment in the high-tech sectors. The leading region in this respect was Berkshire, Buckinghamshire and Oxfordshire (UK), where high-tech sectors accounted for 10.0 % of total employment.

Table 7.1: Venture Capital Investment (VCI) by stage of development in EUR million and as a percentage of GDP, EU-15 and selected countries, 2009

	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	1 890.5 i	0.02 i	8 143.5 i	0.07 i	11 173.8 i	0.10 i
BE	131.1	0.04	471.8	0.14	456.1	0.13
BG	4.1	0.01	2.2	0.01	0.0	0.00
CZ	0.0	0.00	10.4	0.01	51.0	0.04
DK	79.4	0.04	120.2	0.05	288.6	0.13
DE	436.2	0.02	612.3	0.03	1 375.8	0.06
IE	29.9	0.02	26.4	0.02	8.5	0.01
EL	5.0	0.00	16.2	0.01	140.2	0.06
ES	44.5	0.00	543.4	0.05	307.5	0.03
FR	353.2	0.02	1 625.3	0.09	1 411.8	0.07
IT	40.0	0.00	627.0	0.04	325.5	0.02
LU	38.3	0.10	35.3	0.09	0.0	0.00
HU	0.5	0.00	3.3	0.00	187.4	0.20
NL	110.6	0.02	427.3	0.07	213.3	0.04
AT	18.3	0.01	72.8	0.03	41.5	0.02
PL	1.1	0.00	72.5	0.02	411.1	0.13
PT	30.4	0.02	150.6	0.09	118.2	0.07
RO	0.5	0.00	56.6	0.05	21.5	0.02
FI	57.1	0.03	234.8	0.14	96.8	0.06
SE	111.8	0.04	456.0	0.16	647.4	0.22
UK	404.6	0.03	2 724.1	0.17	5 742.6	0.37
NO	82.5	0.03	141.0	0.05	384.8	0.14
CH	195.0	0.05	285.8	0.08	229.4	0.06
US	4 530.5	0.04	8 423.4	0.08	:	:

Source: Eurostat (online data code: htec_vci_earl, htec_vci_exre and htec_vci_buyout)

Table 7.2: VCI in terms of number of investments and number of companies by stage of development, EU-15 and selected countries, 2009

	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	3 112 i	2 094 i	3 236 i	2 205 i	737 i	552 i
BE	136	102	144	132	23	19
BG	2	2	1	1	0	0
CZ	0	0	12	6	6	5
DK	94	70	44	35	15	13
DE	962	659	711	620	94	86
IE	70	51	27	20	3	3
EL	1	1	3	3	3	3
ES	60	53	118	86	24	20
FR	482	247	804	432	245	147
IT	24	18	82	66	24	22
HU	27	20	9	8	0	0
LU	2	2	6	6	2	2
NL	179	138	183	155	19	17
AT	51	49	33	32	13	13
PL	1	1	18	17	14	13
PT	83	54	50	38	6	6
RO	2	2	16	11	4	4
FI	229	159	97	74	41	27
SE	280	194	205	118	37	32
UK	434	279	726	386	190	144
NO	171	106	90	61	14	12
CH	110	83	98	69	25	21
US	1 252	:	1 641	:	:	:

Source: Eurostat (online data code: htec_vci_earl, htec_vci_exre and htec_vci_buyout)

Table 7.3: Economic statistics on high-technology manufacturing sector by NACE Rev.1.1, EU-27 and selected countries, 2007

	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	2 122	16 848	19 073	7 265	284
BG	1 287	696	666	239	: c
CZ	: c	: c	: c	: c	: c
DK	1 104	: c	: c	: c	: c
DE	21 404	187 582	171 760	61 241	6 690
EE	265	: c	: c	: c	: c
IE	334	40 599	39 439	10 774	812
EL	2 531	2 111	1 992	874	86
ES	8 091	29 165	26 415	7 886	1 105
FR	16 038	128 776	116 543	38 157	4 234
IT	30 785	49 685	49 723	20 338	2 732
CY	: c	: c	: c	: c	:
LV	263	: c	: c	: c	: c
LT	423	453	376	129	34
LU	82	: c	: c	: c	: c
HU	5 616	20 889	18 960	2 748	650
MT	:	:	:	:	:
NL	3 030	: c	: c	: c	: c
AT	2 070	10 376	9 561	4 242	630
PL	14 242	11 992	10 953	3 049	:
PT	1 786	: c	: c	: c	: c
RO	2 133	2 296	2 213	733	726
SI	903	: c	: c	: c	: c
SK	455	5 804	5 699	735	247
FI	1 286	41 426	24 173	9 342	321
SE	3 582	27 984	29 521	11 102	:
UK	10 753	90 247	85 497	38 768	: c
NO	786	5 785	5 647	2 225	283

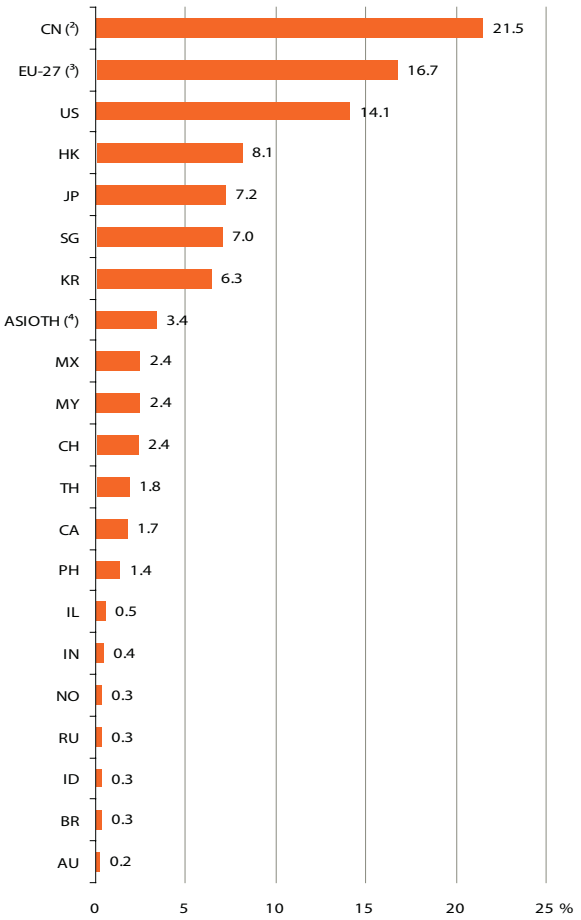
Source: Eurostat (online data code: htec_eco_sbs)

Table 7.4: Economic statistics on high-technology knowledge intensive services by NACE Rev.1.1, EU-27 and selected countries, 2007

