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# Science, technology and innovation in Europe

2009 edition

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Eurostat has set up with the members of the 'European statistical system' (ESS) a network of user support centres which exist in nearly all Member States as well as in some EFTA countries. Their mission is to provide help and guidance to Internet users of European statistical data. Contact details for this support network can be found on Eurostat Internet site.

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# Table of contents

# Introduction

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

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

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

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

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

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

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

NB: tables and figures in this publication refer to the data available on Eurostat's NewCronos database at the time of writing (November 2008). However, NewCronos is updated regularly as new data are received, so more recent data may differ from those available at the time of publishing.

# Abbreviations and symbols

**Statistical symbols**

| | |
|---|---|
| b | Break in series |
| e | Estimation |
| 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 per cent of the unit used |
| 1000s | Thousands |
| 2005 | Calendar year (e.g. from 1.1.2005 to 31.12.2005) |
| 2005/2006 | 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) |

**Acronyms and 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 |
| COMEXT | Eurostat's database of official statistics on EU external trade and trade between EU Member States |
| 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) |
| EU LFS | European Union Labour Force Survey |
| 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 | Japan 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 |
| NewCronos | Eurostat's statistical reference database |
| 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 |
| UN | United Nations |
| USPTO | United States Patent and Trademark Office |
| VCI | Venture capital investment |
| WIPO | World Intellectual Property Organization |

**Country abbreviations**

EU Member States

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

Candidate countries

| | |
|---|---|
| MK | The former Yugoslav Republic of Macedonia (Provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the UN.) |
| HR | Croatia |
| TR | Turkey |

Other countries

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

# Part 1
# Investing in R&D

## Chapter 1 - Government budget appropriations or outlays on R&D

Government budget appropriations or outlays on R&D (GBAORD) are sums allocated to R&D in central government or federal budgets; this means they refer to budget provisions and not to actual expenditure.

In 2007, GBAORD stood at 0.71 % of GDP in the EU-27 and 1.02 % of GDP in the United States. In both cases this was lower than in the previous year.

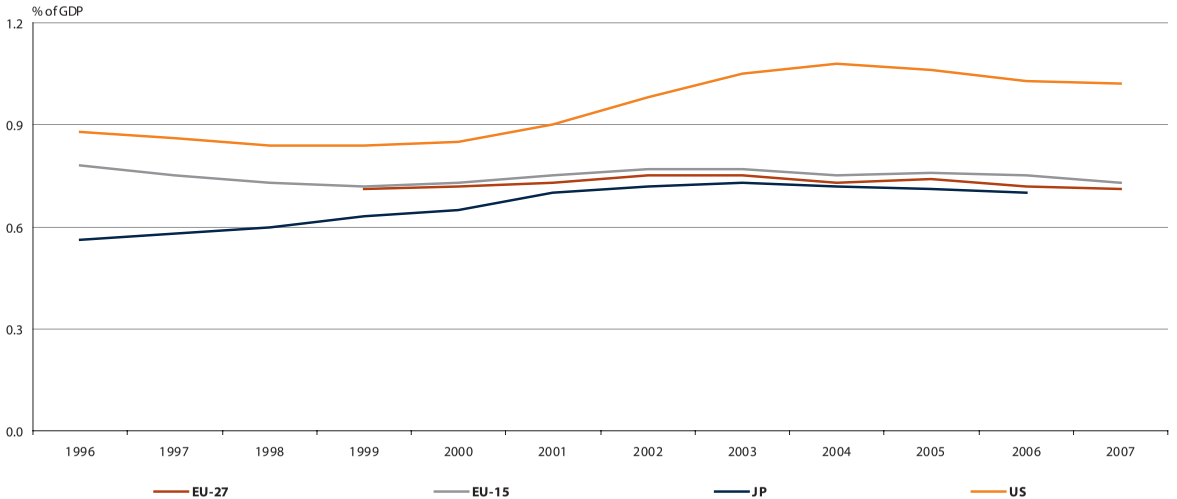
Between 1996 and 2000, GBAORD declined slightly in the EU-27 and the United States, but increased in Japan.

Between 1996 and 1999, GBAORD in the EU-15 and in the United States declined in relative terms (as a percentage of GDP), whereas an increase was recorded in Japan. Between 1999 and 2006, the trends differed significantly: GBAORD expressed as a percentage of GDP was stable in the EU-15, but increased slightly in Japan and noticeably in the United States.

In 2007, GBAORD as a percentage of GDP was above the EU-27 average (0.71 %) in eight Member States (Spain, Finland, Sweden, Denmark, Portugal, Germany, France and the United Kingdom) and Iceland. The lowest GBAORD levels, below 0.3 % of GDP, were recorded in Bulgaria, Slovakia and Malta.

In 2007, GBAORD in the EU-27 amounted to more than EUR 87 billion. In the same year, 'research financed from general university funds (GUF)' comprised the largest share of GBAORD at EU-27 level, representing 31.3 % of total GBAORD allocations. This was also the case in Japan, but not in the United States, which devoted more than half of total GBAORD (58.3 %) to 'defence'. Variations were also observed between EU Member States in terms of socio-economic objectives: in 2007 'research financed from GUF' accounted for the largest share of total GBAORD in 10 Member States for which data are available, while 'non-oriented research' was the top objective in eight Member States. 'industrial production and technology' was the most important socio-economic objective in another four Member States, while 'defence' ranked first only in France and the United Kingdom. 'social structures and relationships' and 'other civil research' were the leading objectives in Lithuania and Romania respectively.

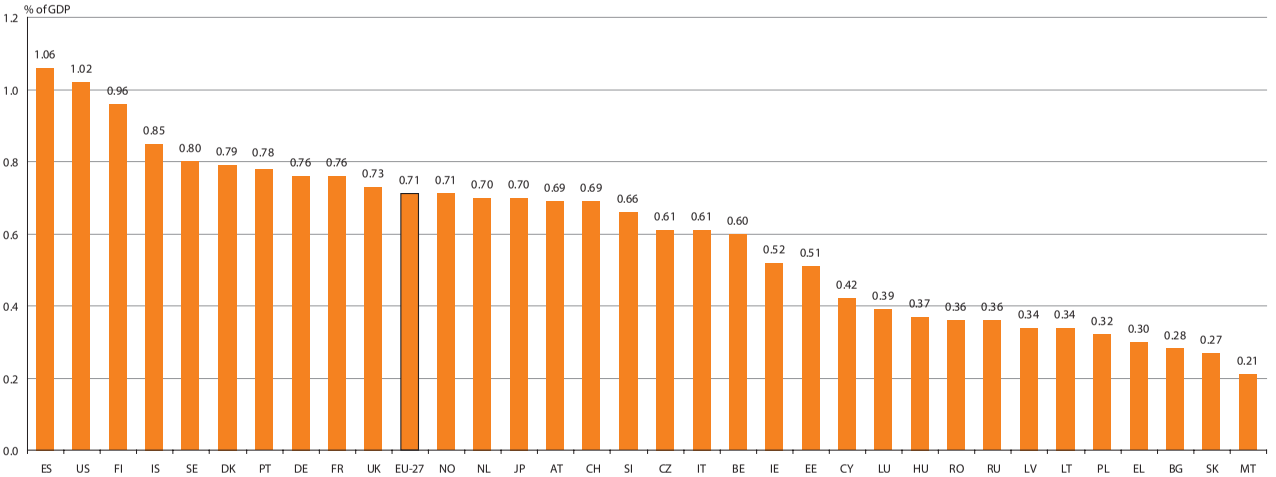
**Figure 1.1:** Total GBAORD as a percentage of GDP, EU-15, EU-27, Japan and United States — 1996-2007




Eurostat estimations: EU-27 and EU-15 — US: 2000: break in series — US: 2007: provisional data — JP and US: federal or central government only
US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Figure 1.2:** Total GBAORD as a percentage of GDP, EU-27 and selected countries — 2007




Eurostat estimation: EU-27 — Provisional data: CZ, DK, DE, EE, IE, EL, FR, LU, NL, AT, SI, SK, FI, SE, UK, IS, US — Exceptions to the reference year: 2006: IT, UK, CH, JP; 2005: HU and RU — AT, JP and US: federal or central government only — US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 1.3:** Total GBAORD in EUR million and by socio-economic objective as a percentage of total, EU-27 and selected countries — 2007

| | Exploration and exploitation of the earth | Infrastructure and general planning of land use | Control and care of the environment | Protection and improvement of human health | Production, distribution & rational utilis. of energy | Agricultural production and technology | Industrial production and technology | Social structures and relationships | Exploration and exploitation of space | Research financed from GUF | Non-oriented research | Other civil research | Defence | Total civil GBAORD | Total GBAORD in EUR million |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EU-27** | 1.6 s | 2.1 s | 2.5 s | 7.8 s | 2.9 s | 3.6 s | 11.6 s | 3.6 s | 4.7 s | 31.3 s | 13.9 s | 1.3 s | 13.1 s | 86.9 s | 87 639 s |
| BE | 0.6 | 0.9 | 2.6 | 1.9 | 1.9 | 1.4 | 31.6 | 3.9 | 10.8 | 16.9 | 24.6 | 2.7 | 0.3 | 99.7 | 2 005 |
| BG | : | : | : | : | : | : | : | : | : | : | : | : | : | : | 80 |
| CZ | 2.2 p | 3.6 p | 2.5 p | 7.3 p | 2.6 p | 4.6 p | 12.9 p | 2.2 p | 0.7 p | 27.0 p | 27.3 p | 4.6 p | 2.5 p | 97.5 p | 774 p |
| DK | 0.7 p | 0.6 p | 2.0 p | 7.8 p | 2.7 p | 5.2 p | 6.5 p | 5.7 p | 1.7 p | 42.4 p | 22.8 p | 1.4 p | 0.6 p | 99.4 p | 1 790 p |
| DE | 1.7 ip | 1.7 ip | 3.0 ip | 4.5 ip | 2.9 ip | 2.3 ip | 13.4 ip | 3.5 ip | 4.7 ip | 39.5 ip | 16.7 ip | 0.6 ip | 6.1 ip | 93.9 ip | 18 405 p |
| EE | 2.5 p | 9.4 p | 6.6 p | 8.4 p | 2.5 p | 9.6 p | 6.2 p | 10.7 p | 0.0 p | 0.0 p | 38.7 p | 4.4 p | 1.0 p | 99.0 p | 78 p |
| IE | 3 p | 2.2 p | 0.9 p | 5.1 p | 0.0 p | 10.1 p | 9.0 p | 11.4 p | 0.0 p | 55.3 p | 3.0 p | 0.0 p | 0.0 p | 100 p | 995 p |
| EL | 3.2 p | 1.6 p | 2.6 p | 6.9 p | 2.0 p | 5.6 p | 9.0 p | 4.3 p | 2.1 p | 50.7 p | 9.8 p | 1.6 p | 0.5 p | 99.5 p | 673 p |
| ES | 1.3 i | 6.5 i | 4.2 i | 11.0 i | 3.1 i | 7.0 i | 20.7 i | 3.4 i | 3.2 i | 16.9 i | 9.6 i | : | 13.3 i | 86.7 i | 11 141 |
| FR | 0.9 p | 0.6 p | 1.8 p | 6.5 p | 5.3 p | 1.6 p | 7.8 p | 0.8 p | 8.8 p | 27.7 p | 7.8 p | 2.4 p | 28.1 p | 71.9 p | 14 442 p |
| IT | 2.3 | 1.0 | 2.6 | 10.3 | 4.0 | 4.0 | 11.7 | 5.2 | 9.5 | 41.8 | 6.2 | 0.0 | 1.4 | 98.6 | 9 099 |
| CY | 1 | 1.0 | 0.7 | 6.8 | 0.1 | 15.7 | 1.9 | 6.0 | 0.0 | 29.2 | 37.5 | 0.0 | 0.0 | 100 | 65 |
| LV | 0.3 | 5.3 | 4.4 | 7.3 | 4.0 | 13.8 | 5.4 | 10.4 | 1.0 | 0.8 | 47.3 | : | 0.1 | 99.9 | 68 |
| LT | 2.6 | 3.8 | 9.5 | 9.9 | 3.2 | 9.1 | 14.4 | 28.7 | : | : | : | 18.0 | 0.8 | 99.2 | 96 |
| LU | 0.5 p | 2.3 p | 3.5 p | 8.6 p | 0.4 p | 2.7 p | 21.1 p | 12.9 p | 0.6 p | 16.5 p | 28.0 p | 3.0 | 0.0 p | 100 p | 142 p |
| HU | 2.9 | 2.1 | 9.7 | 13.1 | 10.4 | 16.4 | 19.6 | 9.1 | 2.3 | 9.1 | 5.0 | 0.3 p | 0.1 | 99.9 | 329 |

Exceptions to the reference year: 2006: IT; 2005: HU — Flag i: DE: unrevised breakdown not adding up to the revised total; ES: includes other classes.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 1.3:** Total GBAORD in EUR million and by socio-economic objective as a percentage of total, EU-27 and selected countries — 2007

| | Exploration and exploitation of the earth | Infrastructure and general planning of land use | Control and care of the environment | Protection and improvement of human health | Production, distribution & rational utilis. of energy | Agricultural production and technology | Industrial production and technology | Social structures and relationships | Exploration and exploitation of space | Research financed from GUF | Non-oriented research | Other civil research | Defence | Total civil GBAORD | Total GBAORD in EUR million |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MT | 0 | 0.2 | 0.7 | 0.1 | 0.0 | 6.0 | 0.0 | 3.4 | 0.0 | 88.8 | 0.0 | 0.9 | 0.0 | 100 | 11 |
| NL | 0.3 p | 4.1 p | 1.3 p | 4.3 p | 3.0 p | 5.0 p | 12.5 p | 1.8 p | 2.6 p | 46.6 p | 9.7 p | 6.9 p | 2.0 p | 98.0 p | 3 990 p |
| AT | 1.5 ip | 1.5 ip | 1.6 ip | 3.2 ip | 1.7 ip | 1.7 ip | 15.7 ip | 1.8 ip | 0.4 ip | 58.6 ip | 12.2 ip | 0.0 ip | 0.0 ip | 100 ip | 1 870 ip |
| PL | 0.9 | 1.2 | 1.8 | 1.9 | 0.8 | 1.1 | 13.2 | 0.8 | 0.1 | 4.5 | 72.0 | 0.2 | 1.4 | 98.6 | 980 |
| PT | 1.1 | 7.0 | 3.3 | 6.3 | 0.9 | 6.7 | 17.5 | 3.9 | 0.4 | 38.5 | 10.5 | 3.5 | 0.5 | 99.5 | 1 116 |
| RO | 2.6 | 3.6 | 5.8 | 6.2 | 3.4 | 10.4 | 23.8 | 10.7 | 0.8 | : | 5.1 | 25.2 | 2.3 | 97.7 | 435 |
| SI | 0.4 p | 1.1 p | 1.0 p | 2.9 p | 0.4 p | 1.9 p | 30.0 p | 1.8 p | 0.0 p | 6.3 p | 37.5 p | 15.3 p | 1.3 p | 98.7 p | 226 p |
| SK | 0 | 4.0 p | 0.6 p | 2.2 p | 0.1 p | 6.0 p | 0.6 p | 1.7 | : | 23.4 | 57.7 ip | 1.5 p | 2.2 p | 97.8 ip | 150 p |
| FI | 1.2 p | 1.6 p | 1.6 p | 6.0 p | 4.5 p | 5.7 p | 27.1 p | 5.5 p | 1.7 p | 25.8 p | 16.7 p | : | 2.4 p | 97.6 p | 1 730 p |
| SE | 0.9 p | 4.0 p | 1.4 p | 0.6 p | 3.4 p | 1.5 p | 5.0 p | 2.3 p | 0.8 p | 45.7 p | 18.0 p | : | 16.4 p | 83.6 p | 2 671 p |
| UK | 2.7 p | 0.8 p | 1.8 p | 14.1 p | 0.2 p | 3.1 p | 1.1 p | 5.3 p | 2.2 p | 21.6 p | 18.6 p | 0.4 p | 28.3 p | 71.7 p | 14 124 p |
| IS | : | 5.7 p | 0.5 p | 10.8 p | 1.4 p | 16.7 p | 1.0 p | 9.4 p | : | 41.9 p | 12.8 p | 0.0 | 0.0 | 100 p | 124 p |
| NO | 2.2 | 2.5 | 1.9 | 12.5 | 2.9 | 8.3 | 7.4 | 6.9 | 2.6 | 34.1 | 13.3 | : | 5.4 | 94.6 | 2 029 |
| CH | 0.1 i | 0.3 i | 0.1 i | 1.3 i | 1.0 i | 2.2 i | 1.0 i | 2.2 i | 4.5 i | 59.6 p | 9.1 i | 17.7 i | 0.6 i | 99.4 i | 2 123 |
| JP | 1.8 i | 4.1 i | 0.8 i | 3.9 i | 15.2 i | 3.4 i | 7.3 i | 0.7 i | 6.8 i | 34.2 i | 16.7 i | : | 5.1 i | 94.9 i | 24 478 i |
| RU | : | : | : | : | : | : | : | : | : | : | : | : | : | : | 3 790 |
| US | 0.6 ip | 1.1 ip | 0.4 ip | 21.6 ip | 1.1 ip | 1.8 ip | 0.4 ip | 1.2 ip | 7.9 ip | : | 5.7 ip | : | 58.3 ip | 41.7 ip | 102 917 ip |

Exceptions to the reference year: 2006: PT, UK, CH, JP — Flag i: AT, CH, JP and US: federal or central government only; SK: includes other classes; JP: defence is underestimated or based on underestimated data; US: total excludes data for the R&D content of general payment to the higher education sector for combined education and research (public GUF).

*Source:* Eurostat, R&D statistics - OECD - MSTI.

# Chapter 2 - R&D expenditure

In 2007, R&D intensity (R&D expenditure as a percentage of GDP) in the EU-27 stood at 1.83 %, down slightly from the previous year. R&D intensity in the EU remained significantly lower than in the United States (2.61 %) and Japan (3.32 %), and was still below the 3 % goal to be achieved by 2010 in line with the Lisbon Strategy.

Only Sweden (3.63 %) and Finland (3.47 %) exceeded the 3 % target. However, Austria, Denmark, Germany, France and Belgium registered R&D intensities above the EU-27 average.