	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	19 296	31 213	30 817	13 457	1 557
BG	4 881	2 668	2 500	1 256	480
CZ	: c	: c	: c	: c	: c
DK	10 175	19 383	17 070	9 074	1 180
DE	69 173	168 779	142 227	85 973	9 636
EE	1 583	1 163	1 079	507	126
IE	6 873	27 365	15 498	6 521	1 614
EL	9 912	11 626	9 439	5 632	1 194
ES	40 305	70 084	56 129	33 518	4 787
FR	72 244	136 872	132 755	68 098	11 211
IT	108 677	107 040	104 659	50 321	7 150
CY	:	:	:	:	:
LV	1 885	1 282	1 202	620	178
LT	2 945	1 492	1 331	627	193
LU	1 283	: c	: c	: c	: c
HU	29 469	10 272	6 677	3 900	704
MT	:	:	:	:	:
NL	27 030	49 052	47 629	22 692	2 411
AT	13 466	16 962	12 332	7 765	1 285
PL	41 943	19 365	17 090	9 388	2 033
PT	14 519	12 010	11 289	5 078	1 224
RO	17 457	8 216	7 404	3 771	2 012
SI	4 369	2 845	2 436	1 221	352
SK	2 249	3 798	3 356	1 759	471
FI	6 575	13 629	12 872	6 319	858
SE	37 170	: c	: c	: c	: c
UK	128 717	229 999	215 883	118 214	16 016
NO	12 234	18 462	17 817	8 507	1 234

Source: Eurostat (online data code: htec_eco_sbs)

Figure 7.5: World market share of high-technology exports, EU-27 and selected countries, 2008 (1)

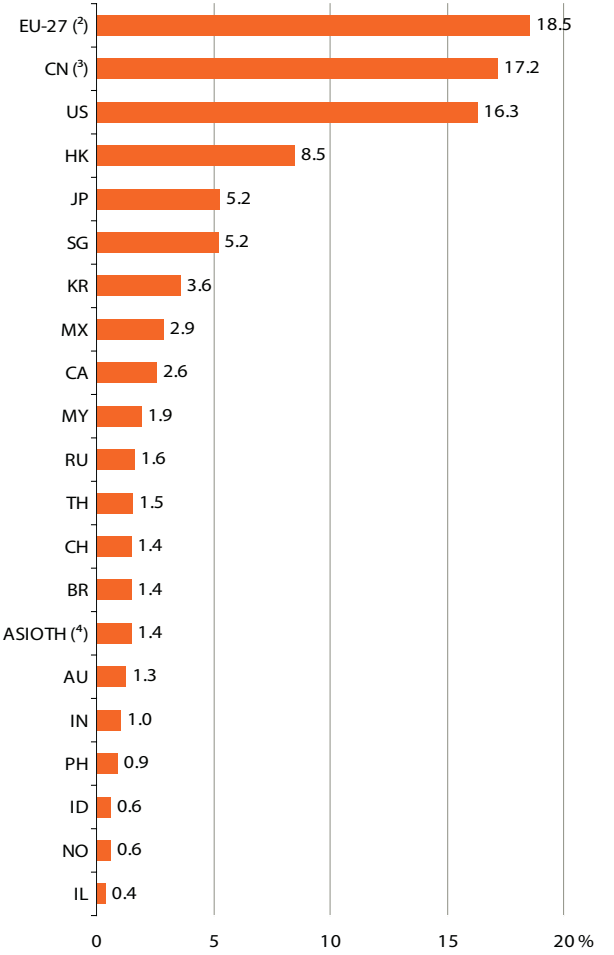


(1) Exceptions to the reference year: 2007 (KR).
(2) CN excluding HK.
(3) EU-27 excluding intra-EU trade.
(4) ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.

Source: Eurostat (online data code: htec_trd_weu4)

Estimation of total high-tech trade by including KR data from 2007.

Figure 7.6: World market share of high-technology imports, EU-27 and selected countries, 2008 (1)



(1) Exceptions to the reference year: 2007 (KR).
(2) EU-27 excluding intra-EU trade.
(3) CN excluding HK.
(4) ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.

Source: Eurostat (online data code: htec_trd_weu4)

Estimation of total high-tech trade by including KR data from 2007.

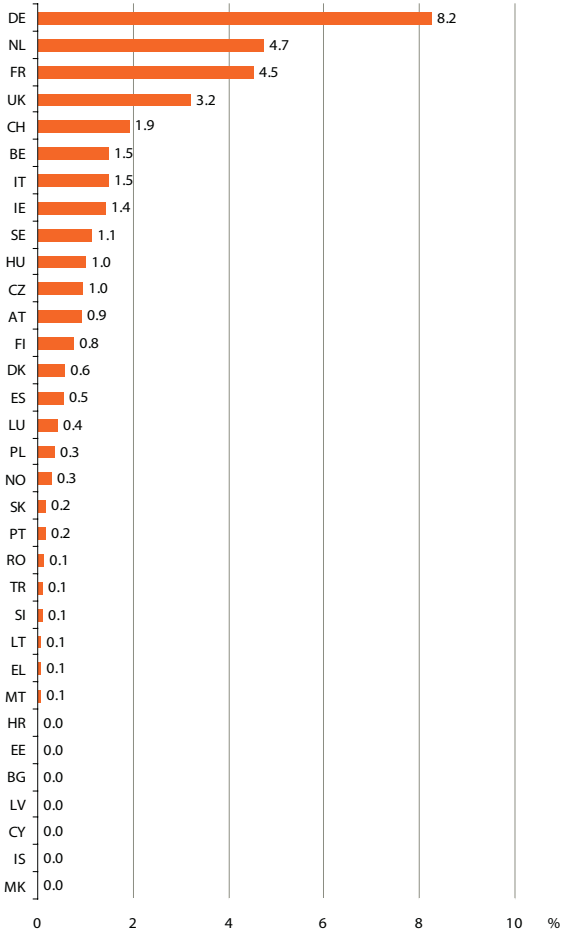
Table 7.7: High-technology trade in EUR million, as a percentage of total, EU-27 and selected countries, 2008 (1)

	Import		Balance	Export	
	EUR million	as a % of total imports	EUR million	EUR million	as a % of total exports
EU-27 (2)	230 265	11.9	-29 536	200 729	12.0
BE	21 533	6.8	268	21 801	6.8
BG	1 572	6.3	-1 029	543	3.6
CZ	14 600	15.1	-485	14 115	14.1
DK	7 663	10.2	859	8 522	10.8
DE	107 370	13.3	14 934	122 304	12.4
EE	866	7.9	-231	634	7.5
IE	13 236	23.2	7 520	20 756	24.3
EL	5 107	8.5	-4 097	1 011	5.9
ES	28 491	10.0	-20 524	7 966	4.2
FR	54 037	11.3	12 861	66 898	16.4
IT	31 010	8.2	-9 243	21 767	6.0
CY	482	6.7	-270	212	19.1
LV	774	7.1	-454	319	4.6
LT	1 064	5.0	-16	1 048	6.5
LU	5 890	27.4	175	6 065	35.2
HU	12 705	17.2	2 225	14 930	20.2
MT	736	22.7	145	881	45.0
NL	64 794	16.4	5 295	70 089	16.2
AT	13 263	10.6	96	13 358	10.8
PL	14 041	9.9	-9 091	4 950	4.3
PT	5 989	9.8	-3 664	2 325	6.1
RO	4 956	8.7	-3 136	1 819	5.4
SI	1 790	7.1	-585	1 205	5.2
SK	4 726	9.5	-2 395	2 331	4.8
FI	8 420	13.5	2 945	11 366	17.3
SE	14 685	12.9	2 187	16 872	13.5
UK	58 018	13.5	-10 787	47 231	15.1
IS	255	6.1	-195	59	1.6
NO	7 304	11.4	-3 340	3 964	3.3
CH	17 975	14.4	10 350	28 325	20.8
HR	1 649	7.9	-1 009	639	6.8
MK	279	6.0	-253	26	1.0
TR	10 560	7.7	-9 259	1 301	1.5
AU	15 647	12.0	-12 687	2 960	2.3
BR	17 918	15.2	-14 319	3 599	2.7
CA	31 770	11.4	-11 174	20 596	6.6
CN(3)	213 319	27.7	45 198	258 517	26.6
HK	105 211	39.4	-7 900	97 312	38.7
IL	4 577	10.3	1 933	6 510	15.6
JP	65 152	12.6	21 208	86 360	16.3
KR	44 864	17.2	31 438	76 302	28.2
MX	35 468	16.9	-6 160	29 308	14.8
RU	19 608	10.8	-15 890	3 718	1.2
SG	64 418	29.6	19 435	83 854	36.5
TH	18 679	15.4	3 401	22 081	18.5
US	202 771	13.8	-33 209	169 562	19.2

(1) Exceptions to the reference year: 2007 (KR).
(2) EU-27 does not include intra-EU trade and therefore does not correspond to the sum of Member States.
(3) CN excluding HK.

Source: Eurostat (online data code: htec_trd_tot4)

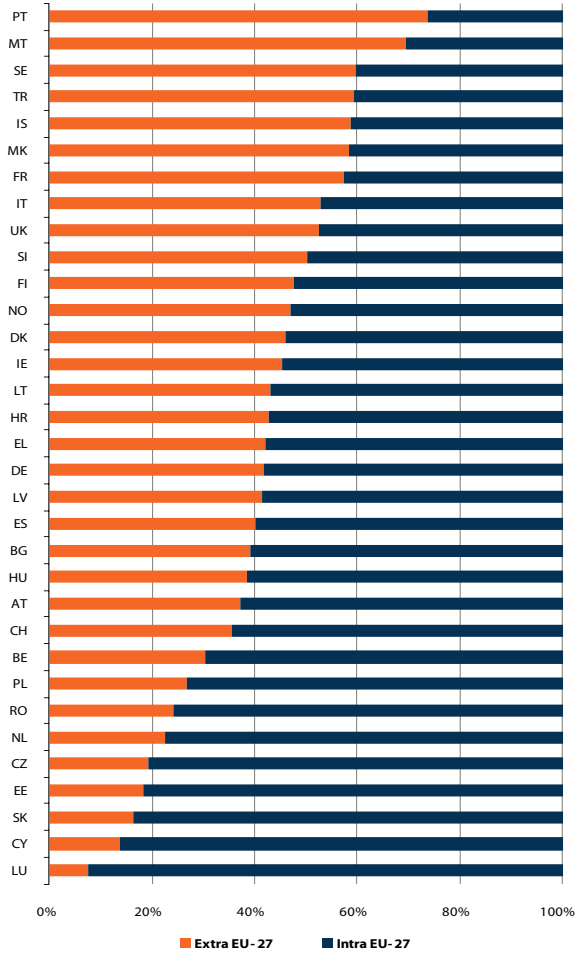
Figure 7.8: World market share for high-technology exports, EU-27 Member States and selected countries, 2008



Source: Eurostat (online data code: htec_trd_wms4)

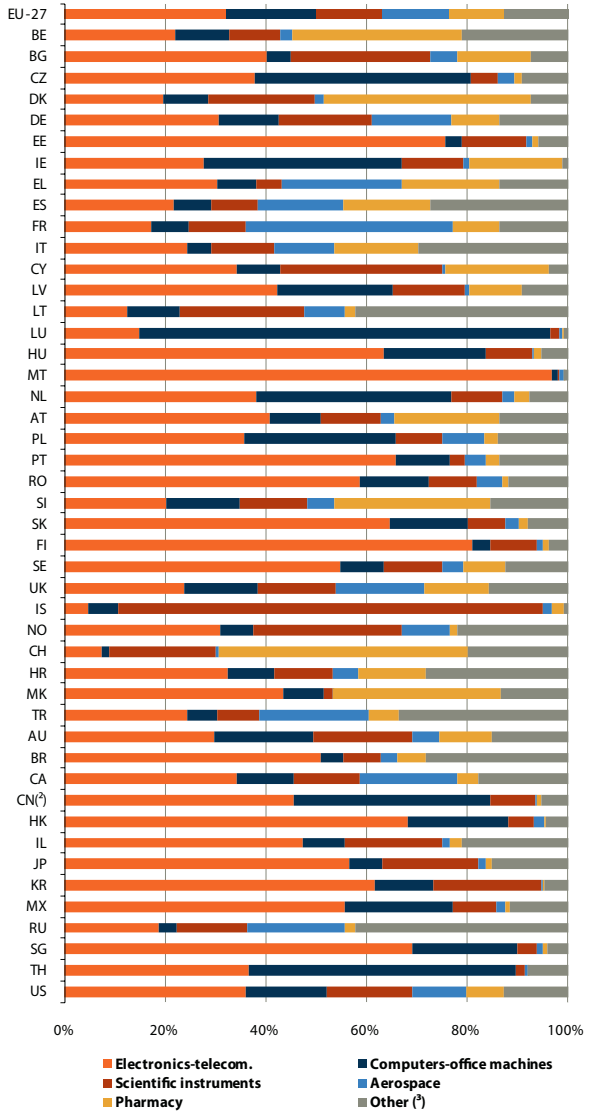
Estimation of total high-tech trade by including KR data from 2007.