In absolute terms, the EU-27 spent EUR 226 million on R&D in 2007, with an average annual growth rate (AAGR) of 4.1 % in relation to 2000. In the global context, Japan and the United States registered a decrease over the same period.

R&D expenditure was mostly financed by the business enterprise sector (BES), accounting for almost two thirds (1.17 %) of R&D intensity in 2007, while the higher education and government sectors accounted for the remaining third (0.65 %).

In 2006, the business enterprise sector remained the primary source of R&D financing, accounting for 55 % of total EU-27 R&D expenditure. However, more business investment will be required in order to reach the 'two-thirds' objective set by the relaunched Lisbon strategy. Germany (68 %), Luxembourg (80 %), Finland (67 %) and Sweden (66 %) have already achieved this target. With shares of 60 %, Belgium and Denmark are also well on the way to reaching this goal, followed by Ireland and Slovenia, with shares of 59 %.

Outside the EU, strong involvement of the BES in R&D was also noted in China, with 69 % of R&D expenditure financed by this sector.

Except for the Czech Republic, Malta and Slovenia, in new Member States and Greece the share of the government sector was far greater than that of the business sector.

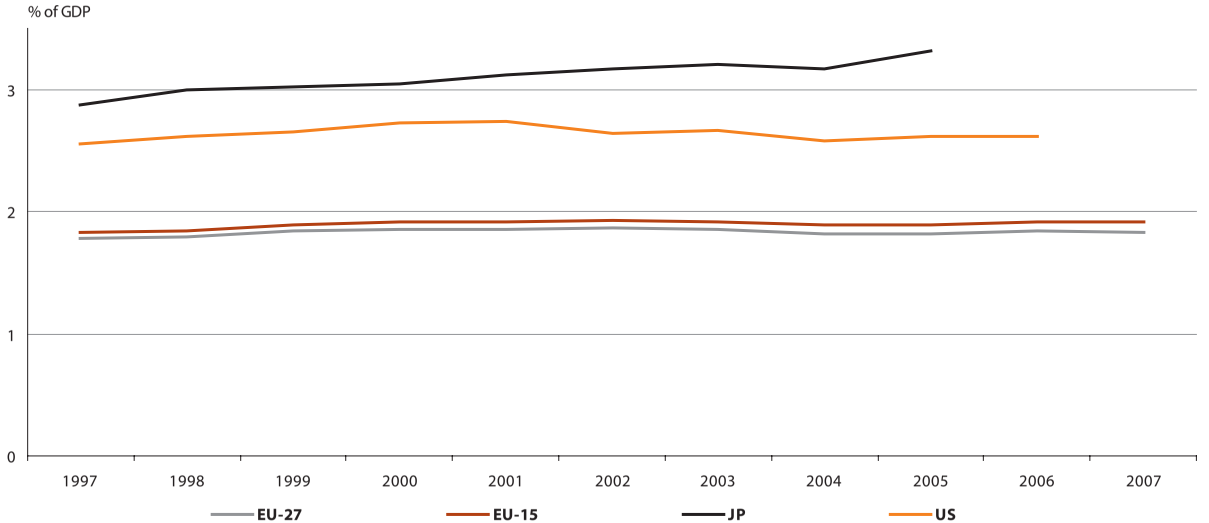
The distribution of business R&D expenditure by source of funds shows that the BES played a major role in terms of R&D financing. Indeed, in 2005 close to 82 % of business R&D expenditure in the EU-27 was self-financed. With the exception of Russia, the BES was the main source of R&D funding in all Member States and selected countries.

In 2005, in most countries R&D expenditure by the higher education sector was mainly devoted to 'natural sciences', followed by 'medical sciences' and 'engineering and technology'.

At national level, R&D intensity in the leading regions varied significantly from one country to another.

The largest discrepancy between the best and worst performing regions was observed in Germany, reaching 5.2 percentage points; conversely, the smallest gap was found in Ireland, with 0.21 percentage point.

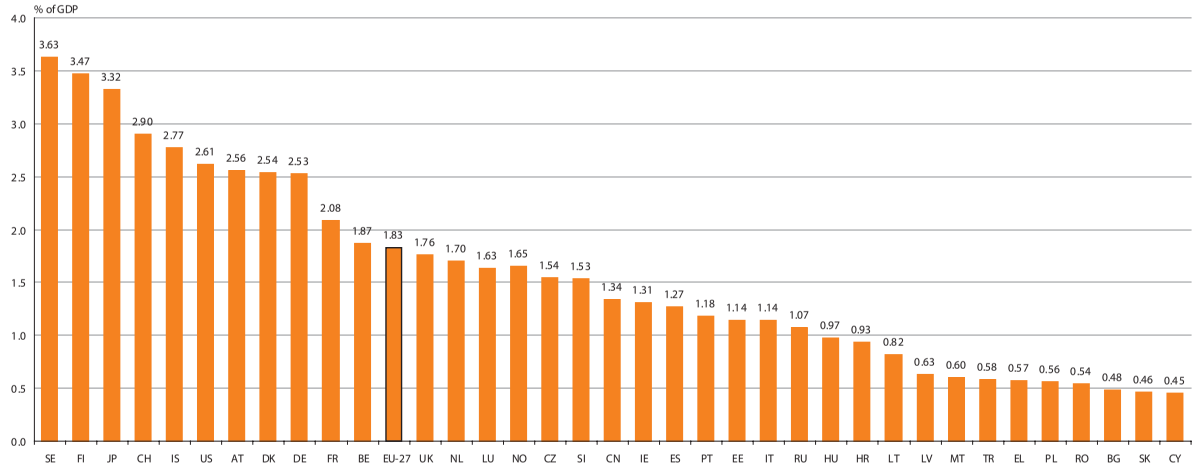
**Figure 2.1:** R&D intensity (R&D expenditure as % of GDP), all sectors, EU-27, EU-15, Japan and the United States — 1997-2007




Eurostat estimation: EU-27, EU-15 — US: federal or central government only.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

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




Eurostat estimation: EU-27 — Exceptions to the reference year: 2006: IT, PL, UK, TR, US; 2005: IS, CN, JP, RU; 2004: CH.
Provisional data: BE, EE, IE, FR, CY, LU, MT, NL, PT, SI, SE — National estimations: DK, DE, EL, AT — US: federal or central government only.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 2.3:** R&D expenditure in EUR million and average annual growth rate (AAGR), by sector of performance, EU-27 and selected countries — 2000-2007

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 |
| **EU-27** | 170 489 s | 226 120 s | 4.1 s | 110 557 s | 144 089 s | 3.9 s | 23 430 s | 30 000 s | 3.6 s | 35 145 s | 50 026 s | 5.2 s |
| BE | 4 964 | 6 263 p | 3.4 | 3 589 | 4 337 p | 2.7 | 312 | 520 p | 7.6 p | 1 005 | 1 367 | 4.5 |
| BG | 71 | 140 | 10.1 | 15 | 43 | 16.2 | 49 | 82 | 7.6 | 7 | 13 | 9.8 |
| CZ | 744 | 1 955 | 14.8 | 446 | 1 248 | 15.8 | 188 | 370 | 10.1 | 106 | 330 | 17.7 |
| DK | 3 892 | 5 779 e | 5.8 | 2 596 | 3 752 e | 5.4 | 492 | 402 e | -2.8 p | 770 | 1 589 e | 10.9 |
| DE | 50 619 | 61 240 e | 2.8 | 35 600 | 42 840 e | 2.7 | 6 873 | 8 400 e | 2.9 p | 8 146 | 10 000 e | 3.0 |
| EE | 37 | 174 p | 24.7 | 8 | 82 p | 38.6 | 9 | 15 | 8.4 | 19 | 73 | 20.8 |
| IE | 1 176 | 2 501 p | 11.4 | 842 | 1 670 p | 10.3 | 96 | 170 | 8.6 | 238 | 660 p | 15.7 |
| EL | 852 | 1 311 e | 7.5 | 278 | 353 e | 4.1 | 188 | 281 e | 6.9 | 383 | 661 e | 9.6 |
| ES | 5 719 | 13 342 | 12.9 | 3 069 | 7 454 | 13.5 | 905 | 2 349 | 14.6 | 1 694 | 3 519 | 11.0 |
| FR | 30 954 b | 39 369 p | 3.5 | 19 348 | 24 872 p | 3.7 | 5 361 b | 6 500 p | 2.8 | 5 804 b | 7 545 p | 3.8 |
| IT | 12 460 | 16 831 | 5.1 | 6 239 | 8 210 | 4.7 | 2 356 | 2 897 | 3.5 | 3 865 | 5 094 | 4.7 |
| CY | 25 | 70 p | 16.1 | 5 | 16 p | 17.7 | 11 | 18 p | 6.8 | 6 | 30 p | 25.7 |
| LV | 38 | 126 | 18.9 | 15 | 41 | 15.3 | 8 | 30 | 20.4 | 14 | 54 | 21.2 |
| LT | 73 | 233 | 18.0 | 16 | 66 | 22.9 | 31 | 48 | 6.8 | 27 | 118 | 23.6 |
| LU | 364 | 591 p | 7.2 | 337 | 495 p | 5.7 | 26 | 78 p | 17.1 | 1 | 18 p | 53.0 |
| HU | 405 i | 977 | 13.4 | 180 i | 492 i | 15.5 | 106 i | 236 i | 12.2 | 97 i | 228 i | 13.0 |
| MT | 12 | 32 p | 22.3 | 3 | 21 | 48.4 | 2 | 1 p | -9.8 | 7 | 10 p | 7.7 |
| NL | 7 626 | 9 666 p | 3.4 | 4 458 | 5 840 p | 3.9 | 974 b | 1 260 ip | 3.8 | 2 120 b | 2 566 ep | 2.8 |

Exceptions to the reference year 2000: EL: 2001; MT: 2002 — Exception to the reference year 2007: 2006: IT — Exceptions to the reference period 2001-2006: 2001-2007: EL; 2002-2007: MT; 2000-2005: IT — Flag i: NL: includes other classes; HU: incomplete breakdown of R&D expenditure by sector of performance.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 2.3:** R&D expenditure in EUR million and average annual growth rate (AAGR), by sector of performance, EU-27 and selected countries — 2000-2007

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 | 2000 | 2007 | AAGR 2000-2007 |
| AT | 4 029 e | 6 946 e | 8.1 | : | 4 891 e | : | : | 363 e | : | : | 1 674 e | : |
| PL | 1 197 | 1 513 | 4.0 | 432 | 477 | 1.7 | 386 | 560 | 6.4 | 377 | 469 | 3.7 |
| PT | 927 e | 1 921 p | 11.0 | 258 e | 988 p | 21.2 | 222 e | 176 p | -3.3 | 348 e | 574 p | 7.4 |
| RO | 149 | 653 | 23.6 | 103 | 272 | 14.9 | 28 | 222 | 34.5 | 17 | 157 | 36.9 |
| SI | 297 | 529 p | 8.6 | 167 | 324 p | 9.9 | 77 | 123 p | 6.9 | 49 | 82 p | 7.5 |
| SK | 143 | 252 | 8.5 | 94 | 100 | 0.8 | 35 | 89 | 14.2 | 14 | 63 | 24.5 |
| FI | 4 423 | 6 243 | 5.1 | 3 136 | 4 513 | 5.3 | 468 | 528 | 1.8 | 789 | 1 165 | 5.7 |
| SE | 10 480 i | 12 063 p | 2.4 | 8 118 i | 8 773 p | 1.3 | 297 i | 734 | 16.3 | 2 054 | 2 541 p | 3.6 |
| UK | 29 070 | 34 037 | 2.7 | 18 884 | 20 985 | 1.8 | 3 672 | 3 401 | -1.3 | 5 985 | 8 892 | 6.8 |
| IS | 251 e | 364 | 7.7 | 142 e | 187 | 5.7 | 64 e | 86 | 5.9 | 41 e | 80 | 14.4 |
| NO | 3 037 | 4 685 | 7.5 | 1 814 | 2 508 | 5.6 | 444 | 715 | 8.3 | 780 | 1 462 | 11.1 |
| CH | 6 852 | 8 486 | 5.5 | 5 065 | 6 257 | 5.4 | 90 bi | 91 i | 0.2 | 1 566 | 1 943 | 5.5 |
| HR | 271 | 348 | 5.2 | 115 | 141 | 4.1 | 60 | 89 | 8.1 | 95 | 117 | 4.3 |
| TR | 1 389 | 2 432 | 9.8 | 465 | 901 | 11.7 | 86 | 284 | 22.1 | 839 | 1 248 | 6.9 |
| CN | 14 063 | 30 002 | 16.4 | 8 499 | 21 325 | 20.2 | 4 183 | 5 912 | 7.2 | 1 381 | 2 765 | 14.9 |
| JP | 153 860 | 121 831 | -4.6 | 109 181 | 93 137 | -3.1 | 15 217 | 10 100 | -7.9 | 22 354 | 16 330 | -6.1 |
| RU | 2 948 | 10 597 | 20.1 | 2 087 | 6 807 | 18.4 | 721 | 3 084 | 23.1 | 134 | 670 | 25.9 |
| US | 289 917 i | 273 772 pi | -1.0 | 216 552 i | 192 584 ip | -1.9 | 29 926 i | 30 462 pi | 0.3 | 33 221 i | 39 098 pi | 2.8 |

Exceptions to the reference year 2000: 2001: SE, NO and CN; HR: 2002 — Exceptions to the reference year 2007: 2004: CH; 2005: IS and JP; 2006: PL, UK, TR, CN, US.
Exceptions to the reference period 2001-2006: 2001-2007: SE and NO; 2002-2007: HR; 2000-2005: IS and JP; 2000-2006: PL, UK, TR, US; 2001-2006: CN.
Flag i: SE: underestimated or based on underestimated data; SE, CH and US: federal or central government only; US: excludes most or all capital expenditure.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 2.4:** R&D expenditure as a percentage of GDP, by sector of performance, EU-27 and selected countries — 2005-2007

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 |
| **EU-27** | 1.82 s | 1.84 s | 1.83 s | 1.15 s | 1.18 s | 1.17 s | 0.25 s | 0.24 s | 0.24 s | 0.40 s | 0.40 s | 0.41 s |
| BE | 1.84 | 1.88 p | 1.87 p | 1.25 | 1.30 p | 1.30 p | 0.15 | 0.15 p | 0.16 p | 0.41 | 0.42 p | 0.41 |
| BG | 0.49 | 0.48 | 0.48 | 0.10 | 0.12 | 0.15 | 0.32 | 0.31 | 0.28 | 0.05 | 0.05 | 0.05 |
| CZ | 1.41 | 1.55 | 1.54 | 0.91 | 1.03 | 0.98 | 0.26 | 0.27 | 0.29 | 0.23 | 0.25 | 0.26 |
| DK | 2.45 | 2.46 | 2.54 e | 1.67 | 1.65 | 1.65 e | 0.16 | 0.16 | 0.18 e | 0.60 | 0.64 | 0.70 e |
| DE | 2.48 | 2.54 | 2.53 e | 1.72 | 1.77 | 1.77 e | 0.35 i | 0.35 i | 0.35 e | 0.41 | 0.41 | 0.41 e |
| EE | 0.94 | 1.15 | 1.14 p | 0.42 | 0.51 | 0.54 p | 0.11 | 0.15 | 0.10 | 0.39 | 0.47 | 0.48 |
| IE | 1.25 | 1.30 p | 1.31 p | 0.82 | 0.88 p | 0.88 p | 0.09 | 0.08 | 0.09 | 0.34 | 0.34 | 0.35 p |
| EL | 0.58 | 0.57 e | 0.57 e | 0.18 | 0.17 e | 0.15 e | 0.12 | 0.12 e | 0.12 e | 0.28 | 0.27 e | 0.29 e |
| ES | 1.12 | 1.20 | 1.27 | 0.60 | 0.67 | 0.71 | 0.19 | 0.20 | 0.22 | 0.33 | 0.33 | 0.33 |
| FR | 2.10 | 2.10 p | 2.08 p | 1.30 | 1.32 p | 1.31 p | 0.37 | 0.35 p | 0.34 p | 0.40 | 0.40 p | 0.40 p |
| IT | 1.09 | 1.14 | : | 0.55 | 0.55 | 0.56 p | 0.19 | 0.20 | 0.21 p | 0.33 b | 0.34 | : |
| CY | 0.40 | 0.43 | 0.45 p | 0.09 | 0.10 | 0.10 p | 0.13 | 0.12 | 0.12 p | 0.16 | 0.18 | 0.19 p |
| LV | 0.56 | 0.70 | 0.63 | 0.23 | 0.35 | 0.21 | 0.10 | 0.11 | 0.15 | 0.23 | 0.24 | 0.27 |
| LT | 0.75 | 0.79 | 0.82 | 0.15 | 0.22 | 0.23 | 0.19 | 0.18 | 0.17 | 0.41 | 0.39 | 0.41 |
| LU | 1.56 | 1.66 | 1.63 p | 1.35 | 1.43 | 1.36 p | 0.19 | 0.20 | 0.22 p | 0.02 | 0.04 | 0.05 p |
| HU | 0.94 | 1.00 | 0.97 | 0.41 i | 0.48 i | 0.49 i | 0.26 i | 0.25 i | 0.23 i | 0.24 i | 0.24 i | 0.23 i |
| MT | 0.60 | 0.64 | 0.60 p | 0.41 | 0.44 | 0.39 p | 0.03 | 0.03 | 0.02 p | 0.16 | 0.18 | 0.19 p |
| NL | 1.72 p | 1.71 p | 1.70 p | 1.01 | 1.01 | 1.03 p | 0.24 i | 0.23 i | 0.22 pi | 0.48 ep | 0.47 ep | 0.45 ep |

Flag i: DE: includes other classes; HU: incomplete breakdown of R&D expenditure by sector of performance; NL: includes other classes.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