Figure 7.9: Intra and extra EU exports of high-tech products, EU-27 Member States and selected countries, 2008



Source: Eurostat (online data code: htec_trd_tot4)

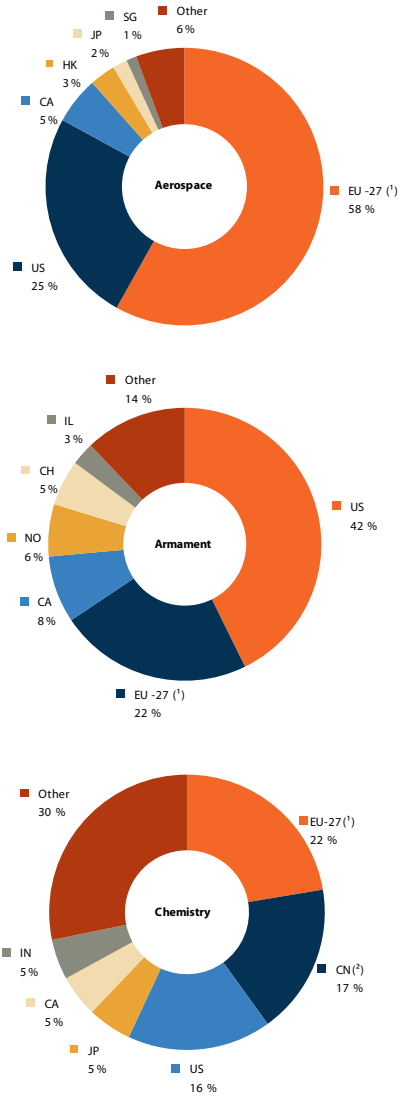
Figure 7.10: High-tech exports by high-technology group of products, EU-27 and selected countries, 2008 (1)



(1) Exception to the reference year: 2007 (KR).
(2) CN excluding HK.
(3) 'Other' includes 'Electrical machinery', 'Chemistry', 'Non-electrical machinery' and 'Armament'.

Source: Eurostat (online data code: htec_trd_group4)

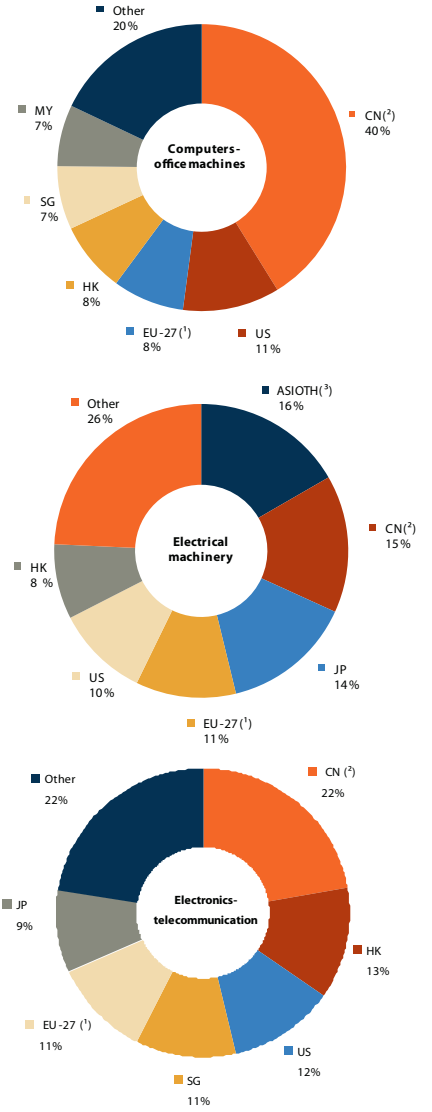
Figure 7.11: World shares (export) of 'Aerospace', 'Armament' and 'Chemistry', EU-27 and main exporters, 2008



(1) EU-27 excluding intra-EU trade.
(2) CN excluding HK.

Source: Eurostat (online data code: htec_trd_weu4)

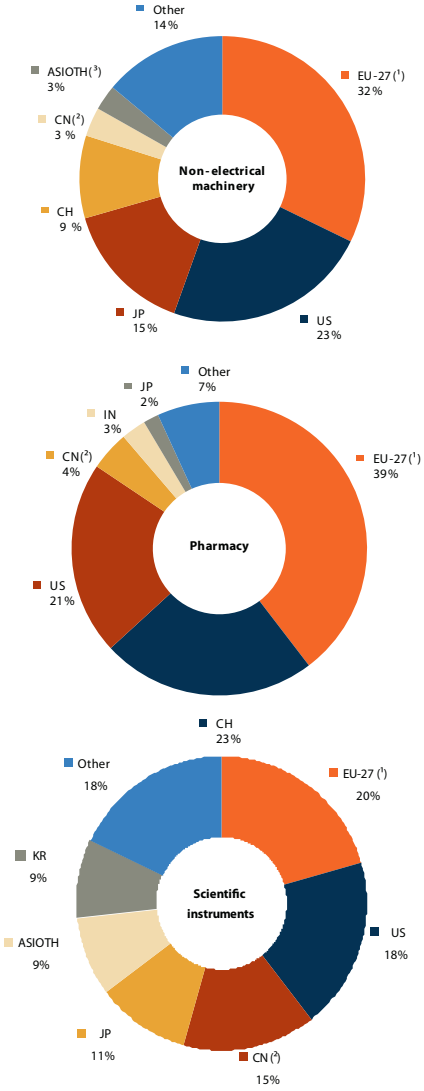
Figure 7.12: World shares (export) of 'Computers-office machines', 'Electrical machinery' and 'Eletronics-telecommunication', EU-27 and main exporters, 2008



(1) EU-27 excluding intra-EU trade.
(2) CN excluding HK.
(3) ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.

Source: Eurostat (online data code: htec_trd_weu4)

Figure 7.13: World shares (export) of 'Non-electrical machinery', 'Pharmacy' and 'Scientific instruments' EU-27 and main exporters, 2008



(1) EU-27 excluding intra-EU trade.
(2) CN excluding HK.
(3) ASIOTH: Other Asia, n.e.s. This includes mainly Taiwan.