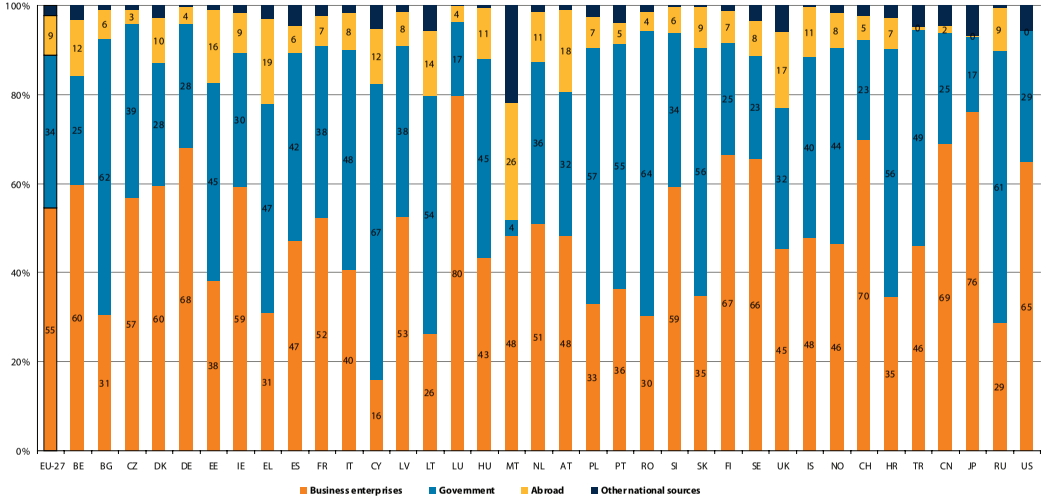
**Table 2.4:** R&D expenditure as a percentage of GDP, by sector of performance, EU-27 and selected countries — 2005-2007

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 | 2005 | 2006 | 2007 |
| AT | 2.44 e | 2.46 | 2.56 e | 1.70 e | 1.73 | 1.81 e | 0.13 e | 0.13 | 0.13 e | 0.61 e | 0.59 | 0.62 e |
| PL | 0.57 | 0.56 | | 0.18 | 0.18 | : | 0.21 | 0.21 | : | 0.18 | 0.17 | : |
| PT | 0.81 | 1.00 e | 1.18 p | 0.31 | 0.47 e | 0.61 p | 0.12 | 0.11 e | 0.11 p | 0.29 | 0.32 e | 0.35 p |
| RO | 0.41 | 0.45 | 0.54 | 0.20 | 0.22 | 0.22 | 0.14 | 0.15 | 0.18 | 0.06 | 0.08 | 0.13 |
| SI | 1.44 | 1.56 | 1.53 p | 0.85 | 0.94 | 0.94 p | 0.35 | 0.38 | 0.36 p | 0.24 | 0.24 | 0.24 p |
| SK | 0.51 | 0.49 | 0.46 | 0.25 | 0.21 | 0.18 | 0.15 i | 0.16 i | 0.16 | 0.10 | 0.12 | 0.11 |
| FI | 3.48 | 3.45 | 3.47 | 2.46 | 2.46 | 2.51 | 0.33 | 0.32 | 0.29 | 0.66 | 0.65 | 0.65 |
| SE | 3.80 b | 3.74 | 3.63 p | 2.81 b | 2.79 | 2.64 p | 0.18 b | 0.17 | 0.22 | 0.79 | 0.77 p | 0.77 p |
| UK | 1.73 | 1.76 | : | 1.06 | 1.08 | : | 0.18 | 0.18 | : | 0.45 | 0.46 | : |
| IS | 2.77 | : | : | 1.43 | : | : | 0.65 | : | : | 0.61 | : | : |
| NO | 1.52 | 1.52 | 1.65 | 0.82 | 0.82 | 0.88 | 0.24 | 0.24 | 0.25 | 0.47 | 0.46 | 0.51 |
| CH | : | : | : | : | : | : | : | 0.02 i | : | : | : | : |
| HR | 1.00 | 0.87 | 0.93 | 0.41 | 0.32 | 0.38 | 0.24 | 0.23 | 0.24 | 0.35 | 0.32 | 0.31 |
| TR | 0.59 | 0.58 | : | 0.20 | 0.21 | : | 0.07 | 0.07 | : | 0.32 | 0.30 | : |
| CN | 1.34 | : | : | 0.91 | : | : | 0.29 | : | : | 0.13 | : | : |
| JP | 3.32 | : | : | 2.54 | : | : | 0.28 | : | : | 0.45 | : | : |
| RU | 1.07 | : | : | 0.73 | : | : | 0.28 | : | : | 0.06 | : | : |
| US | 2.61 pi | 2.61 pi | : | 1.82 pi | 1.83 pi | : | 0.31 pi | 0.29 pi | : | 0.37 pi | 0.37 pi | : |

Flag i: SK: defence excluded (all or mostly); CH and US: federal or central government only; US: excludes most or all capital expenditure.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

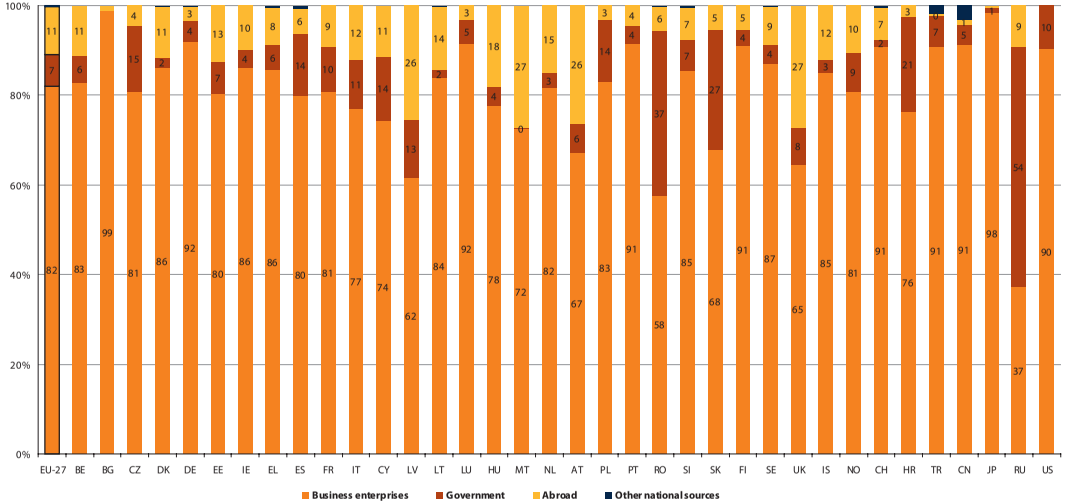
**Figure 2.5:** Total R&D expenditure by source of funds as a percentage of total, EU-27 and selected countries — 2006




Eurostat estimation: EU-27 — CN: excluding HK — Exceptions to the reference year: 2005: EU-27, BE, DK, EL, IT, LU, PT, SE, IS, NO, JP; 2004: CH; 2003: NL.
SK: underestimated or based on underestimated data — CN: incomplete breakdown of R&D expenditure by source of funds — US: excludes most or all capital expenditure.
Provisional data all sources: IE — Provisional data total only: BE, FR, NL — Break in series: SE — National estimations (total only): EL, PT.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

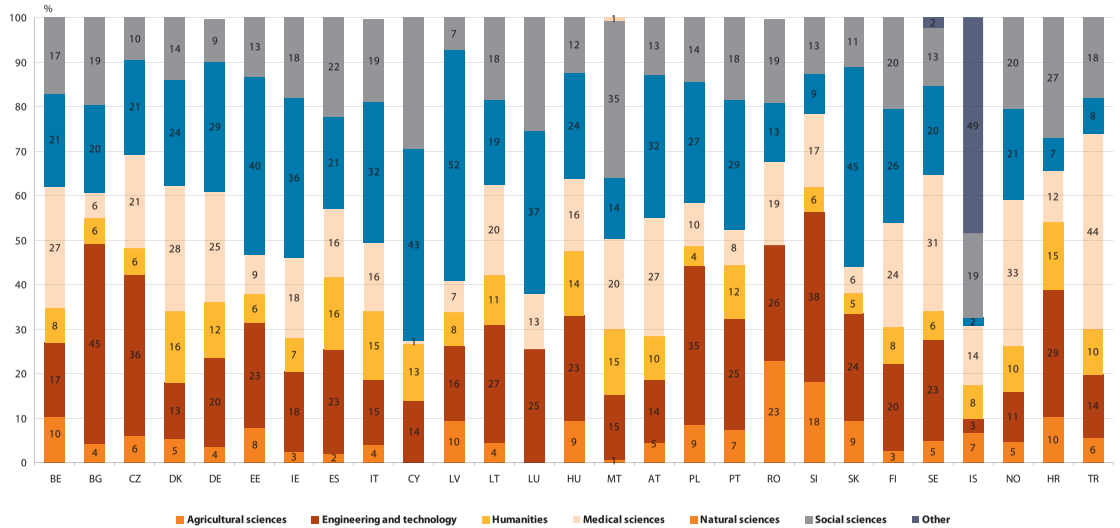
**Figure 2.6:** Business enterprises R&D expenditure by source of funds as a percentage of total, EU-27 and selected countries — 2005




Eurostat estimation: EU-27 — CN: excluding HK — Exceptions to the reference year: 2004: AT and CH; 2003: NL.
National estimation total only: NL — Provisional data: US — HU and CN: incomplete breakdown of R&D expenditure by source of funds — US: excludes most or all capital expenditure.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

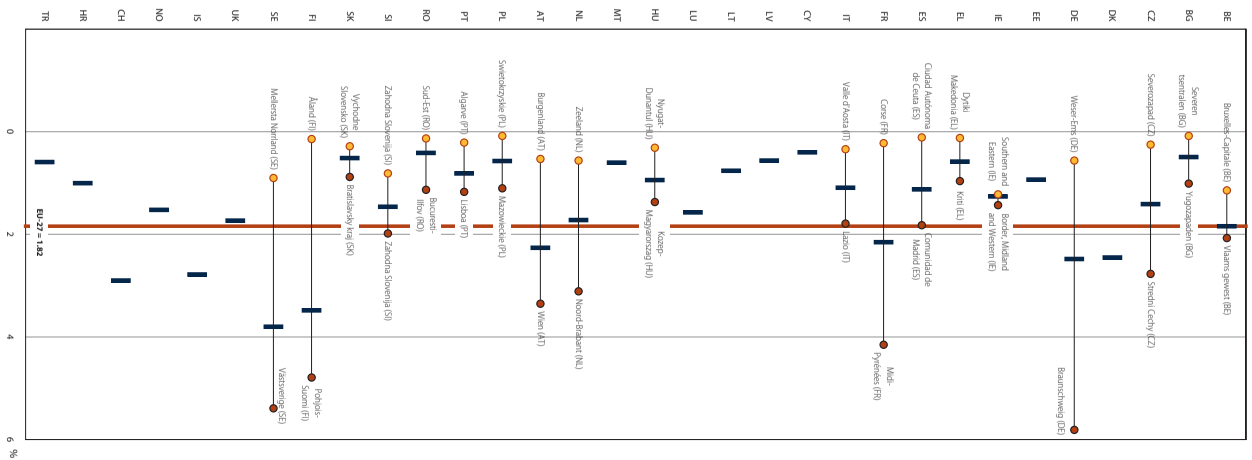
**Figure 2.7:** R&D expenditure by field of sciences as a percentage of total in higher education sector, selected countries — 2005




Exceptions to the reference year: 2004: AT and HR — Breakdown by field of science not available for: EL, FR, NL, UK, CH, CN, JP, US — Provisional data: IT.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Figure 2.8:** Regional disparities (NUTS 2 level) in R&D expenditure as a percentage of GDP, all sectors, EU-27 and selected countries — 2005




Eurostat estimation: EU-27 — NUTS level 1: BE — NL: national estimates and provisional data — Break in series: FR and SE — Exceptions to the reference year: AT, FR and CH: 2004.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

# Part 2
# Monitoring the knowledge workers

## Chapter 3 - R&D personnel

In 2005, 1.44 % of total EU-27 employment was related to R&D activities (in head count — HC). At national level, the highest shares of R&D personnel (in HC) in total employment were observed in Iceland (3.58 %), Finland (3.22 %) and Sweden (2.71 %).

R&D personnel intensity in the business enterprise sector (BES) accounted for 0.62 % of R&D employment in the EU-27 in 2005. Luxembourg was in the lead with 2.15 %, followed by Northern European countries such as Finland (1.70 %), Sweden (1.51 %), Iceland (1.48 %) and Denmark (1.43 %).

In absolute terms, in the EU-27 more than 2 million people in full-time equivalents (FTE) were engaged in R&D activities in 2006. More than half of R&D personnel (1.1 million FTE) were employed in the business enterprise sector. The higher education sector (HES) employed more than 600 000 persons in R&D and the government sector (GOV) more than 300 000. Between 2000 and 2006 all sectors registered an average annual growth rate in excess of 0.7 %. Over the same period, R&D personnel increased faster in the higher education sector (2.3 %) than in the government sector (0.7 %).

Women are still under-represented in R&D personnel, especially in the BES, where they accounted for only 22.6 % of persons employed. By contrast, the government and higher education sectors employed higher shares of female workers, with 43.4 % and 45.5 % respectively.

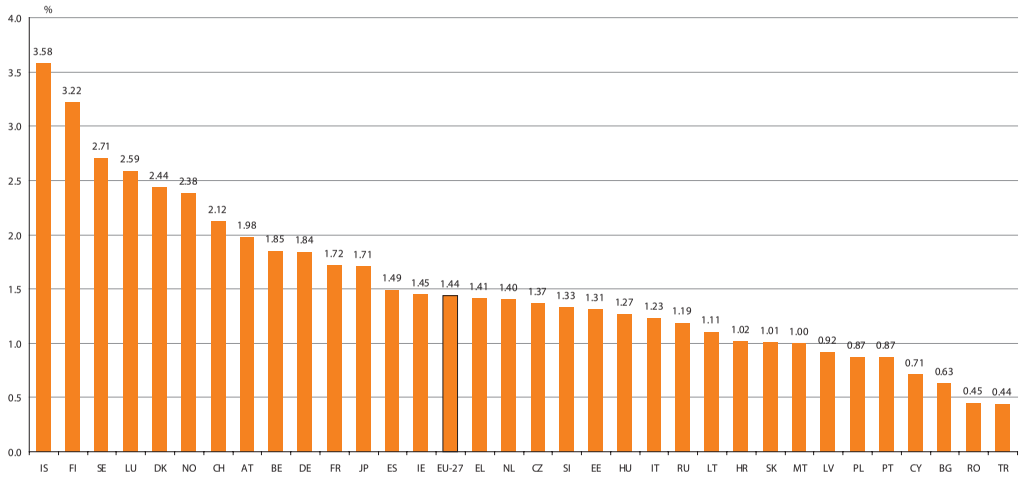
The breakdown of researchers by sector of performance reveals a complex picture across the EU-27. The majority of researchers in the EU-27 were employed in the BES, followed by the higher education sector (35 %); the government sector employed 14 % of researchers at EU level.

In 2005, women accounted for 30 % of researchers in all sectors, against 19 % of researchers in the BES. Latvia was the only country where female researchers outnumbered their male counterparts in all sectors.

Looking at the breakdown of business enterprise researchers in full-time equivalents (FTE) by sector of economic activity (NACE), in 2005 manufacturing was by far the most important sector of economic activity in the EU-27. The manufacturing sector employed more than 80 % of researchers in Germany, and more than 70 % in Belgium, France, Malta, Slovenia and Finland. In most countries the manufacturing sector was followed by services.

At regional level, Wien (AT) was the leading region when considering the share of R&D personnel in total employment (with 4.5 %), followed by Trøndelag (NO) and Praha (CZ). The analysis points to two important features: many of the 15 leading regions in terms of R&D personnel as a share of total employment are capital regions, and Germany counted four such leading regions.

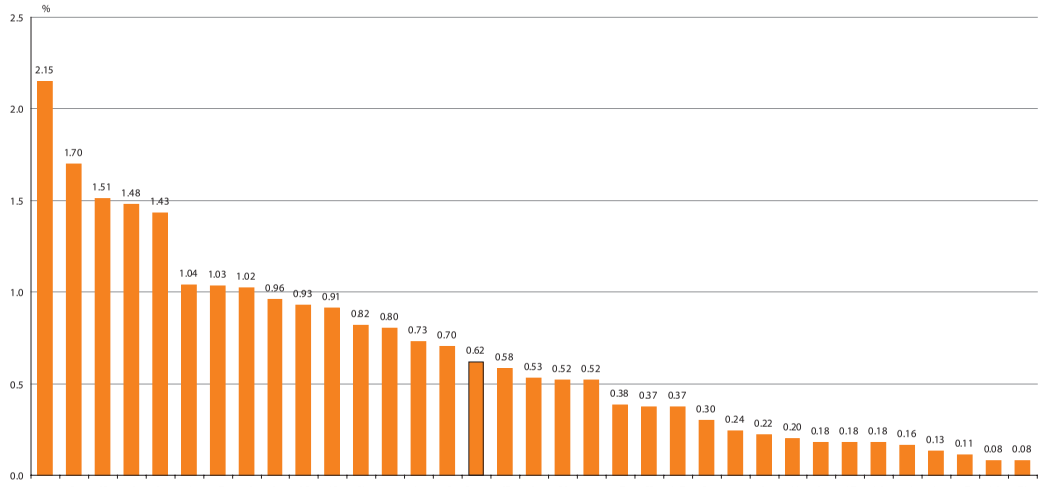
**Figure 3.1:** R&D personnel as a percentage of persons employed (HC), all sectors, EU-27 and selected countries — 2005




EU-27: Eurostat estimation — 2004: AT, CH — Provisional data: NL — Break in series: SE — Data not available: UK.
FR: defence excluded (all or mostly) — RU: underestimated or based on underestimated data.

*Source*: Eurostat, R&D statistics - OECD - MSTI.