Source: Eurostat (online data code: htec_trd_weu4)

Table 7.14: Statistics on employment in high-technology manufacturing sector by NACE Rev.2, EU-27 and selected countries, 2009 ([1])

	Total in 1 000's		% of total employment		% of women		AGR 2008-2009	
EU-27 ([2])	2 398	s	1.1	s	37.7	s	-6.0	s
BE	51		1.2		39.4		-17.9	
BG	27		0.8		45.7		0.4	
CZ	68		1.4		52.2		-7.3	
DK	44		1.6		42.2		0.2	
DE	677		1.8		33.7		7.7	
EE	7	u	1.2	u	:	u	4.7	u
IE	57		3.0		36.0		-6.1	
EL	19		0.4		39.9		-9.8	
ES	93		0.5		41.3		-38.0	
FR	265		1.0		36.1		-13.3	
IT	250		1.1		34.3		2.0	
CY	1	u	0.3	u	:	u	-36.6	u
LV	5		0.5		73.7		15.4	
LT	:	u	:	u	:	u	:	u
LU	:	u	:	u	:	u	:	
HU	95		2.5		49.9		-12.0	
MT	4		2.6		43.3	u	-2.0	
NL	58		0.7		29.2		-9.5	
AT	43		1.1		35.1		-1.5	
PL	122		0.8		47.2		-2.8	
PT	28		0.6		59.7		-15.4	
RO	53		0.6		46.9		3.5	
SI	16		1.7		47.8	u	-3.2	
SK	34		1.5		57.1		-20.4	
FI	40		1.6		34.6		-14.5	
SE	36		0.8		34.8		3.6	
UK	297		1.0		31.9		-13.2	
IS	:	u	:	u	:	u	:	u
NO	13		0.5		:	u	-21.6	
CH	117		2.8		34.7		3.7	
HR	8	u	0.5	u	:	u	-36.9	u
MK	6		1.0		:	u	:	
TR	57		0.3		23.2		:	

([1]) Exceptions to the reference year: 2008 (LU, MK).
([2]) Eurostat estimate.

Source: Eurostat (online data code: htec_emp_nat2)

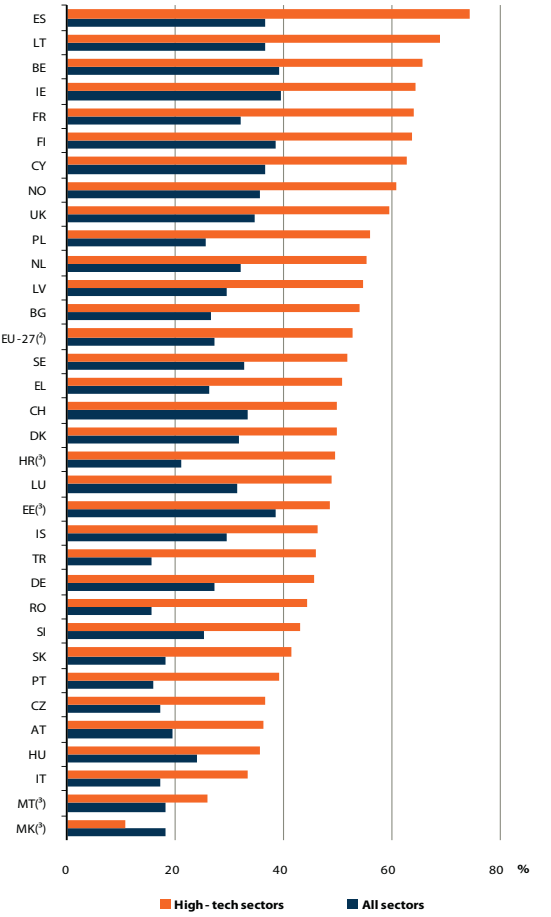
Table 7.15: Statistics on employment in high-tech knowledge-intensive services sector by NACE Rev.2, EU-27 and selected countries, 2009 ([1])

	Total in 1 000's		% of total employment		% of women		AGR 2008-2009	
EU-27 ([2])	5 694	s	2.6	s	31.1	s	-0.1	
BE	145		3.3		28.5		9.9	
BG	68		2.1		42.9		-7.4	
CZ	129		2.6		28.3		9.9	
DK	102		3.7		28.5		-0.4	
DE	968		2.5		31.2		1.1	
EE	13		2.2		43.4	u	-5.2	
IE	71		3.7		30.3		2.4	
EL	77		1.7		30.0		2.1	
ES	563		3.0		34.6		13.8	
FR	730		2.9		31.6		8.7	
IT	520		2.3		31.7		-2.1	
CY	9		2.3		31.7		-9.0	
LV	20		2.0		29.2		-16.3	
LT	24		1.7		40.7	u	1.0	
LU	7		3.3		27.4	u	:	
HU	83		2.2		32.1		-6.1	
MT	5		3.3		:	u	-10.1	
NL	281		3.3		23.6		-3.3	
AT	106		2.6		30.1		8.5	
PL	307		1.9		33.1		7.2	
PT	85		1.7		32.6		2.8	
RO	117		1.3		36.7		4.5	
SI	31		3.2		29.8	u	11.6	
SK	48		2.0		28.2		6.7	
FI	99		4.0		37.2		-5.3	
SE	190		4.2		30.4		0.6	
UK	894		3.1		28.3		-16.3	
IS	7		4.5		30.3		1.2	
NO	84		3.4		29.0		14.7	
CH	129		3.0		29.6		5.1	
HR	34	u	2.1	u	35.9	u	-1.2	u
MK	29		4.7		10.5	u	:	
TR	139		0.7		26.9		:	

([1]) Exceptions to the reference year: 2008 (LU, MK).
([2]) Eurostat estimate.

Source: Eurostat (online data code: htec_emp_nat2)

Figure 7.16: Share of tertiary educated persons in all sectors and in high-tech sectors by NACE Rev.2, EU-27 and selected countries, 2009 (1)

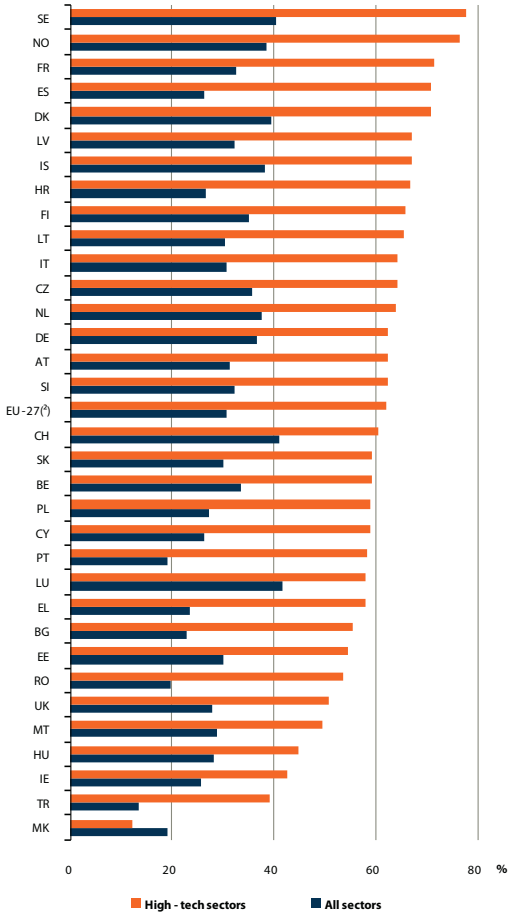


(1) Exceptions to the reference year: 2008 (LU and MK).
(2) Eurostat estimate.
(3) Data lack reliability due to small sample size but are publishable.