**Figure 3.2:** R&D personnel in the business enterprise sector, as a percentage of persons employed (HC), EU-27 and selected countries — 2005




EU-27: Eurostat estimation — National estimation: UK — Break in series: SE — Exceptions to the reference year: 2004: AT and CH — RU: underestimated or based on underestimated data.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 3.3:** R&D personnel in FTE by sector of performance, total, percentage of women in 2006 and average annual growth rate (AAGR) 2000-2006, EU-27 and selected countries

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 |
| **EU-27** | 2 192 594 s | 33.0 s | 1.9 | 1 176 701 s | 22.6 s | 1.9 | 334 234 s | 43.4 s | 0.7 | 653 285 s | 45.5 s | 2.3 |
| BE | 55 204 p | : | 0.6 | 32 208 p | 24.5 p | -0.7 | 3 665 p | : | 0.8 | 18 968 | : | 3.0 |
| BG | 16 321 | 50.9 | 1.1 | 2 463 | 39.5 | 2.4 | 10 255 | 57.9 | -0.6 | 3 464 | 38.8 | 6.2 |
| CZ | 47 729 | 31.5 | 12.0 | 24 101 | 21.4 | 13.1 | 10 698 | 45.8 | 7.0 | 12 776 | 38.6 | 15.7 |
| DK | 44 878 | : | 3.0 | 29 238 | : | 3.5 | 3 273 | 46.4 | -8.9 | 12 080 | 46.4 | 7.2 |
| DE | 487 260 | : | 0.1 | 312 145 e | : | 0.0 | 78 357 | 37.5 | 1.5 | 96 758 b | 41.1 b | -0.7 |
| EE | 4 741 | 42.1 | 4.2 | 1 631 | 29.1 | 25.5 | 714 | 62.6 | -4.6 | 2 290 | 44.2 | -0.1 |
| IE | 17 660 p | : | 5.6 | 10 800 p | : | 3.6 | 1 248 | 38.3 | -2.3 | 5 612 | 42.1 | 13.7 |
| EL | 35 140 e | : | 3.1 | 11 402 e | : | 0.4 | 4 578 e | : | -0.6 | 18 952 e | : | 5.9 |
| ES | 188 978 | 38.2 | 7.8 | 82 870 | : | 9.9 | 34 588 | 49.3 | 7.5 | 70 950 | 43.2 | 6.2 |
| FR | 363 867 i | : | 1.8 | 202 157 | : | 2.2 | 54 506 i | : | 0.3 | 101 073 | : | 1.9 |
| IT | 192 002 | 34.8 | 4.2 | 80 082 | 19.0 | 3.8 | 36 165 | 48.3 | 2.5 | 67 688 | 46.1 | 3.6 |
| CY | 1 226 | 37.9 | 10.3 | 310 | 30.3 | 13.6 | 353 | 43.3 | 0.2 | 466 | : | 22.6 |
| LV | 6 520 | 49.1 | 3.0 | 1 873 | 38.3 | 5.4 | 1 164 | 63.4 | -0.4 | 3 482 | : | 3.2 |
| LT | 11 443 | 53.6 | -0.5 | 1 276 | 38.4 | 14.4 | 2 930 | 57.1 | -8.4 | 7 237 | : | 2.5 |
| LU | 4 377 | : | 3.0 | 3 549 | : | 1.0 | 635 | : | 13.1 | 193 | : | 42.6 |
| HU | 25 971 | 41.6 | 1.7 | 9 279 | 32.7 | 6.2 | 8 169 | 47.3 | -0.1 | 8 523 | 45.7 | -0.6 |
| MT | 861 | 25.2 | 16.0 | 508 | 19.5 | 61.3 | 46 | 32.6 | -23.6 | 307 | 33.6 | 3.7 |

EU-27: Eurostat estimation — Flag i: FR: defence excluded (all or mostly).
Exceptions to the reference period: 2001-2006: EL; 2002-2006: MT.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

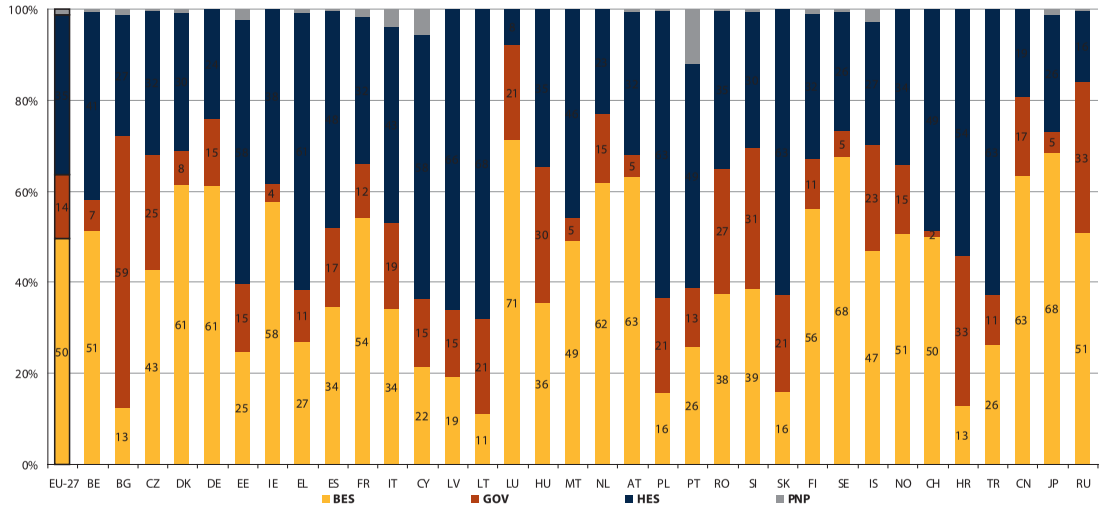
**Table 3.3:** R&D personnel in FTE by sector of performance, total, percentage of women in 2006 and average annual growth rate (AAGR) 2000-2006, EU-27 and selected countries

| | All sectors | | | Business enterprise sector | | | Government sector | | | Higher education sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 | TOTAL 2006 | % of female | AAGR 2000-2006 |
| NL | 96 861 p | : | 1.6 | 54 968 | : | 2.5 | 12 765 i | : | 0.2 | 29 128 ep | : | 1.4 |
| AT | 49 377 | 23.5 | 6.1 | 34 126 | 15.7 | 6.3 | 2 423 | 40.9 | 4.1 | 12 668 | 40.6 | 6.4 |
| PL | 73 554 | : | -1.2 | 14 166 | : | -4.4 | 17 668 | : | -1.1 | 41 535 | : | 0.0 |
| PT | 30 160 | : | 5.5 | 9 289 | : | 17.3 | 4 500 | : | -4.5 | 12 841 | : | 4.8 |
| RO | 30 802 | 46.5 | -1.6 | 13 761 | 44.4 | -7.9 | 8 381 | 52.8 | 1.7 | 8 563 | 43.5 | 14.6 |
| SI | 9 793 | 37.0 | 2.3 | 4 807 | 30.8 | 2.6 | 2 842 | 44.6 | 1.7 | 2 116 | 41.2 | 3.3 |
| SK | 15 028 | 45.1 | -0.2 | 3 144 | 33.7 | -8.0 | 3 732 i | 52.6 i | -1.9 | 8 138 | 46.2 | 5.6 |
| FI | 58 257 | : | 1.7 | 32 993 | : | 1.9 | 7 408 | : | 0.2 | 17 362 | : | 2.0 |
| SE | 78 715 | : | 1.7 | 57 641 | : | 3.1 | 3 618 | : | 5.1 | 17 137 | : | -2.9 |
| UK | 323 358 e | : | 0.2 | 145 401 | : | 0.0 | 20 415 | 37.0 | -11.7 | : | : | : |
| IS | 3 226 | 39.2 | 4.0 | 1 530 | 33.8 | 5.9 | 849 | 41.2 | 4.4 | 742 | 44.7 | 0.5 |
| NO | 31 745 | : | 3.2 | 16 545 | : | 2.2 | 5 330 | : | 2.3 | 9 870 | : | 5.7 |
| CH | 52 250 | : | 0.0 | 33 085 | : | -2.2 | 810 i | : | -2.5 | 18 355 e | : | 4.8 |
| HR | 9 516 | 48.7 | -7.4 | 2 259 | 41.6 | -2.4 | 3 178 | 53.2 | 1.2 | 4 052 | 49.2 | -14.1 |
| TR | 54 444 | 30.8 | 12.4 | 18 029 | 22.4 | 20.0 | 9 702 | 23.4 | 15.6 | 26 713 | 39.1 | : |
| CN | 1 502 472 i | : | 8.5 | 987 834 i | : | 12.8 | 272 133 i | : | -0.6 | 242 505 i | : | 7.3 |
| JP | 921 173 | : | 0.5 | 609 808 | : | 0.9 | 62 975 | : | 1.2 | 234 052 | : | 0.5 |
| RU | 916 509 | : | -1.6 | 515 319 | : | -3.3 | 297 880 | : | 1.3 | 100 990 | : | 0.2 |

CN: excluding HK.
Exceptions to the reference year: 2005: UK, IS, JP; 2004: CH — Exceptions to the reference period: 2001-2006: SE , NO; 2000-2005: JP, IS; 2002-2006: AT, HR; 2002-2005: UK; 2000-2004: CH.
Flag i: SK: defence excluded (all or mostly); NL: includes other classes; CN: data do not comply with Frascati Manual recommendations; CH: federal or central government only.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

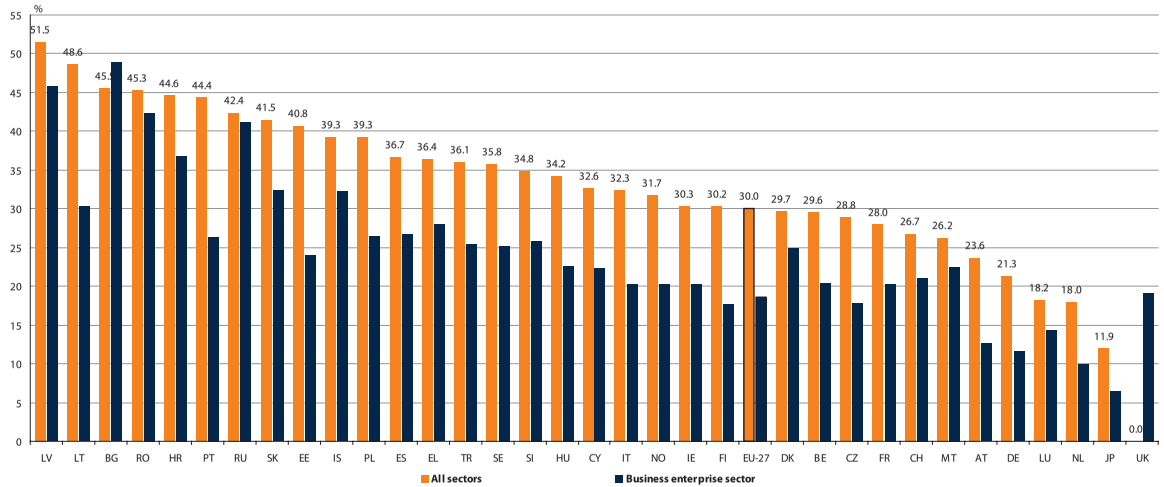
**Figure 3.4:** Researchers by sector of performance (FTE), EU-27 and selected countries — 2006




EU-27: Eurostat estimation — CN: excluding HK — Provisional data: BE, IE, NL — National estimation: EL, UK — Exceptions to the reference year: 2005: UK, IS, JP; 2004: CH. FR and SK: defence excluded (all or mostly) — SE and NO: university graduates instead of researchers — CH: federal or central government only.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Figure 3.5:** Percentage of women researchers (HC) in all sectors and in the business enterprise sector, EU-27 and selected countries — 2005




EU-27: Eurostat estimation — National estimation: UK — Provisional data: NL (all sectors) — Break in series: SE — Exceptions to the reference year: 2004: AT, CH. SE and NO: university graduates instead of researchers — RU: underestimated or based on underestimated data — FR: defence excluded (all or mostly).

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Table 3.6:** Business enterprise researchers in FTE, by economic activity (NACE Rev 1.1), EU-27 and selected countries — 2005

| | Total | Agriculture, hunting, forestry and fishing | | Mining and quarrying | | Manufacturing | | Electricity, gas and water supply | | Construction | | Services | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FTE | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total |
| **EU-27** | 635 034 s | : | : | : | : | : | : | : | : | : | : | : | : |
| BE | 16 769 | 133 | 0.8 | 34 | 0.2 | 12 804 | 76.4 | 66 | 0.4 | 242 | 1.4 | 3 490 | 20.8 |
| BG | 1 157 | : c | : | : c | : | 501 | 43.3 | 0 | 0.0 | 0 | 0.0 | 653 | 56.4 |
| CZ | 10 353 b | 33 b | 0.3 | 4 b | 0.0 | 5 070 b | 49.0 | 8 b | 0.1 | 76 b | 0.7 | 5 162 b | 49.9 |
| DK | 17 624 | 52 | 0.3 | : c | : | 9 156 | 52.0 | : c | : | 54 | 0.3 | 8 325 | 47.2 |
| DE | 166 874 | 190 | 0.1 | 62 | 0.0 | 144 495 | 86.6 | 331 | 0.2 | 189 | 0.1 | 21 608 | 12.9 |
| EE | 883 | 2 | 0.2 | : c | : | 272 | 30.8 | 29 | 3.3 | : c | : | 576 | 65.2 |
| IE | 6 768 | 7 | 0.1 | 2 | 0.0 | 3 649 | 53.9 | 9 | 0.1 | 0 | 0.0 | 3 091 | 45.7 |
| EL | 6 033 | 35 | 0.6 | 69 | 1.1 | 2 837 | 47.0 | 3 | 0.0 | 38 | 0.6 | 3 050 | 50.6 |
| ES | 35 034 | 234 | 0.7 | 42 | 0.1 | 16 465 | 47.0 | 205 | 0.6 | 804 | 2.3 | 17 284 | 49.3 |
| FR | 106 837 | 1 138 | 1.0 | 365 | 0.3 | 85 130 | 79.7 | 1 979 | 1.8 | 383 | 0.4 | 17 843 | 16.7 |
| IT | 27 939 | : | : | 96 | 0.3 | 17 820 | 63.8 | 91 | 0.3 | 64 | 0.2 | 9 868 | 35.3 |
| CY | 130 | 2 | 1.5 | 0 | 0.0 | 49 | 37.7 | 3 | 2.3 | 0 | 0.0 | 75 | 57.7 |
| LV | 468 | : | : | : | : | 162 | 34.6 | : | : | : | : | 306 | 65.4 |
| LT | 716 | : | : | 4 | 0.6 | 440 | 61.5 | 5 | 0.7 | 6 | 0.8 | 261 | 36.5 |
| LU | 1 696 | : | : | : | : | 835 | 49.2 | : | : | : | : | 860 | 50.7 |
| HU | 5 008 | 118 | 2.4 | 2 | 0.0 | 3 152 | 62.9 | 47 | 0.9 | 22 | 0.4 | 1 667 | 33.3 |
| MT | 236 | : | : | 0 | 0.0 | 179 | 75.8 | 1 | 0.4 | 0 | 0.0 | 56 | 23.7 |

EU-27: Eurostat estimation — Break in series: CZ.
*Source:* Eurostat, R&D statistics - OECD - MSTI.

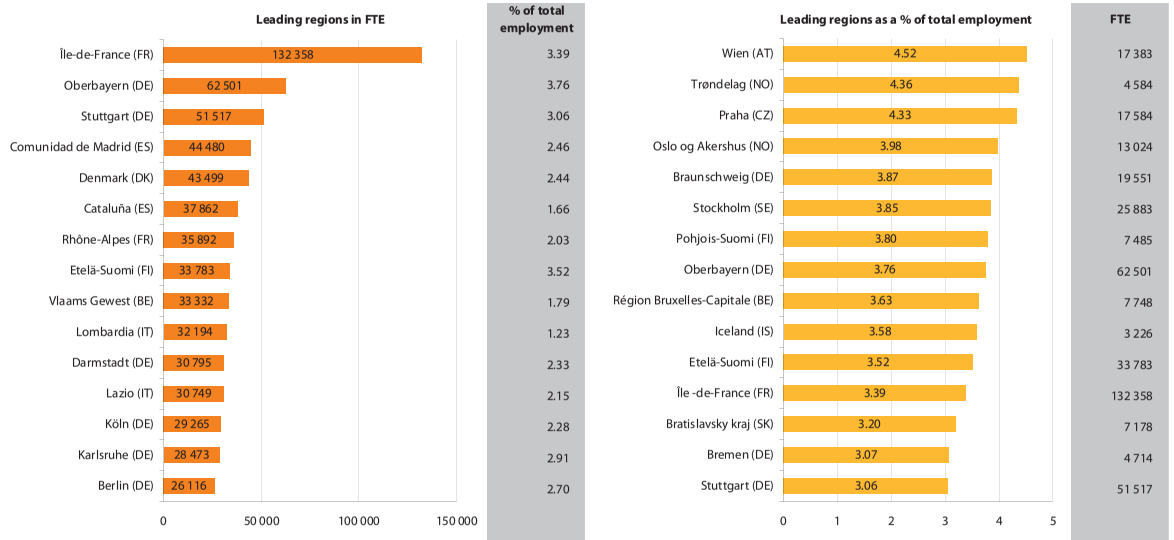
**Table 3.6:** Business enterprise researchers in FTE, by economic activity (NACE Rev 1.1), EU-27 and selected countries — 2005

| | Total | Agriculture, hunting, forestry and fishing | | Mining and quarrying | | Manufacturing | | Electricity, gas and water supply | | Construction | | Services | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FTE | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total | FTE | % of total |
| NL | 22 898 | 205 | 0.9 | 388 | 1.7 | 14 361 | 62.7 | 100 | 0.4 | 144 | 0.6 | 7 700 | 33.6 |
| AT | 16 508 | 13 | 0.1 | 10 | 0.1 | 11 458 | 69.4 | 42 | 0.3 | 81 | 0.5 | 4 904 | 29.7 |
| PL | 9 412 | 25 | 0.3 | 1 | 0.0 | 4 558 | 48.4 | 56 | 0.6 | 0 | 0.0 | 4 772 | 50.7 |
| PT | 4 014 | 23 | 0.6 | 4 | 0.1 | 2 042 | 50.9 | 15 | 0.4 | 43 | 1.1 | 1 887 | 47.0 |
| RO | 10 319 | 1 215 | 11.8 | 342 | 3.3 | 6 727 | 65.2 | 548 | 5.3 | 87 | 0.8 | 1 400 | 13.6 |
| SI | 1 936 | 0 | 0.0 | 25 | 1.3 | 1 475 | 76.2 | 3 | 0.2 | 0 | 0.0 | 433 | 22.4 |
| SK | 1 947 | 55 | 2.8 | 0 | 0.0 | 547 | 28.1 | : c | : | : c | : | 1 339 | 68.8 |
| FI | 21 967 | 3 | 0.0 | 16 | 0.1 | 17 250 | 78.5 | 24 | 0.1 | 110 | 0.5 | 4 564 | 20.8 |
| SE | 36 697 bi | 100 bi | 0.3 | 98 bi | 0.3 | 24 126 bi | 65.7 | 61 bi | 0.2 | 285 bi | 0.8 | 12 028 bi | 32.8 |
| UK | 93 717 | : c | : | 220 | 0.2 | : c | : | 179 | 0.2 | 478 | 0.5 | 23 432 | 25.0 |
| IS | 1 012 | 19 | 1.9 | : | : | 348 | 34.4 | 6 | 0.6 | 4 | 0.4 | 635 | 62.7 |
| NO | 10 692 i | 76 | 0.7 | 449 | 4.2 | 4 276 | 40.0 | 46 | 0.4 | 54 | 0.5 | 5 791 | 54.2 |
| CH | 12 640 | : | : | : | : | 9 365 | 74.1 | : | : | : | : | 3 275 | 25.9 |
| HR | 707 | 79 | 11.2 | 0 | 0.0 | 229 | 32.4 | 0 | : | 67 | 9.5 | 332 | 47.0 |
| TR | 9 456 | 30 | 0.3 | 68 | 0.7 | 5 897 | 62.4 | 10 | 0.1 | 46 | 0.5 | 3 404 | 36.0 |
| CN | 696 413 i | : | : | : | : | : | : | : | : | : | : | : | : |
| JP | 481 496 | : | : | : | : | : | : | : | : | : | : | : | : |
| RU | 237 959 | : | : | : | : | : | : | : | : | : | : | : | : |
| US | 1 104 500 | : | : | : | : | : | : | : | : | : | : | : | : |

CN: excluding HK — Break in series: SE — Exceptions to the reference year: 2004: AT, CH.
Flag i: SE and NO: university graduates instead of researchers; CN: data do not comply with Frascati Manual recommendations.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

**Figure 3.7:** Top 15 regions in terms of total R&D personnel in FTE and as a percentage of total employment (HC), all sectors — 2005




Exceptions to the reference year: 2004: AT; 2001: FR — NUTS0: DK; NUTS1: BE.

*Source:* Eurostat, R&D statistics - OECD - MSTI.

# Chapter 4 - Human ressources in science and technology

Human resources in science and technology (HRST) are defined as individuals who have successfully completed tertiary-level education (HRSTE) and/or work in an S&T occupation as professionals or technicians (HRSTO). Statistics on HRST contribute significantly to measuring the new economy and its dynamism. They provide an overview of supply and demand levels for highly qualified persons by measuring HRST stocks and flows.

In 2006 the EU counted 18.8 million tertiary education students, representing 28.4 % of the population aged 20-29. Finland, Greece and Lithuania recorded the highest shares of the population aged 20-29 in tertiary education, with 46.5 %, 41.9 % and 40.6 % respectively. The share of women in tertiary education was above 50 % in all countries under review except for Germany, Turkey, Liechtenstein, China and Japan.

In the EU as a whole, more tertiary-level students were studying engineering, manufacturing and construction than science, mathematics and computing. This was also the case at country level, except in Ireland, France, Cyprus, Malta, Austria, the United Kingdom and Norway, where the share of students in science, mathematics and computing was higher. The share of women in these fields was lower than the average female participation rate in higher education, at 37.2 % in science, mathematics and computing and 24.4 % in engineering, manufacturing and construction.

In 2006, 3.8 million students graduated from tertiary education in the EU. Except for Croatia, Iceland, China and Japan, in all countries under review more than half of tertiary education graduates were women.

In terms of HRST stocks, the EU counted more than 87 million highly qualified persons in 2007, but not all of them were employed. Women accounted for half of HRST stocks in the EU-27 and for more than half of HRST stocks in 18 Member States. The Baltic States recorded the highest shares of women in HRST, with 63.6 % in Latvia, 62.9 % in Estonia and 61.8 % in Lithuania. On the other hand, Malta recorded the lowest share of female HRST stocks (40.3 %). Turkey (33.9 %) and China (43.2 %) also recorded low levels of female participation in HRST. Among the HRST population, 35.2 million persons were considered as HRST by virtue of both education and occupation (HRSTC). The share of women in HRSTC was 52 %, compared with 50.7 % in HRSTE.

At EU-27 level, public expenditure on education as a percentage of GDP stood at 5.0 %. Denmark was the leading country on education expenditure, with 8.3 % of GDP, followed by Iceland and Norway, with 7.6 % and 7.0 % respectively.

In all EU and EFTA countries, HRST unemployment rates (HRSTU) for 2007 were significantly lower than for the non-tertiary-educated population (NHRSTU). In the EU-27 the unemployment rates for the two groups stood at 2.3 % and 7.1 % respectively. The largest discrepancy between HRSTU and NHRSTU was found in Slovakia, at 10 percentage points, compared with less than 1 percentage point in Denmark and Norway.

In 2007, Luxembourg recorded the highest share of foreign HRST aged 25-64 in Europe, with 48.9 % of HRST being non-nationals; however it should be noted that not all of these HRST were in employment. Cyprus, Spain, the United Kingdom and Switzerland accounted for the highest shares of HRST with non-EU citizenship.

Concerning HRSTO at regional level and as a share of the labour force, Praha (CZ) was the only region where more than 50 % of the labour force was employed in S&T occupations. Germany counted nine regions among the top 30 regions in terms of S&T occupation, and Switzerland counted five.

**Table 4.1:** Students and graduates from tertiary education, total and in selected fields of study, percentage of population aged 20-29 and percentage of women, EU-27 and selected countries — 2006

| | Students participating in tertiary education, 2006 | | | | | | | | | Graduates from tertiary education, 2006 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In any field | | | In science, mathematics and computing | | | In engineering, manufacturing and construction | | | In any field | | |
| | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female |
| **EU-27** | 18 782 520 | 28.4 | 55.1 | 1 903 777 i | 3.0 i | 37.2 i | 2 610 315 | 4.0 | 24.4 i | 3 794 591 i | 5.8 i | 58.9 i |
| BE | 394 427 | 30.1 | 54.7 | 27 141 | 2.1 | 31.8 | 41 670 | 3.2 | 24.2 | 81 567 | 6.2 | 58.8 |
| BG | 243 464 | 22.0 | 53.5 | 12 129 | 1.1 | 48.9 | 51 083 | 4.6 | 31.8 | 45 353 | 4.1 | 60.1 |
| CZ | 337 405 | 21.9 | 53.8 | 28 822 | 1.9 | 32.5 | 48 538 | 3.1 | 24.0 | 69 312 | 4.5 | 56.9 |
| DK | 228 893 | 36.8 | 57.4 | 18 415 | 3.0 | 32.6 | 23 077 | 3.7 | 32.9 | 47 539 | 7.6 | 58.0 |
| DE | 2 289 465 | 23.5 | 49.7 | 347 803 | 3.6 | 34.8 | 360 394 | 3.7 | 18.2 | 358 706 | 3.7 | 53.7 |
| EE | 68 287 | 34.2 | 61.6 | 6 860 | 3.4 | 39.1 | 8 412 | 4.2 | 27.2 | 11 541 | 5.8 | 71.4 |
| IE | 186 045 | 25.4 | 55.1 | 21 627 | 3.0 | 42.3 | 19 420 | 2.7 | 16.4 | 59 184 | 8.1 | 56.1 |
| EL | 653 003 | 41.9 | 50.9 | : | : | : | 93 626 | 6.0 | 23.6 | 64 387 | 4.1 | 61.4 |
| ES | 1 789 254 | 27.3 | 53.9 | 203 595 | 3.1 | 34.1 | 318 881 | 4.9 | 28.0 | 285 957 | 4.4 | 58.3 |
| FR | 2 201 201 | 27.3 | 55.3 | 269 665 | 3.3 | 35.7 | 252 882 | 3.1 | 23.4 | 643 600 | 8.0 | 55.5 |
| IT | 2 029 023 | 29.4 | 56.9 | 159 681 | 2.3 | 49.7 | 316 135 | 4.6 | 28.3 | 279 492 | 4.1 | 58.1 |
| CY | 20 587 | 16.1 | 50.9 | 2 605 | 2.0 | 35.9 | 1 262 | 1.0 | 14.0 | 3 858 | 3.0 | 61.5 |
| LV | 131 125 | 38.5 | 63.3 | 6 792 | 2.0 | 30.5 | 13 159 | 3.9 | 20.8 | 26 414 | 7.8 | 70.6 |
| LT | 198 868 | 40.6 | 59.9 | 12 180 | 2.5 | 33.8 | 35 775 | 7.3 | 25.2 | 43 343 | 8.9 | 66.1 |
| LU | 2 692 | 4.5 | 51.6 | 226 | 0.4 | : | 405 | 0.7 | : | : | : | : |
| HU | 438 702 | 29.8 | 58.5 | 23 017 | 1.6 | 31.1 | 54 569 | 3.7 | 18.7 | 69 756 | 4.7 | 65.3 |
| MT | 8 922 | 15.0 | 57.0 | 748 | 1.3 | 36.2 | 680 | 1.1 | 29.1 | 2 676 | 4.5 | 58.0 |

% Tertiary students of all ages are divided by the population aged 20-29 years.
Flag i: EU-27 aggregate excluding EL in Science, mathematics and computing & excluding LU for % of women in selected fields of study and excluding LU from graduates from tertiary education.

*Source:* Eurostat HRST statistics.

**Table 4.1:** Students and graduates from tertiary education, total and in selected fields of study, percentage of population aged 20-29 and percentage of women, EU-27 and selected countries — 2006

| | Students participating in tertiary education, 2006 | | | | | | | | | Graduates from tertiary education, 2006 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In any field | | | In science, mathematics and computing | | | In engineering, manufacturing and construction | | | In any field | | |
| | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female | Total | % of population aged 20-29 | % female |
| NL | 579 622 | 29.6 | 51.1 | 38 052 | 1.9 | 15.6 | 47 292 | 2.4 | 15.0 | 117 392 | 6.0 | 55.9 |
| AT | 253 139 | 24.1 | 53.8 | 31 334 | 3.0 | 34.3 | 29 890 | 2.8 | 21.3 | 34 825 | 3.3 | 51.7 |
| PL | 2 145 687 | 33.5 | 57.4 | 207 455 | 3.2 | 36.7 | 269 810 | 4.2 | 27.1 | 504 051 | 7.9 | 65.6 |
| PT | 367 312 | 24.6 | 55.2 | 26 833 | 1.8 | 49.5 | 80 597 | 5.4 | 25.7 | 71 828 | 4.8 | 65.4 |
| RO | 834 969 | 24.6 | 55.4 | 39 116 | 1.2 | 53.9 | 152 176 | 4.5 | 29.7 | 174 821 | 5.2 | 59.2 |
| SI | 114 794 | 39.5 | 58.4 | 6 241 | 2.1 | 33.0 | 17 962 | 6.2 | 24.1 | 17 145 | 5.9 | 61.9 |
| SK | 197 943 | 21.6 | 57.7 | 17 910 | 2.0 | 35.8 | 32 439 | 3.5 | 28.5 | 40 190 | 4.4 | 59.5 |
| FI | 308 966 | 46.5 | 53.9 | 35 269 | 5.3 | 39.8 | 80 153 | 12.1 | 18.8 | 40 044 | 6.0 | 63.0 |
| SE | 422 614 | 39.1 | 59.6 | 40 910 | 3.8 | 42.9 | 68 846 | 6.4 | 27.8 | 60 762 | 5.6 | 63.7 |
| UK | 2 336 111 | 29.4 | 57.3 | 319 351 | 4.0 | 36.9 | 191 182 | 2.4 | 19.8 | 640 848 | 8.1 | 58.1 |
| HR | 136 646 | 22.1 | 54.1 | 10 143 | 1.6 | 42.0 | 22 283 | 3.6 | 25.4 | 20 687 | 3.4 | 58.6 |
| MK | 48 368 | 14.9 | 56.7 | 3 499 | 1.1 | 52.2 | 8 873 | 2.7 | 32.3 | 6 501 | 2.0 | 64.5 |
| TR | 2 342 898 | 17.6 | 42.4 | 175 757 | 1.3 | 39.5 | 312 420 | 2.3 | 18.6 | 373 375 | 2.8 | 44.7 |
| IS | 15 721 | : | 64.3 | 1 263 | : | 38.2 | 1 149 | : | 32.0 | 3 404 | : | 67.0 |
| LI | 636 | 14.4 | 30.3 | : | : | : | 159 | 3.6 | 37.1 | 132 | 3.0 | 25.0 |
| NO | 214 711 | 38.0 | 59.7 | 19 120 | 3.4 | 33.4 | 14 387 | 2.5 | 24.0 | 33 529 | 5.9 | 61.4 |
| CH | 204 999 | 22.4 | 46.9 | 21 983 | 2.4 | 29.1 | 27 418 | 3.0 | 14.5 | 56 320 | 6.2 | 43.9 |
| JP | 4 084 861 | : | 45.7 | 118 689 | : | 25.0 | 655 851 | : | 11.7 | 1 067 939 | : | 49.3 |
| US | 17 487 475 | : | 57.4 | 1 554 778 | : | 38.6 | 1 166 545 | : | 16.2 | 2 639 006 | : | 58.3 |

% Tertiary students of all ages are divided by the population aged 20-29 years — MK: provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the United Nations.

*Source:* Eurostat HRST statistics.

**Table 4.2:** HRST stocks by category of HRST, aged 25-64 years, total and percentage of women, EU-27 and selected countries — 2007

| | HRST Human resources in S&T | | HRSTC Human resources in S&T core | | HRSTE Human resources in S&T in terms of education | | HRSTO Human resources in S&T in terms of occupation | |
|---|---|---|---|---|---|---|---|---|
| | 1 000s | % female | 1 000s | % female | 1 000s | % female | 1 000s | % female |
| **EU-27** | 87 028 i | 50.5 | 35 243 i | 52.0 | 62 382 i | 50.7 | 59 888 i | 51.2 |
| BE | 2 212 | 50.0 | 967 | 52.5 | 1 834 | 52.3 | 1 345 | 48.6 |
| BG | 1 093 | 58.8 | 513 | 67.1 | 935 | 61.0 | 670 | 62.1 |
| CZ | 1 802 | 51.5 | 540 | 46.5 | 825 | 45.9 | 1 517 | 52.8 |
| DK | 1 253 b | 51.1 | 592 b | 55.7 | 907 b | 53.1 | 938 b | 52.0 |
| DE | 16 915 | 47.8 | 6 610 | 44.9 | 10 944 | 42.4 | 12 581 | 51.0 |
| EE | 266 | 62.9 | 103 | 73.0 | 219 | 63.3 | 150 | 69.3 |
| IE | 827 | 52.8 | 338 | 54.4 | 728 | 53.5 | 437 | 52.8 |
| EL | 1 546 | 48.1 | 778 | 48.9 | 1 325 | 48.2 | 998 | 48.6 |
| ES | 8 621 | 48.7 | 3 592 | 51.4 | 7 602 | 50.2 | 4 610 | 48.5 |
| FR | 11 084 | 51.3 | 4 534 | 53.4 | 8 245 | 54.4 | 7 373 | 49.1 |
| IT | 8 723 | 49.6 | 2 797 | 51.6 | 4 466 | 54.3 | 7 054 | 47.4 |
| CY | 160 | 50.3 | 75 | 48.6 | 141 | 51.6 | 94 | 47.0 |
| LV | 395 | 63.6 | 156 | 69.3 | 273 | 62.7 | 277 | 67.6 |
| LT | 625 | 61.8 | 268 | 70.9 | 517 | 59.7 | 376 | 71.2 |
| LU | 94 | 48.6 | 52 | 48.0 | 69 | 47.8 | 77 | 48.9 |
| HU | 1 409 | 58.3 | 576 | 56.8 | 1 002 | 55.8 | 982 | 59.9 |

*Source:* Eurostat HRST statistics.

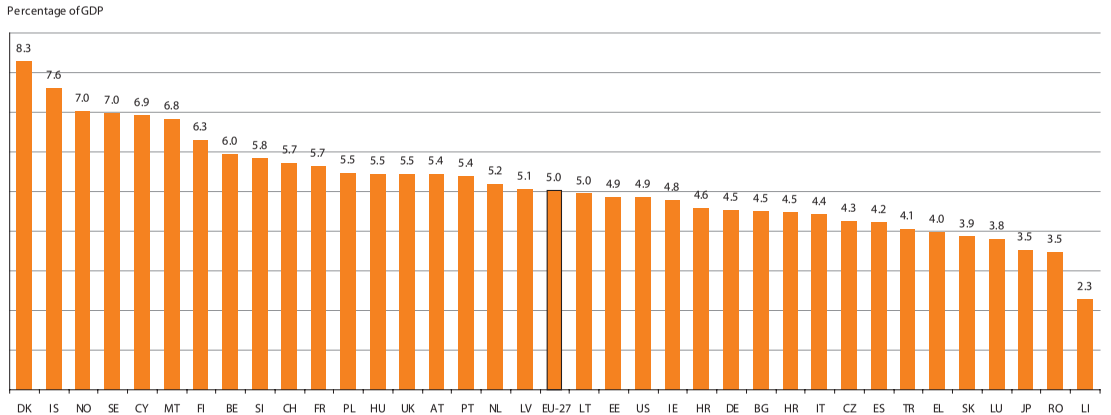
**Table 4.2:** HRST stocks by category of HRST, aged 25-64 years, total and percentage of women, EU-27 and selected countries — 2007

| | HRST Human resources in S&T | | HRSTC Human resources in S&T core | | HRSTE Human resources in S&T in terms of education | | HRSTO Human resources in S&T in terms of occupation | |
|---|---|---|---|---|---|---|---|---|
| | 1 000s | % female | 1 000s | % female | 1 000s | % female | 1 000s | % female |
| HU | 1 409 | 58.3 | 576 | 56.8 | 1 002 | 55.8 | 982 | 59.9 |
| MT | 43 | 40.3 | 17 | 48.4 | 26 | 46.3 | 34 | 39.7 |
| NL | 3 872 | 48.1 | 1 725 | 47.3 | 2 753 | 46.2 | 2 844 | 49.5 |
| AT | 1 423 | 44.9 | 446 | 46.9 | 802 | 42.3 | 1 067 | 47.7 |
| PL | 5 269 | 58.8 | 2 318 | 60.3 | 3 862 | 58.0 | 3 726 | 60.4 |
| PT | 1 118 | 53.5 | 527 | 60.7 | 807 | 60.4 | 838 | 51.3 |
| RO | 2 112 | 53.2 | 973 | 51.6 | 1 422 | 48.6 | 1 663 | 56.2 |
| SI | 374 | 55.2 | 169 | 61.0 | 257 | 57.2 | 286 | 56.8 |
| SK | 804 | 56.3 | 272 | 54.0 | 436 | 51.6 | 639 | 58.5 |
| FI | 1 257 | 54.7 | 562 | 59.9 | 1 019 | 57.2 | 800 | 55.2 |
| SE | 2 105 | 51.5 | 1 032 | 59.1 | 1 474 | 56.9 | 1 663 | 51.5 |
| UK | 11 626 | 48.6 | 4 713 | 51.9 | 9 491 | 50.0 | 6 848 | 48.9 |
| HR | 499 b | 50.7 | 223 b | 56.6 | 359 b | 54.0 | 363 b | 51.1 |
| MK | : | : | : | : | : | : | : | : |
| TR | 4 125 | 33.9 | 1 470 | 36.9 | 3 277 | 37.4 | 2 318 | 30.9 |
| IS | 61 b | 56.2 | 22 b | 55.7 | 33 b | 54.9 | 50 b | 56.8 |
| LI | : | : | : | : | : | : | : | : |
| NO | 1 103 | 51.5 | 599 | 54.7 | 858 | 54.0 | 844 | 51.2 |
| CH | 1 946 | 43.2 | 805 | 38.0 | 1 320 | 37.0 | 1 431 | 45.9 |

Exceptions to the reference year: 2006: HR, IS — MK: provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the United Nations.