Source: Eurostat (online data code: htec_emp_nisced2)

High-tech sectors = High-tech manufacturing and high-tech KIS

Figure 7.17: Share of technicians and professionals in all sectors and in high-tech sectors by NACE Rev.2, EU-27 and selected countries, 2009 (1)

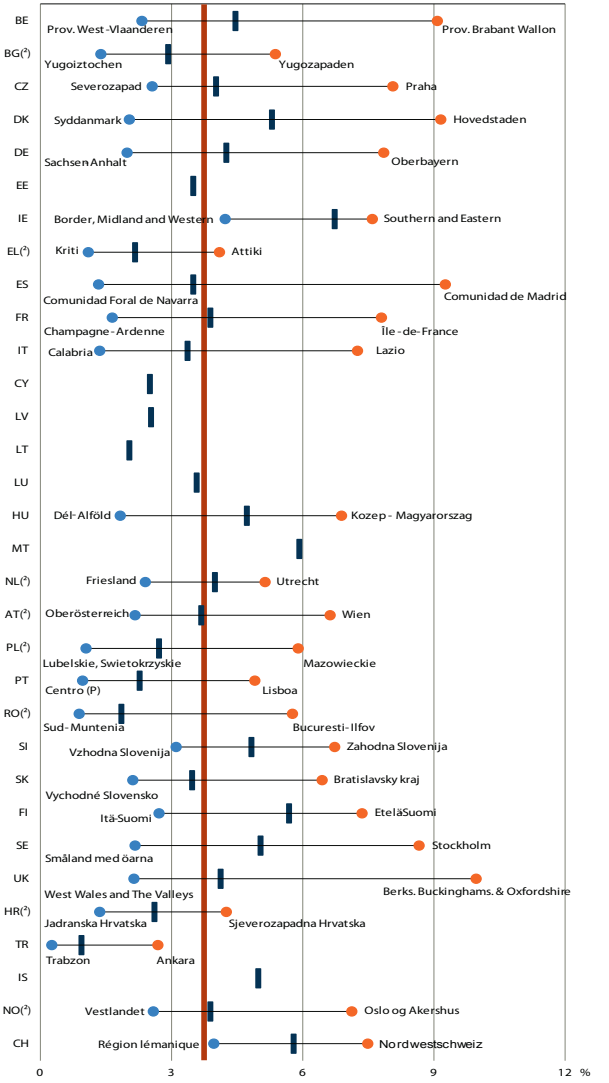


(1) Exceptions to the reference year: 2008 (LU and MK).
(2) Eurostat estimate.

Source: Eurostat (online data code: htec_emp_nisco2)

High-tech sectors= High-tech manufacturing and high-tech KIS.

Figure 7.18: Regional disparities in employment in high-tech sectors as a percentage of total employment (NUTS 2 level), 2009([1])



([1]) Exceptions to the reference year: 2008 (LU).
([2]) Data lack reliability due to small sample size but are publishable.

Source: Eurostat (online data code: htec_emp_reg2)

High-tech sectors = high-technology manufacturing plus high-tech KIS.
Due to small sample size, data for the 55 regions cannot be published.

Methodological notes

GBAORD

1. Concepts and Definition

Government budget appropriations or outlays on R&D (GBAORD) are all the funds allocated to R&D in central government or federal budgets and therefore refer to budget provisions, not to actual expenditure. Provincial or state governments should be included where the 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. This and 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 the public funding of R&D.

Eurostat collects aggregated data which are then checked and processed, and compared with other data 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

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 R&D 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 by NABS. Some follow other compatible classifications (e.g. OECD, Nordforsk), which are then converted to the NABS classification (see Table 8.2 of the Frascati Manual).

5. Time series

The analysis in the present publication covers the period 2005 to 2009.

R&D expenditure and personnel

1. Concepts and definitions

The basic concepts, guidelines for collecting data and classifications used in compiling statistics on research and experimental development are given 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 according to 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 the 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 expenditures are all expenditures 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 the national accounts is used as reference data. At regional level, GDP data are taken from the regional accounts. Both data series were 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 each 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) to obtain an internationally comparable figure expressed in PPS.

Purchasing power standard at constant year 2000 prices

The Purchasing power standard at constant 2000 prices is based on the GDP price deflator with base year 2000 and the PPPs for 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 fixed base year. Therefore the further away from the base year the comparison is made, the less accurate the price adjustment for the various countries becomes. 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. Total R&D personnel is defined as follows:

'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 who are 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

Intramural expenditure and R&D personnel are broken down by institutional sector, i.e. the sector in which the R&D is performed. There are four main sectors:

- the business enterprise sector (BES);
- 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

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 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 R&D variable, as appropriate. The method for calculating R&D personnel in head count (HC) is somewhat different. 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 for the period 2002-2008. Data series in Eurostat's reference database are available from 1981 onwards, though availability differs depending on the variables and institutional sectors. Not all years are complete. For that reason the figures for the latest year available for each country are analysed.

Additional information on the method 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 our understanding of both demand and supply for highly qualified personnel. The data presented in this publication focus on two main aspects: stocks and flows. The former serves to show the needs for, and the current situation of the highly skilled labour force, and the latter indicates to what degree this demand is likely to be met in the future.

Human resources in science and technology are defined according to the OECD *Canberra Manual* as persons fulfilling at least one of the following conditions:

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

OR/AND

- not formally qualified as above but employed in an

S&T occupation where the above qualifications are normally required (ISCO '88 COM codes 2 or 3).

The above educational or occupational requirements are considered by reference to internationally harmonised standards:

- the International Standard Classification of Education — ISCED — giving the level of formal education achievement;
- the International Standard Classification of Occupation — ISCO — detailing the type of occupation.

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 also Eurostat's reference database (http://epp.eurostat.ec.europa.eu) under Science and Technology/Human Resources in Science & Technology.