*Source:* Eurostat HRST statistics.

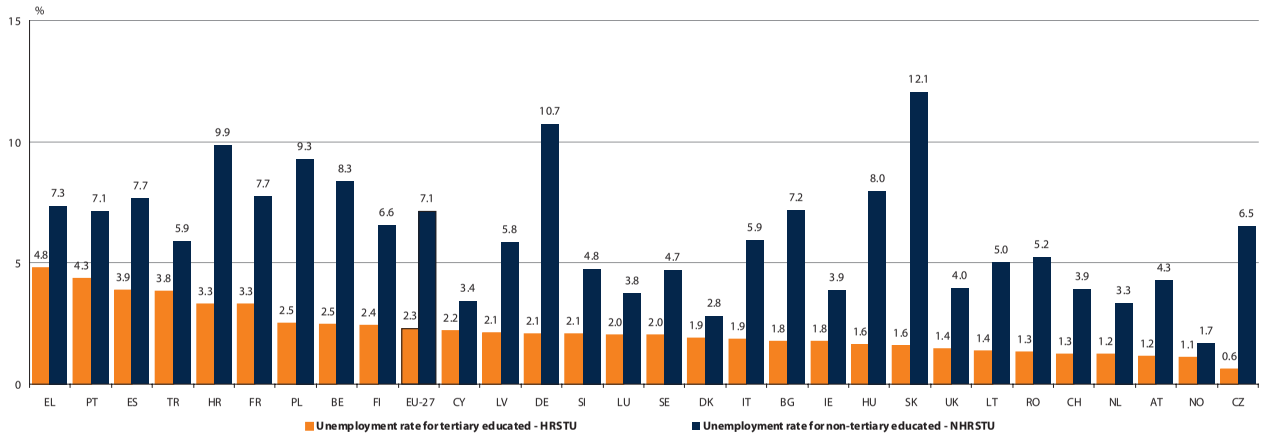
**Figure 4.3:** Total public expenditure on education as a percentage of GDP, for all levels of education combined, EU-27 and selected countries — 2006




Exception to the reference year: 2004: TR.

*Source:* Eurostat HRST statistics.

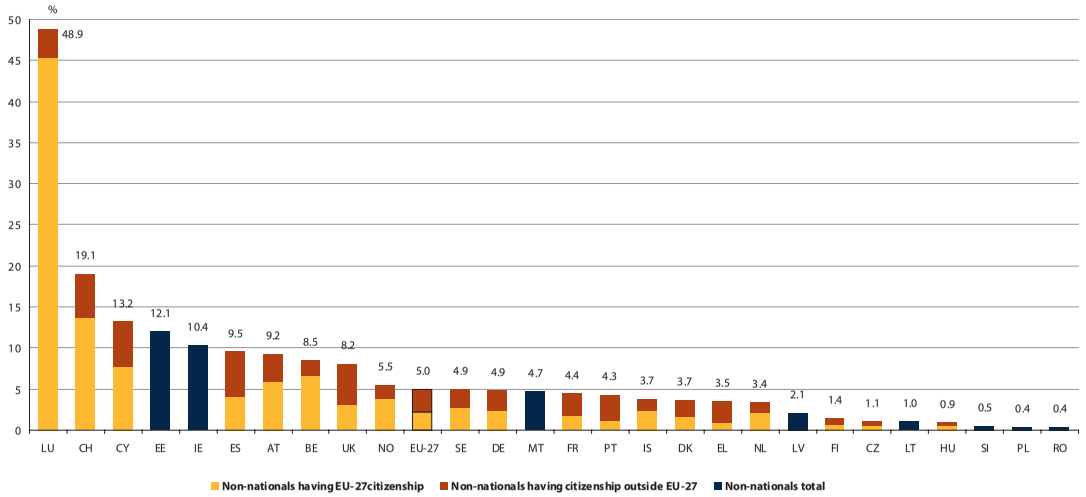
**Figure 4.4:** Unemployment rate for tertiary-educated population (HRSTU) and non-tertiary-educated population (NHRSTU), aged 25-64 years, EU-27 and selected countries — 2007




Exception to the reference year: 2006: HR — Data lack reliability due to reduced sample size but publishable: LT.
Data not published for EE and MT because of lacking reliability due to reduced sample size — Data unavailable for IS, LI and MK — MK: provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the United Nations.

*Source:* Eurostat HRST statistics.

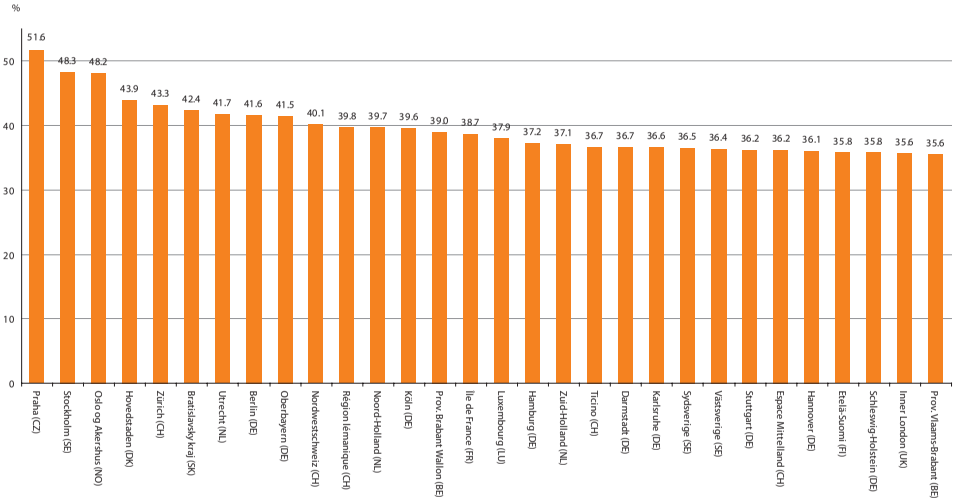
**Figure 4.5:** Share of non-national human resources in science and technology (HRST), aged 25-64 years, EU-27 and selected countries — 2007




EU-27: Eurostat estimation — Only total number of non-nationals is available for EE, IE, MT, LV, LT, SI, PL and RO — Exceptions to the reference year: 2005: IE; 2006: IS. The breakdown by citizenship is not available for BG, IT, SK, HR and TR — Data lack reliability due to reduced sample size but are publishable: LT, MT, PL, RO, SI.

*Source:* Eurostat HRST statistics.

**Figure 4.6:** Human Resources in S&T in terms of occupation (HRSTO) as a percentage of labour force (NUTS level 2), top 30 regions — 2007




*Source:* Eurostat HRST statistics.

# Part 3
# Productivity and competitiveness

## Chapter 5 - Innovation

**The Community Innovation Survey 2006 (CIS 2006)**

The Community Innovation Survey is a survey of innovation activity in enterprises covering the EU Member States, candidate countries, Iceland and Norway.

Community legislation on innovation statistics has increased the frequency for compiling Community Innovation Statistics from four to two years. In 2006, Eurostat — in close cooperation with the Member States — therefore continued the preparatory work on the next CIS based on the reference year 2006 (CIS 2006). It was decided that CIS 2006 should take a fairly conservative approach, keeping the harmonised survey questionnaire and methodology used in CIS 4 (2004).

Features of CIS 2006 include:

• use of the same main characteristics as CIS 4 (such as the survey questionnaire and methodology);

• broad implementation at national level, often on a voluntary basis;

• new pilot modules on organisational and marketing innovation and on knowledge flows, in preparation for CIS 2008; these pilot modules are planned to be implemented on a wider scale in many countries.

As the questionnaire and methodology have been left unchanged in the move from CIS 4 (2004) to CIS 2006, it will be possible to compare data and analyse trends by looking at the results from CIS 3, CIS 4 and CIS 2006.

The pilot modules on marketing and organisational innovations include questions on whether these new types are integrated or linked with product or process innovations. This type of data can potentially provide a number of insights into how innovation activities (and thus also knowledge transfer) are linked across enterprises and to what extent innovation projects span more than one area.

**First results of CIS 2006**

In 2006, 38.8 % of EU-27 enterprises were considered to be innovative. Germany led the ranking in this respect, with 62.6 % of innovative enterprises. Only two Member States from the 2004 enlargement, Estonia and Cyprus, were above the EU-27 average in terms of innovative enterprises; the other newly acceded countries, together with the United Kingdom, the Netherlands, Italy and Spain, were below the EU-27 average.

Most innovative enterprises were innovators in terms of both products and processes. This was the case of Cyprus, Germany, Luxembourg, Austria and Belgium. However, product innovators accounted for a significant share of innovative enterprises in Germany (19 %) and Luxembourg (17 %).

More than half of innovative enterprises in Cyprus, Finland, Lithuania, Slovenia and Poland are engaged in cooperation with other enterprises, while in Italy, Romania, Germany and Spain cooperation levels were relatively low.

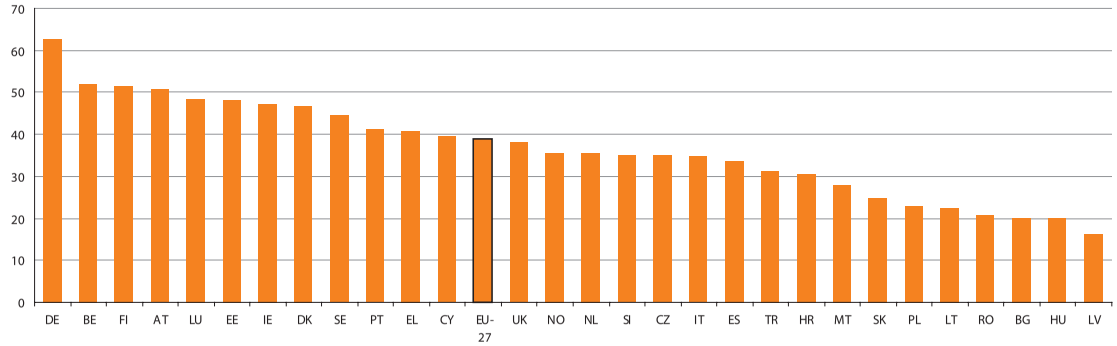
In 2006, Romania recorded the highest level of turnover relating to new or significantly improved products new to the enterprise but not new to the market (as a percentage of total turnover of innovative enterprises), followed by Slovakia. On the other hand, Luxembourg (27.6 %) accounted for the highest share of enterprises offering new or improved products new to the market (as a percentage of all enterprises), followed by Sweden, Malta and Austria.

In 2006, innovative enterprises in Turkey were the most active in registering trademarks and patent applications. Almost 25 % of innovative enterprises in Greece, Luxembourg, the Netherlands and Norway registered a trademark, while innovative enterprises in the Czech Republic, Estonia and Malta were more involved in registering industrial designs.

Central governments were, in 2006, the most important source of public funding for European innovative enterprises, except in Greece, Poland, Romania and Slovakia, where the European Union was the main public funding source.

Organisational and/or marketing innovations are becoming widespread in European enterprises. In 2006, Germany was the only country where such innovations were introduced in more than 50 % of enterprises.

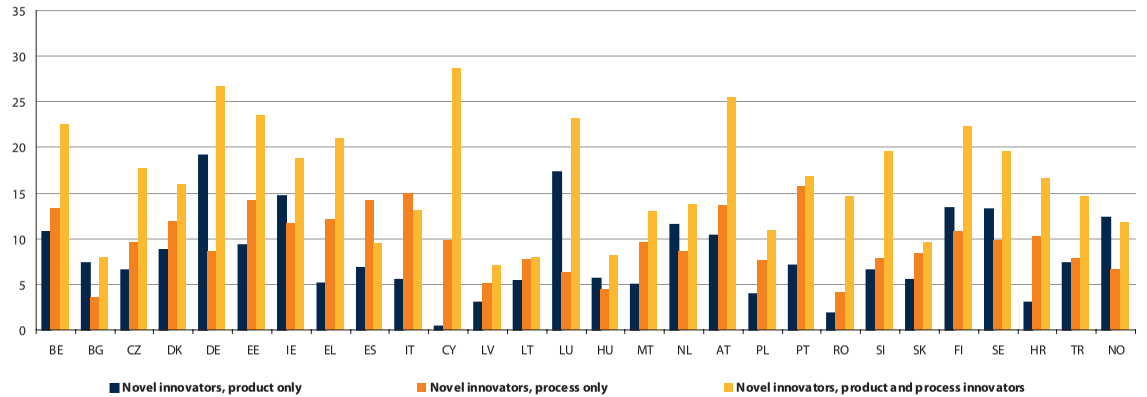
**Figure 5.1:** Innovative enterprises, as a percentage of all enterprises, EU-27 and selected countries — 2006




FR: no data available — EU-27: excluding FR.

*Source:* Eurostat, Community Innovation Statistics 2006.

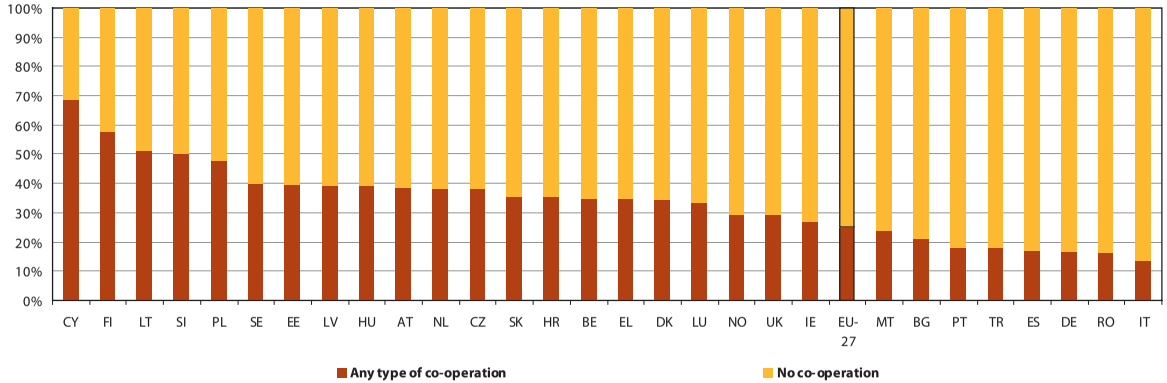
**Figure 5.2:** Innovative enterprises, by type of innovator, as a percentage of all enterprises, EU-27 and selected countries — 2006




FR, UK: no data available.

*Source:* Eurostat, Community Innovation Statistics 2006.

**Figure 5.3:** Innovative enterprises broken down into those that cooperate and those that do not cooperate, as a percentage of innovative enterprises, EU-27 and selected countries — 2006




FR: no data available — EU-27: excluding FR.

*Source:* Eurostat, Community Innovation Statistics 2006.

**Table 5.4:** Turnover related to new or significantly improved products which are new to the enterprise but not new to the market, as a percentage of total turnover of innovative enterprises, by sector, EU-27 and selected countries — 2006

| | All NACE - Core NACE | Total industry (excluding construction | Manufacturing | Services - Core G_to_K | K: Core coverage (NACE 72, 74.2 and 74.3) | 74 Core: Other business services (NACE 74.2, 74.3) |
|---|---|---|---|---|---|---|
| **EU-27** | 10.4 | 11.9 | : | 8.7 | : | : |
| BE | 7.8 | 8.0 | 8.1 | 7.7 | 9.3 | 7.3 |
| BG | 9.1 | 5.0 | 5.2 | 20.5 | 11.7 | 17.6 |
| CZ | 7.6 | 7.3 | 8.7 | 8.3 | 10.3 | 6.5 |
| DK | 7.9 | 10.3 | 12.4 | 5.9 | 5.4 | 3.6 |
| DE | 11.3 | 15.4 | 16.3 | 7.3 | 12.0 | 10.8 |
| EE | 13.3 | 11.0 | 12.7 | 15.4 | 14.7 | 9.8 |
| IE | 7.2 | 6.2 | 6.5 | 8.6 | : c | 5.9 |
| EL | 12.4 | 9.7 | 10.2 | 15.7 | 3.9 | 2.1 |
| ES | 12.1 | 13.6 | 14.9 | 10.2 | 10.3 | 10.3 |
| FR | : | : | 11.9 | : | : | : |
| IT | 7.3 | 7.2 | 8.4 | 7.5 | 10.0 | 14.0 |
| CY | 9.9 | 11.1 | 15.2 | 9.5 | 18.5 | 9.7 |
| LV | 3.0 | 2.5 | 3.1 | 3.3 | 0.4 | 0.1 |
| LT | 10.6 | 15.0 | 14.8 | 4.3 | 13.7 | 6.9 |

EU-27: excluding FR.