Stocks and inflows

HRST stocks provide information on the number of HRST at a particular point in time. Stock data relate to the employment status as well as the occupational and educational profiles of individuals in the given year.

HRST stock data and their derived indicators are extracted and built up using data from the EU Labour Force Survey — EU-LFS. The EU-LFS is based on a sample of the population. All results conform to Eurostat guidelines on sample-size limitations and are therefore not published, if the degree of sampling error is likely to be high, and flagged as unreliable, if the degree of reliability is too small.

The population covered excludes anyone below the age of 15 or over the age of 74. This is because no-one below the age of 15 will fulfil either of the requirements for being classified as HRST and also for data quality reasons.

The main categories of HRST are as follows:

HRST — Human Resources in Science and Technology

- successfully completed education at the third level in an S&T field of study (ISCED '97 version levels 5a, 5b or 6); or
- not formally qualified as above but employed in an

S&T occupation where the above qualifications are normally required (ISCO '88 COM codes 2 or 3).

HRSTO — Human Resources in Science and Technology — Occupation

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

HRSTE — Human Resources in Science and Technology — Education

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

HRSTC — Human Resources in Science and Technology — Core

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

SE — Scientists and Engineers

- 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

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

NHRSTU — Unemployed non-HRST

- no education at the third level in an S&T field of study and unemployed.

HRST inflows are the number of people who do not fulfil any of the conditions for inclusion in HRST at the beginning of a time period but acquire at least one of them during the period. Graduates from a country's higher education system represent the main inflow into the national stock of HRST.

HRST education inflow data are extracted from the Eurostat Education database, built on data from the UNESCO/OECD/Eurostat questionnaire on education, based on the ISCED classification. Users should note that European education

systems differ and that duplications of degrees might exist for some countries.

This publication 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 educational fields of Life sciences, Physical sciences, Mathematics and statistics, Computing (codes 42, 44, 46, 48).

Engineering groups the fields of education in Engineering and engineering trades, Manufacturing and processing, Architecture and building (codes 52, 54, 58).

2. Sources

The data on stocks and job-to-job mobility are obtained from the the EU Labour Force Survey — EU-LFS. The National Statistical Institutes are responsible for conducting the surveys and forwarding the results to Eurostat.

The data on education inflows are obtained from Eurostat's Education database and in turn via the UNESCO/OECD/Eurostat questionnaire on education. The National Statistical Institutes are responsible for conducting the surveys, compiling the results and forwarding the results to Eurostat.

3. Geographical coverage

Geographical coverage depends on data source. For HRST stocks these data are available for EU-27 Member States, Candidate countries and EFTA countries. HRST inflows from education are available for EU-27 Member States, Candidate countries, EFTA countries, United States and Japan.

Innovation

1. Concepts and definitions

1.1 Community Innovation Survey

At European level, the **Community Innovation Survey (CIS)** is a survey of innovation activity in enterprises covering EU Member States, Candidate countries, Iceland and Norway. CIS data are the main source of information for studying innovation drivers and corporate innovation behaviour.

The data are collected on a two-yearly basis (from 2004 onwards). The last survey, CIS 2008, was carried out in 27

Member States, Candidate countries, Norway and Iceland It was launched in 2009, based on the reference period 2008, with the observation period 2006 to 2008. It introduced a new definition of innovation, adding organisational and marketing innovation to products and processes.

In the interests of comparability, Eurostat developed the harmonised survey questionnaire in close cooperation with the participating countries, accompanied by a set of definitions and methodological recommendations.

The changes to the CIS 2008 questionnaire were made in the light of the third revision of the *Oslo Manual*, 2005 edition, which gives methodological guidelines and defines the concept of innovation, and of Commission Regulation No 1450/2004.

1.2 Oslo Manual 2005

Innovation: an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.

Innovations are based on the results of new technological developments, new combinations of existing technology or the utilisation of other knowledge acquired by the enterprise. Innovations may be developed by the innovating enterprise or by another enterprise. However, purely selling innovations wholly produced and developed by other enterprises is not included as an innovation activity. Innovations should be new to the enterprise concerned. For product innovations, they do not necessarily have to be new to the market, and for process innovations the enterprise does not necessarily have to be the first to have introduced the process.

There are four types of innovations: product innovations, process innovations, marketing innovations and organisational innovations. This classification preserves as much continuity as possible with the previous definition of technological product and process innovation used in the second edition of the Manual. Product innovations and process innovations are closely related to the concept of technological product innovation and technological process innovation. Marketing innovations and organisational innovations broaden the range compared to the previous definition.

A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant

improvements in technical specifications, components and materials, incorporated software, user-friendliness or other functional characteristics.

A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products.

An **organisational innovation** is a new organisational method in the enterprise's business practices (including knowledge management), workplace organisation or external relations that has not been previously used by the enterprise. It must be the result of strategic decisions taken by management; it excludes mergers or acquisitions, even if for the first time.

A **marketing innovation** is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at addressing customer needs better, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales. It excludes seasonal, regular and other routine changes in marketing methods.

2. Statistical units

The main statistical unit for CIS 2008 was the **enterprise.**

The CIS 2008 target population was the total population of enterprises (with 10 or more employees) engaged primarily in the following economic activities: mining and quarrying (NACE 05-09), manufacturing (NACE 10-33), electricity, gas, steam and air conditioning supply (NACE 35), water supply; sewerage, waste management and remediation activities (NACE 36-39), wholesale trade, except of motor vehicles and motorcycles (NACE 46), transportation and storage (NACE 49-53), publishing activities (NACE 58), telecommunications (NACE 61), computer programming, consultancy and related activities (NACE 62), information services activities (NACE 63), financial and insurance activities (NACE 64-66), and architectural and engineering activities; technical testing and analysis (NACE 71).

NACE Rev. 2 sections B, C, D, E, H and K, and in the NACE Rev. 2 divisions 46, 58, 61, 62, 63 and 71 constitutes the core NACE population of the CIS 2008. NACE Rev. 2 sections A, F,

I, L and N and NACE divisions 45, 47, 59-60, 69-70, 72-75 are part of the non-core population.

3. Type of Survey

Most of the countries used a stratified sample survey for their CIS 2008, while a number used a census or a combination of the two.

The economic activities covered by this publication are based on the NACE Rev. 1.1 classification. The three sectors used in the publication are:

- all NACE - Core NACE activities related to innovation activities (B, C, D, E, G46, H, J58, J61, J62, J63, K and M71);
- Manufacturing which means NACE C;
- Core Services — NACE sections H and K, and NACE divisions 46, 58, 61, 62, 63 and 71

The CIS 2008 data are organised in the Eurostat reference database according to broadly the same structure as the questionnaire.

4. Reference period

CIS 2008 covered the observation period 2006-2008 inclusive, i.e. the three-year period from the beginning of 2006 to the end of 2008. The reference period for CIS 2008 was the calendar year 2008.

All the countries covered collected data for this observation period.

Patents

1. Concepts and definitions

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

2. Sources

Following changes in the production of patent statistics at Eurostat in 2007, data shown on the Eurostat webpage are no

longer fully comparable with data previously disseminated. From 2007 onwards Eurostat's production of EPO and USPTO data has been based almost exclusively on the **EPO Worldwide Statistical Patent Database**. This database, also known as 'PATSTAT', was developed by the EPO in 2005, using their collection and knowledge of patent data.

EPO patent applications by priority year

The new methodology for EPO data used for calculating indicators is very similar to the OECD methodology. For patent applications to the EPO all direct applications (EPO-direct) are taken into account, but among the PCT applications (applications following the procedure laid down by the Patent Cooperation Treaty — PCT) made to the EPO only those that have entered into the regional phase are counted. As PCT patent applications in the international phase designating the EPO will no longer be included in the calculation of patent applications to the EPO, the data shown are lower. Nevertheless, patent data produced by Eurostat and the OECD may still not be exactly the same. Any differences may 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

Eurostat uses the same methodology as the OECD for patents granted by the USPTO. Any differences may 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 a set of patents taken in various countries for protecting the same invention, i.e. related patents are grouped into a single record to derive a unique patent family. A patent is a member of a triadic patent family only if it has been applied for and filed at the European Patent Office (EPO) and the Japanese Patent Office (JPO) and if it 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; the values of the patents are more homogeneous).

Data on triadic patent families are presented by priority year, i.e. the year of the first international filing of a patent. This exacerbates the disadvantage of traditional patent counts with respect to timeliness, and so the latest available data refer to

2005 only (2002 to 2005 being provisional data).

3. Reference year (or date)

All patent statistics from Eurostat are shown by priority date, i.e. the first date of filing of the patent application anywhere in the world. This date is the earliest and is chosen so as to be the closest to the date of the invention as patent procedures always take several years. The drawback 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 fractional counting as the counting method. This means that when a patent was invented by several inventors from different countries, the respective contributions of each country are taken into account. This is done in order to eliminate multiple counting of such patents. For example, a patent co-invented 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. Counting patents in the event of multiple IPC codes

Patent data take into account all levels of the International Patent Classification (IPC). If a patent is assigned to more than one IPC code, not only the main (first) IPC code is taken into account, but all of them. The application is divided equally among all IPC codes (fractional counting), thus avoiding double counting. Only after the fractional counting are the IPC codes rounded at class level.

6. 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, which 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 referring to the different categories of the system. A patent can have a single IPC code or more than one.

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 accordance with the International Patent Classification (IPC)

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

Nanotechnology

In contrast to the data for the other technological fields shown above, nanotechnology patent applications are not directly based on an aggregation of patent applications with the same IPC codes. The EPO introduced 'Y01N' tags to label nanotechnology in their databases because, given 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 updated and improved as new aspects of this young technology emerge.

Co-patenting

Data on co-patenting for patent applications to the EPO and patents granted by the USPTO are available at national level according to the inventor's and 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 number of patent publications cited in patents to the EPO.

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

Number of citations referring to non-EU patent publications: Citations in the patent applications to the EPO that have only EU inventors (applicants), and of those citations the corresponding patent publications. Cited patent publications are divided into those with at least one EU inventor (applicant) and those with only non-EU inventors (applicants).

High-technology

1. Concepts and definitions

High-tech statistics comprise economic, employment and 'Science, technology and innovation' (STI) data describing manufacturing and services industries, broken down by technological intensity.

Two main approaches are used to identify technology-intensity: sectoral and product.

The sectoral approach

This is an aggregation of manufacturing industries according to technological intensity (R&D expenditure/value added) and based on the Statistical Classification of Economic Activities in the European Community (NACE) at 3-digit level.

The sectoral approach covers the manufacturing sector and the service sector. This publication uses the following breakdowns under the sectoral approach:

High-tech manufacturing

High-tech manufacturing aggregate comprises the following NACE Rev.1.1 codes: 24.4, 30, 32, 33, 35.3.

High-tech manufacturing aggregate comprises the following NACE Rev. 2 codes: 21, 26, 30.3.

High-tech Knowledge Intensive Services

High-tech Knowledge Intensive Services aggregate comprises the following NACE Rev. 1.1 codes: 64, 72, 73.

High-tech Knowledge Intensive Services aggregate comprises the following NACE Rev. 2 codes: 59 to 63 and 72.

Total High-tech sector is the sum of High-tech manufacturing and High-tech Knowledge Intensive Services.

The product approach

This was devised to complement the sectoral approach. It opens the way to a far more detailed analysis of trade.

High-technology product groups are defined according to their R&D intensity, using concepts developed by the OECD — R&D expenditure/total sales covering six countries. These can be classified in nine groups: Aerospace, Computers-Office machines, Electronics-Telecommunications, Pharmacy, Scientific instruments, Electrical machinery, Chemistry, Non-electrical machinery, and Armament. The groups classified as high-technology products are aggregated on the basis of the Standard International Trade Classification (SITC).

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

Venture capital investments

Data are broken down into three 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 buyout, management buy-in, leverage buyout and venture purchase of quoted shares.

The basic data are provided by the European Private Equity and Venture Capital Association (EVCA). For more information on venture capital, please refer to: http://www.evca.eu

High-tech economic statistics

Data on high-tech enterprises are extracted and built up using data from the Structural Business Statistics — SBS. In this publication the SBS data are presented for the last available year by NACE Rev.1.1.

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

Turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties.

Value added at factor cost is 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 please see also the Eurostat metadata on high-technology statistics on Eurostat's reference webpage.

2. Data sources

The domain uses various other domains and sources, mainly from within Eurostat's official statistics.

Data on high-tech economic statistics and derived indicators are extracted and built up using data from the Structural Business Statistics — SBS. In this publication the SBS data are presented for the last available year by NACE Rev.1.1.

Data on high-tech employment make use of EU-LFS data. High-tech trade data 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. The high-tech products group in this publication accord with SITC Rev.4.

For more details, please refer to methodologies of the specific data sources.

For Venture Capital Investment the basic data are provided by the European Private Equity and Venture Capital Association (EVCA). For more information on venture capital, please refer to: http://www.evca.eu

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Science, technology and innovation in Europe 2011 edition

This pocketbook gives an overview of science, technology and innovation (STI) statistics. 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.

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.

http://ec.europa.eu/eurostat

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