*Source:* Eurostat, Community Innovation Statistics 2006.

**Table 5.4:** Turnover related to new or significantly improved products which are new to the enterprise but not new to the market, as a percentage of total turnover of innovative enterprises, by sector, EU-27 and selected countries — 2006

| | All NACE - Core NACE | Total industry (excluding construction) | Manufacturing | Services - Core G to K | K: Core coverage (NACE 72, 74.2 and 74.3) | 74 Core: Other business services (NACE 74.2, 74.3) |
|---|---|---|---|---|---|---|
| LU | 8.2 | 5.4 | 4.9 | 9.3 | 6.0 | : c |
| HU | 4.3 | 5.0 | 5.4 | 2.7 | 7.0 | 3.7 |
| MT | 6.5 | 6.3 | 6.4 | 6.7 | 23.8 | : c |
| NL | 8.1 | 7.7 | 7.9 | 8.5 | 11.2 | 2.5 |
| AT | 9.0 | 9.0 | 10.0 | 8.9 | 10.1 | 10.8 |
| PL | 9.2 | 10.1 | 12.8 | 7.7 | 7.5 | 5.2 |
| PT | 9.5 | 12.0 | 12.9 | 7.4 | 26.8 | 2.7 |
| RO | 28.6 | 32.9 | 31.6 | 23.5 | 29.4 | 31.9 |
| SI | 11.5 | 13.3 | : c | 7.8 | 8.1 | 8.0 |
| SK | 15.5 | 17.6 | 19.6 | 9.9 | 4.2 | 2.6 |
| FI | 5.9 | 6.2 | 6.2 | 5.2 | 10.3 | : c |
| SE | : u | : u | : u | : u | : u | : u |
| UK | 13.8 | 13.3 | 14.8 | 14.1 | 25.4 | 17.5 |
| HR | 16.3 | 18.7 | 18.8 | 12.2 | 12.4 | 12.4 |
| TR | 16.7 | 6.1 | 6.0 | 27.8 | 11.4 | 11.9 |
| NO | 7.5 | 7.4 | 9.2 | 7.5 | 12.7 | 10.8 |

*Source:* Eurostat, Community Innovation Statistics 2006.

**Table 5.5:** Enterprises that have new or significantly improved products new to the market, as a percentage of all enterprises, EU-27 and selected countries — 2006

| | All NACE - Core NACE | Total industry (excluding construction) | Manufacturing | Services - Core G to K | K: Core coverage (NACE 72, 74.2 and 74.3) | 74 Core: Other business services (NACE 74.2, 74.3) |
|---|---|---|---|---|---|---|
| **EU-27** | 12.7 | 14.0 | : | 11.1 | : | : |
| BE | 21.6 | 24.8 | 24.9 | 18.9 | 39.4 | 36.5 |
| BG | 8.3 | 10.0 | 10.1 | 5.7 | 21.0 | 8.6 |
| CZ | 13.6 | 15.6 | 16.0 | 10.7 | 17.8 | 10.3 |
| DK | 15.8 | 20.6 | 20.6 | 12.3 | 25.7 | 12.9 |
| DE | 19.0 | 24.3 | 25.4 | 14.4 | 19.4 | 14.0 |
| EE | 15.8 | 16.8 | 17.6 | 14.7 | 20.2 | 13.0 |
| IE | 19.3 | 24.8 | 25.6 | 15.8 | : c | 14.9 |
| EL | 20.2 | 19.8 | 20.1 | 20.8 | 27.2 | 10.0 |
| ES | 6.1 | 7.7 | 7.8 | 4.0 | 16.1 | 9.3 |
| FR | : | : | 30.3 | : | : | : |
| IT | 10.2 | 11.8 | 12.0 | 6.4 | 14.6 | 11.2 |
| CY | 13.6 | 17.0 | 17.2 | 10.5 | 24.1 | 6.5 |
| LV | 7.2 | 6.6 | 7.0 | 7.8 | 18.1 | 10.7 |
| LT | 8.0 | 8.8 | 9.1 | 7.1 | 18.8 | 9.5 |

EU-27: excluding FR.

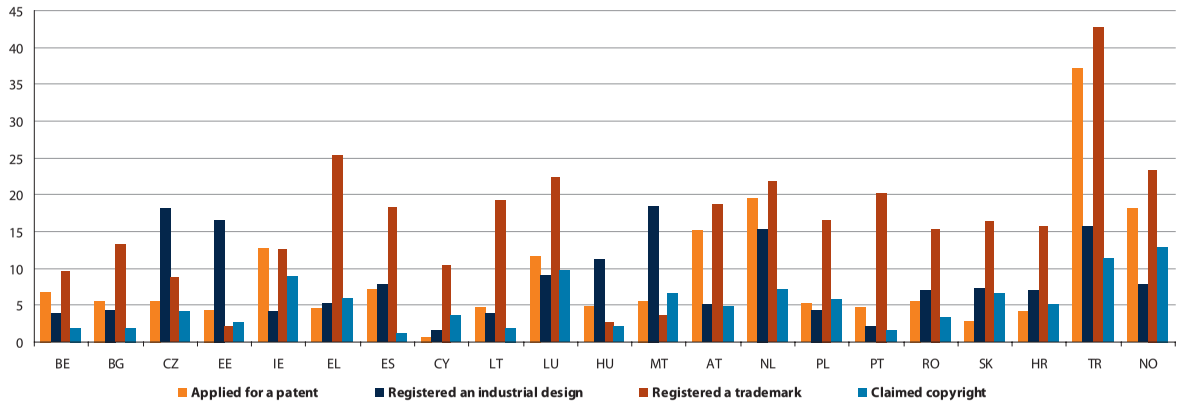
*Source:* Eurostat, Community Innovation Statistics 2006.

**Table 5.5:** Enterprises that have new or significantly improved products new to the market, as a percentage of all enterprises, by sector, EU-27 and selected countries — 2006

| | All NACE - Core NACE | Total industry (excluding construction) | Manufacturing | Services - Core G to K | K: Core coverage (NACE 72, 74.2 and 74.3) | 74 Core: Other business services (NACE 74.2, 74.3) |
|---|---|---|---|---|---|---|
| LU | 28.5 | 27.6 | 27.7 | 28.9 | 44.3 | : c |
| HU | 6.2 | 6.5 | 6.7 | 5.8 | 13.4 | 5.4 |
| MT | 16.5 | 25.5 | 26.7 | 10.4 | 26.3 | : c |
| NL | 17.1 | 21.1 | 21.0 | 14.6 | 28.7 | 21.1 |
| AT | 23.0 | 25.0 | 25.2 | 21.3 | 38.8 | 30.9 |
| PL | 7.5 | 7.6 | 7.8 | 7.4 | 20.3 | 9.8 |
| PT | 12.3 | 12.0 | 12.1 | 12.8 | 29.5 | 10.9 |
| RO | 5.1 | 5.8 | 5.9 | 4.0 | 8.1 | 5.4 |
| SI | 17.9 | 20.6 | : c | 14.2 | 28.0 | 16.3 |
| SK | 9.4 | 10.3 | 10.6 | 8.0 | 11.3 | 5.4 |
| FI | 23.0 | 24.5 | 25.8 | 21.4 | 29.2 | : |
| SE | 22.8 | 25.6 | 26.3 | 20.5 | 31.2 | : u |
| UK | 12.0 | 13.4 | 13.4 | 11.0 | 19.1 | 10.0 |
| HR | 9.7 | 13.6 | 14.5 | 6.3 | 10.7 | 5.1 |
| TR | 18.7 | 21.6 | 22.1 | 13.7 | 20.7 | 17.2 |
| NO | 14.2 | 14.5 | 15.3 | 13.8 | 25.1 | 16.7 |

*Source:* Eurostat, Community Innovation Statistics 2006.

**Figure 5.6:** Intellectual property rights of innovative enterprises, as a percentage of innovative enterprises, available EU-27 Member States and selected countries — 2006



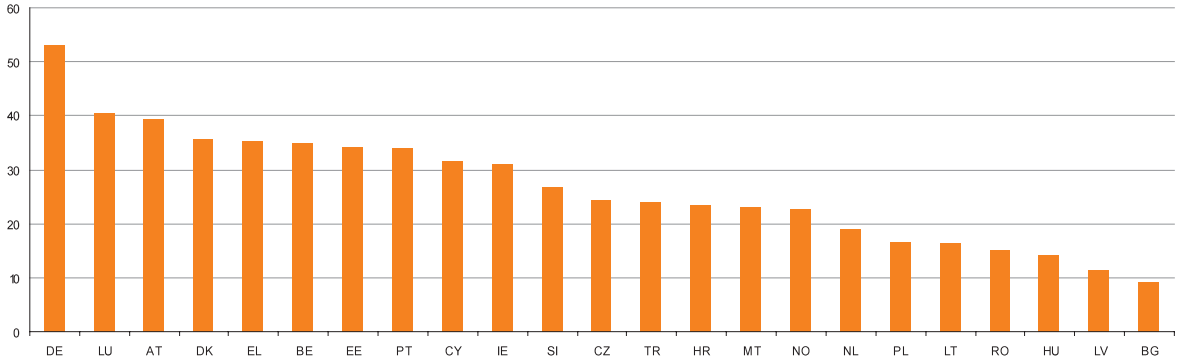

*Source:* Eurostat, Community Innovation Statistics 2006.

**Table 5.7:** Innovative enterprises receiving public funding for innovation by source of funds, as a percentage of all enterprises, available EU-27 Member States and selected countries — 2006

| | Enterprise that received any public funding | Enterprise that received funding from local or regional authorities | Enterprise that received funding from central government (including central government agencies or ministries) | Enterprise that received funding from the European Union | Enterprise that received funding from the 6th Framework Programme |
|---|---|---|---|---|---|
| BE | 12.7 | 9.8 | 4.2 | 2.3 | 0.8 |
| BG | 1.6 | 0.1 | 1.0 | 0.9 | 0.2 |
| CZ | 5.6 | 0.9 | 3.6 | 2.3 | 1.1 |
| DE | 8.8 | 3.8 | 5.0 | 2.1 | : |
| EE | 4.6 | 0.3 | 3.4 | 1.5 | 0.4 |
| EL | 14.0 | 2.9 | 7.3 | 7.8 | 3.3 |
| ES | 7.7 | 5.2 | 3.4 | 0.7 | 0.3 |
| CY | 18.1 | 2.8 | 15.7 | 5.0 | 1.5 |
| LT | 2.9 | 0.7 | 1.6 | 1.5 | 0.4 |
| LU | 7.5 | 1.5 | 6.4 | 2.2 | 1.7 |
| HU | 6.0 | 0.3 | 4.6 | 2.5 | 0.6 |
| MT | 4.6 | 0.0 | 3.9 | 1.6 | 0.6 |
| NL | 11.8 | 3.1 | 10.1 | 2.1 | : |
| AT | 15.6 | 9.1 | 11.9 | 4.0 | 1.4 |
| PL | 5.3 | 0.8 | 1.5 | 3.8 | 0.4 |
| PT | 4.9 | 0.6 | 3.6 | 1.9 | 0.6 |
| RO | 2.5 | 0.6 | 0.9 | 1.6 | 0.5 |
| SI | 8.0 | 1.0 | 6.1 | 3.4 | 1.2 |
| SK | 3.7 | 0.8 | 1.2 | 2.3 | 0.4 |
| HR | 6.1 | 1.0 | 5.4 | 0.3 | 0.1 |
| TR | 6.7 | 0.6 | 5.9 | 0.6 | 0.5 |

*Source:* Eurostat, Community Innovation Statistics 2006.

**Figure 5.8:** Innovative enterprises that introduced organisational and/or marketing innovations by country, as a percentage of all enterprises, available EU-27 Member States and selected countries — 2006




IE and SI: data cover only organisational innovations.

*Source:* Eurostat, Community Innovation Statistics 2006.

# Chapter 6 - Patents

In 2005 the largest share of patent applications to the EPO came from Germany, with more than 22 000, followed by France and the United Kingdom. Germany also recorded the highest levels in terms of patent applications per million inhabitants (275), followed by Finland (268) and Luxembourg (195). This number was even higher in Liechtenstein and Switzerland, with 622 and 411 patent applications to the EPO per million inhabitants respectively.

Looking at 2000–2005[1] average annual growth rates (AAGR), patenting activity increased significantly in almost all European countries over the period considered. The only exceptions were Hungary, the Netherlands, Finland, Sweden and the United Kingdom.

In 2004 most EU-27 patent applications to the EPO were filed under IPC Section B 'performing operations; transporting'. In many countries, 25 % or more of all national applications were registered in only one IPC section. Denmark, Ireland and Slovenia specialised in patenting linked to 'human necessities' (IPC Section A). 'performing operations; transporting' (Section B) accounted for the most significant shares in Germany, Greece, Spain, Italy, Luxembourg and Austria; whereas 25 % or more of national patent applications from Belgium, the Czech Republic, Hungary and Poland were filed in 'chemistry; metallurgy' (Section C). In contrast, patent activity was lower in 'textiles; paper' (Section D) and 'fixed constructions' (Section E).

Considering patents granted by the USPTO, the relative shares between EU Member States are comparable to those for patent applications filed at the EPO. However the USPTO granted more than three times as many patents to inventors in the United States than to inventors in the EU-27.

In 2004, most high-tech patent applications to the EPO came from Germany (3 465), followed by France (1 832) and the United Kingdom (1 333). Between 1994 and 1999 the EU-27 AAGR in terms of high-tech patent applications stood at 18.6 %. In contrast, a decrease was observed between 1999 and 2004, as the number of high-tech patent applications fell by 0.4 % a year.

Regarding high-tech applications per million labour force, Finland led the ranking with 258, followed by Sweden (121.9) and the Netherlands (118.4).

(1) 2005 — Eurostat estimate

Looking at triadic patent families, the United States was in the lead between 1992 and 1997 and again between 1999 and 2002. The EU-27 ranked second until 1999, before being overtaken by Japan. A decreasing trend was observed between 2000 and 2002 for these three economies.

Biotechnology is an interesting field in terms of patent applications. Considering the number of biotechnology patent applications to the EPO in 2004, the United States was in the lead, followed by the EU-27 and Japan. This ranking remained unchanged over the period 1994–2004. Although the number of biotechnology patent applications from US inventors has fallen since 2000, it remained relatively stable in the EU-27.

At regional level, in 2004 Île-de-France (FR) recorded the highest number of both total patent applications and high-tech patent applications, followed by Stuttgart (DE) and Oberbayern (DE) for total patent applications, and Noord-Brabant (NL) and Oberbayern (DE) for high-tech patent applications. The top fifteen regions by total number of patent applications included ten regions in Germany, two in France, and one in the Netherlands, Italy and Finland. Moreover, the top fifteen regions in terms of patent applications per million inhabitants included eleven regions in Germany, two in Sweden, and one in the Netherlands and Austria.

**Table 6.1:** Patent applications to the EPO, total number, per million inhabitants, by IPC section as a percentage of total and average annual growth rate, EU-27 and selected countries — 2000, 2004, 2005

| | Total number | | Per million inhabitants | | Distribution by IPC section as a percentage of total — 2004 | | | | | | | | Average annual growth rate 2000-2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2000 | 2005 | Human necessities | Performing operations, transporting | Chemistry, metallurgy | Textiles, paper | Fixed constructions | Mech. engineering, lighting, heating, weapons, blasting | Physics | Electricity | |
| **EU-27** | 48 804 | 51 875 e | 101.3 | 105.7 e | 14.9 | 21.4 | 13.5 | 1.9 | 4.8 | 11.1 | 16.2 | 16.2 | 1.2 |
| BE | 1 330 | 1 348 e | 130.3 | 129.1 e | 14.7 | 19.9 | 26.5 | 3.0 | 4.6 | 4.2 | 13.1 | 14.1 | 0.3 |
| BG | 8 | 11 p | 1.0 | 1.4 p | 16.0 | 16.0 | 12.4 | : | 10.6 | 16.0 | 13.5 | 15.5 | 5.8 |
| CZ | 60 | 74 e | 5.8 | 7.3 e | 12.4 | 16.4 | 28.5 | 2.7 | 5.9 | 8.1 | 19.0 | 7.0 | 4.4 |
| DK | 839 | 945 e | 157.9 | 174.6 e | 25.9 | 14.5 | 19.0 | 0.9 | 5.9 | 10.2 | 10.4 | 12.9 | 2.4 |
| DE | 21 000 | 22 689 e | 256.0 | 275.0 e | 12.3 | 24.0 | 13.3 | 2.0 | 4.9 | 14.1 | 15.0 | 14.5 | 1.6 |
| EE | 7 | 8 e | 5.3 | 5.6 e | 23.0 | 11.5 | 23.0 | : | : | : | 30.9 | 11.5 | 0.7 |
| IE | 213 | 263 e | 57.0 | 64.1 e | 25.1 | 13.8 | 11.9 | 1.1 | 4.0 | 6.8 | 18.0 | 19.3 | 4.3 |
| EL | 52 | 72 p | 4.8 | 6.5 p | 10.1 | 34.7 | 7.0 | 1.5 | 9.2 | 13.1 | 11.0 | 13.2 | 7.0 |
| ES | 731 | 1 260 e | 18.4 | 29.3 e | 20.5 | 23.1 | 17.9 | 1.6 | 9.4 | 9.7 | 9.4 | 8.4 | 11.5 |
| FR | 7 191 | 7 465 e | 119.5 | 119.2 e | 16.5 | 20.3 | 12.2 | 1.1 | 3.8 | 11.2 | 16.7 | 18.2 | 0.7 |
| IT | 3 724 | 4 446 e | 65.4 | 76.1 e | 18.9 | 26.4 | 11.1 | 3.5 | 5.9 | 12.4 | 10.8 | 10.9 | 3.6 |
| CY | 4 | 13 p | 6.1 | 17.0 p | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | : | 16.7 | : | 24.9 |
| LV | 2 | 13 e | 0.7 | 5.7 e | 27.5 | 10.2 | 42.0 | : | : | 20.4 | : | : | 50.6 |
| LT | 3 | 5 p | 0.9 | 1.3 p | 7.3 | 9.6 | 5.6 | : | 7.3 | : | 68.5 | 1.8 | 8.4 |
| LU | 63 | 90 e | 147.4 | 194.9 e | 4.9 | 39.4 | 14.7 | 1.0 | 3.1 | 15.6 | 11.3 | 10.0 | 7.4 |
| HU | 116 | 79 e | 11.3 | 7.8 e | 12.1 | 14.3 | 35.4 | : | 2.0 | 5.0 | 10.7 | 20.6 | -7.5 |
| MT | 5 | 9 e | 13.2 | 21.6 e | 22.2 | 5.6 | 5.6 | : | : | 11.1 | 44.4 | 11.1 | 11.7 |
| NL | 2 927 | 2 825 e | 185.7 | 173.3 e | 14.8 | 14.9 | 12.8 | 1.4 | 3.6 | 4.1 | 28.4 | 19.8 | -0.7 |

*Source:* Eurostat, Patent statistics.

**Table 6.1:** Patent applications to the EPO, total number, per million inhabitants, by IPC section as a percentage of total and average annual growth rate, EU-27 and selected countries — 2000, 2004, 2005

| | Total number | | Per million inhabitants | | Distribution by IPC section as a percentage of total — 2004 | | | | | | | | Average annual growth rate 2000-2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2000 | 2005 | Human necessities | Performing operations, transporting | Chemistry, metallurgy | Textiles, paper | Fixed constructions | Mech. engineering, lighting, heating, weapons, blasting | Physics | Electricity | |
| AT | 1 070 | 1 503 e | 134.1 | 183.1 e | 12.9 | 24.8 | 10.3 | 3.2 | 10.1 | 11.5 | 13.5 | 13.7 | 7.0 |
| PL | 35 | 116 e | 0.9 | 3.0 e | 19.3 | 11.7 | 27.0 | 1.1 | 3.0 | 14.9 | 9.0 | 14.0 | 27.2 |
| PT | 36 | 78 p | 3.6 | 7.4 p | 21.5 | 19.4 | 19.7 | : | 17.8 | 3.6 | 11.1 | 6.8 | 16.6 |
| RO | 7 | 15 p | 0.3 | 0.7 p | 18.4 | 9.2 | 7.8 | : | 18.4 | 6.1 | 27.4 | 12.7 | 16.0 |
| SI | 31 | 64 e | 15.9 | 32.2 e | 28.8 | 10.0 | 24.1 | 1.8 | 10.6 | 8.1 | 7.3 | 9.3 | 15.4 |
| SK | 15 | 31 e | 2.9 | 5.8 e | 11.5 | 5.1 | 20.1 | : | 5.1 | 30.6 | 11.9 | 15.7 | 15.1 |
| FI | 1 408 | 1 401 e | 272.8 | 267.6 e | 6.9 | 13.9 | 6.2 | 4.8 | 2.0 | 3.7 | 21.4 | 41.1 | -0.1 |
| SE | 2 193 | 1 665 e | 247.6 | 184.8 e | 15.9 | 20.2 | 9.2 | 1.9 | 4.6 | 10.0 | 13.3 | 24.9 | -5.4 |
| UK | 5 734 | 5 490 e | 97.9 | 91.4 e | 18.5 | 15.5 | 16.5 | 1.0 | 3.8 | 7.0 | 21.1 | 16.4 | -0.9 |
| IS | 35 | 15 p | 128.6 | 52.6 p | 67.9 | 4.5 | 16.3 | : | : | : | 11.3 | : | -15.3 |
| LI | 20 | 22 e | 624.1 | 622.8 e | 24.2 | 23.4 | 15.5 | : | 4.3 | 12.8 | 14.6 | 5.3 | 1.5 |
| NO | 372 | 440 e | 83.7 | 95.5 e | 19.6 | 17.1 | 16.4 | 0.4 | 8.1 | 9.8 | 16.2 | 12.5 | 3.4 |
| CH | 2 467 | 3 048 e | 346.3 | 411.1 e | 19.4 | 20.8 | 15.2 | 2.3 | 3.9 | 7.1 | 19.1 | 12.1 | 4.3 |
| HR | 18 | 22 e | 4.0 | 5.0 e | 33.3 | 3.3 | 22.1 | : | 11.1 | 10.0 | 11.1 | 9.1 | 3.9 |
| TR | 22 | 69 p | 0.3 | 1.0 p | 19.2 | 6.3 | 4.7 | 9.7 | 6.4 | 36.5 | 9.5 | 7.7 | 25.7 |
| CN | 184 | 853 p | 0.2 | 0.7 p | 12.0 | 8.2 | 11.5 | 1.6 | 1.1 | 4.5 | 12.0 | 49.1 | 35.8 |
| JP | 18 549 | 21 215 e | 146.7 | 166.1 e | 9.0 | 16.9 | 14.6 | 1.0 | 0.7 | 9.0 | 24.4 | 24.5 | 2.7 |
| RU | 214 | 274 e | 1.5 | 1.9 e | 20.9 | 18.3 | 21.5 | : | 1.8 | 7.3 | 15.9 | 14.3 | 5.1 |
| US | 30 108 | 31 575 e | 110.8 | 106.4 e | 22.5 | 12.4 | 16.7 | 1.0 | 1.4 | 5.4 | 22.2 | 18.3 | 1.0 |

*Source:* Eurostat, Patent statistics.

**Table 6.2:** Patents granted by the USPTO, total number, per million inhabitants, by IPC section as a percentage of total and average annual growth rate, EU-27 and selected countries — 1997, 2001, 2002

| | Total number | | Per million inhabitants | | Distribution by IPC section as a percentage of total — 2001 | | | | | | | | Average annual growth rate 1997-2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 2002 | 1997 | 2002 | Human necessities | Performing operations, transporting | Chemistry, metallurgy | Textiles, paper | Fixed constructions | Mech. engineering, lighting, heating, weapons, blasting | Physics | Electricity | |
| **EU-27** | 28 659 | 24 070 e | 59.9 | 49.7 e | 11.7 | 20.0 | 11.4 | 1.6 | 2.4 | 11.3 | 22.0 | 19.6 | -3.4 |
| BE | 848 | 541 e | 83.4 | 52.4 e | 9.5 | 18.9 | 23.5 | 3.0 | 2.3 | 4.8 | 18.4 | 19.7 | -8.6 |
| BG | 6 | 5 p | 0.7 | 0.7 p | : | : | : | : | : | : | 18.9 | 81.1 | -1.6 |
| CZ | 39 | 45 e | 3.8 | 4.4 e | 7.7 | 7.8 | 17.1 | 2.2 | : | 14.6 | 40.8 | 9.8 | 2.8 |
| DK | 486 | 373 e | 92.1 | 69.4 e | 22.1 | 10.8 | 14.6 | 0.7 | 2.6 | 7.1 | 19.8 | 22.2 | -5.2 |
| DE | 11 708 | 10 517 e | 142.8 | 127.6 e | 8.5 | 23.3 | 11.8 | 1.7 | 1.5 | 15.1 | 21.1 | 16.9 | -2.1 |
| EE | 4 | 2 p | 2.8 | 1.5 p | 33.3 | : | 66.7 | : | : | : | : | : | -12.9 |
| IE | 139 | 191 e | 38.0 | 49.0 e | 25.6 | 7.7 | 2.5 | 0.5 | 1.7 | 2.7 | 27.9 | 31.4 | 6.6 |
| EL | 27 | 20 p | 2.5 | 1.9 p | 36.4 | 8.7 | 7.3 | : | : | 8.0 | 18.7 | 20.8 | -5.3 |
| ES | 302 | 331 e | 7.6 | 8.1 e | 18.7 | 32.7 | 11.6 | 0.6 | 2.9 | 6.7 | 11.9 | 14.9 | 1.8 |
| FR | 4 393 | 3 044 e | 73.6 | 49.6 e | 15.2 | 18.8 | 11.0 | 1.1 | 2.0 | 9.4 | 21.7 | 20.8 | -7.1 |
| IT | 1 790 | 1 671 e | 31.5 | 29.3 e | 16.1 | 26.6 | 10.6 | 2.4 | 3.0 | 10.5 | 16.5 | 14.3 | -1.4 |
| CY | 1 | 4 e | 0.9 | 6.0 e | : | : | 50.0 | 50.0 | : | : | : | : | 49.5 |
| LV | 2 | 3 p | 0.6 | 1.1 p | 28.3 | : | 71.7 | : | : | : | : | : | 10.7 |
| LT | 3 | 7 p | 0.7 | 1.9 p | 36.6 | : | : | : | : | : | 63.9 | : | 21.9 |
| LU | 34 | 55 e | 80.9 | 124.0 e | 6.6 | 42.2 | 22.6 | 1.0 | 2.6 | 11.7 | 7.6 | 5.8 | 10.3 |
| HU | 71 | 60 e | 6.9 | 5.9 e | 12.4 | 6.0 | 34.6 | 1.1 | : | 6.6 | 10.9 | 28.4 | -3.4 |
| MT | 1 | 3 e | 2.7 | 7.2 e | 50.0 | 50.0 | : | : | : | : | : | : | 23.2 |
| NL | 1 453 | 1 335 e | 93.4 | 82.9 e | 11.7 | 10.0 | 12.6 | 0.7 | 3.8 | 4.3 | 29.4 | 27.4 | -1.7 |

*Source:* Eurostat, Patent statistics.

**Table 6.2:** Patents granted by the USPTO, total number, per million inhabitants, by IPC section as a percentage of total and average annual growth rate, EU-27 and selected countries — 1997, 2001, 2002

| | Total number | | Per million inhabitants | | Distribution by IPC section as a percentage of total — 2001 | | | | | | | | Average annual growth rate 1997-2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 2002 | 1997 | 2002 | Human necessities | Performing operations, transporting | Chemistry, metallurgy | Textiles, paper | Fixed constructions | Mech. engineering, lighting, heating, weapons, blasting | Physics | Electricity | |
| AT | 583 | 623 e | 73.2 | 77.3 e | 12.9 | 24.5 | 9.6 | 2.4 | 6.3 | 14.5 | 12.4 | 17.5 | 1.4 |
| PL | 31 | 43 e | 0.8 | 1.1 e | 14.9 | 13.9 | 16.5 | : | : | 6.6 | 15.3 | 32.8 | 7.0 |
| PT | 15 | 21 e | 1.4 | 2.0 e | 4.8 | 16.7 | 26.4 | : | 4.8 | 9.6 | 13.1 | 24.7 | 7.5 |
| RO | 7 | 11 e | 0.3 | 0.5 e | 4.6 | 18.5 | : | : | 4.6 | 2.3 | 38.2 | 31.7 | 9.2 |
| SI | 11 | 16 e | 5.8 | 8.1 e | 36.4 | 6.7 | 26.8 | : | : | : | : | 30.1 | 7.2 |
| SK | 7 | 4 p | 1.4 | 0.7 p | 10.6 | : | 70.5 | : | : | : | 10.6 | 8.0 | -12.3 |
| FI | 896 | 766 e | 174.7 | 147.5 e | 6.1 | 12.6 | 8.1 | 5.0 | 2.0 | 4.5 | 22.1 | 39.6 | -3.1 |
| SE | 1 881 | 1 100 e | 212.6 | 123.4 e | 16.9 | 21.4 | 5.8 | 1.9 | 1.6 | 10.7 | 19.6 | 22.0 | -10.2 |
| UK | 3 924 | 3 298 e | 67.4 | 55.7 e | 12.9 | 12.4 | 10.8 | 0.8 | 4.8 | 8.0 | 29.5 | 20.9 | -3.4 |
| IS | 14 | 18 p | 50.0 | 62.7 p | 29.3 | 6.5 | 1.3 | : | : | : | 39.0 | 23.9 | 5.9 |
| LI | 17 | 13 e | 556.1 | 378.2 e | 28.7 | 27.1 | 20.3 | : | 2.9 | 7.8 | 9.2 | 3.9 | -6.0 |
| NO | 298 | 201 e | 67.9 | 44.3 e | 17.4 | 14.3 | 10.3 | : | 11.0 | 10.5 | 28.5 | 8.0 | -7.6 |
| CH | 1 525 | 1 235 e | 215.3 | 170.3 e | 14.7 | 20.9 | 13.0 | 2.8 | 1.3 | 9.3 | 23.0 | 14.9 | -4.1 |
| HR | 11 | 17 e | 2.4 | 3.9 e | 41.1 | 30.2 | 10.0 | : | 6.2 | : | 6.2 | 6.2 | 10.0 |
| TR | 9 | 18 e | 0.1 | 0.3 e | 24.1 | : | 16.1 | 5.4 | : | 40.4 | 3.5 | 10.6 | 15.6 |
| CN | 161 | 680 p | 0.1 | 0.5 p | 14.5 | 14.8 | 11.0 | 0.3 | 1.9 | 6.3 | 18.1 | 33.1 | 33.3 |
| JP | 35 232 | 37 520 e | 282.7 | 294.4 e | 4.6 | 15.9 | 7.1 | 0.6 | 0.6 | 8.2 | 35.6 | 27.6 | 1.3 |
| RU | 245 | 198 e | 1.7 | 1.4 e | 13.9 | 11.1 | 23.9 | 0.8 | 3.2 | 6.4 | 27.5 | 13.3 | -4.1 |
| US | 99 883 | 97 168 e | 374.8 | 337.1 e | 16.5 | 15.2 | 8.6 | 0.7 | 3.0 | 6.8 | 27.5 | 21.6 | -0.5 |

*Source:* Eurostat, Patent statistics.

**Table 6.3:** High-tech patent applications to the EPO, total number, per million inhabitants, per million labour force and average annual growth rate, EU-27 and selected countries — 1994, 1999 and 2004

| | Total number | | | AAGR | | per million inhabitants | per million labour force |
|---|---|---|---|---|---|---|---|
| | 1994 | 1999 | 2004 | 1994-1999 | 1999-2004 | 2004 | 2004 |
| **EU-27** | 4 533 | 10 635 | 10 398 | 18.6 | -0.4 | 21.3 | 45.6 |
| BE | 125 | 304 | 319 | 19.5 | 1.0 | 30.7 | 70.6 |
| BG | : | 1 | 2 | : | 36.8 | 0.3 | 0.7 |
| CZ | 1 | 5 | 13 | 49.2 | 21.1 | 1.3 | 2.5 |
| DK | 79 | 223 | 227 | 22.9 | 0.3 | 42.1 | 78.3 |
| DE | 1 347 | 3 570 | 3 465 | 21.5 | -0.6 | 42.0 | 86.6 |
| EE | 0 | 2 | 2 | 68.2 | 5.9 | 1.7 | 3.5 |
| IE | 16 | 58 | 53 | 29.9 | -1.9 | 13.2 | 27.2 |
| EL | 4 | 10 | 15 | 20.9 | 9.0 | 1.4 | 3.1 |
| ES | 45 | 121 | 139 | 21.9 | 2.9 | 3.3 | 6.9 |
| FR | 934 | 1 795 | 1 832 | 13.9 | 0.4 | 29.4 | 66.8 |
| IT | 264 | 360 | 506 | 6.3 | 7.1 | 8.7 | 20.8 |
| CY | : | 0 | : | : | : | : | : |
| LV | : | 0 | : | : | : | : | : |
| LT | 0 | 2 | 0 | 71.9 | -30.1 | 0.1 | 0.2 |
| LU | 1 | 3 | 10 | 24.6 | 27.7 | 22.4 | 51.3 |
| HU | 8 | 27 | 27 | 28.0 | -0.1 | 2.7 | 6.6 |
| MT | : | : | : | : | : | : | : |
| NL | 324 | 967 | 1 006 | 24.4 | 0.8 | 61.9 | 118.4 |

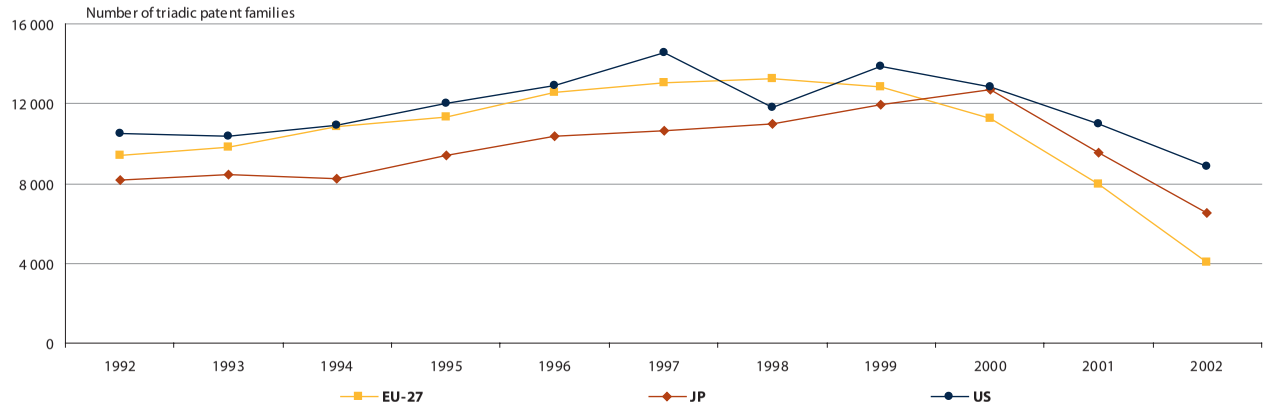
*Source:* Eurostat, Patent statistics.

**Table 6.3:** High-tech patent applications to the EPO, total number, per million inhabitants, per million labour force and average annual growth rate, EU-27 and selected countries — 1994, 1999 and 2004

| | Total number | | | AAGR | | per million inhabitants | per million labour force |
|---|---|---|---|---|---|---|---|
| | 1994 | 1999 | 2004 | 1994-1999 | 1999-2004 | 2004 | 2004 |
| AT | 75 | 146 | 184 | 14.2 | 4.8 | 22.7 | 46.9 |
| PL | 3 | 2 | 21 | -4.3 | 57.1 | 0.5 | 1.2 |
| PT | 1 | 6 | 6 | 65.3 | -0.2 | 0.6 | 1.1 |
| RO | 2 | 1 | 3 | -19.6 | 30.4 | 0.1 | 0.3 |
| SI | 4 | 1 | 2 | -20.4 | 11.3 | 1.0 | 2.0 |
| SK | 2 | 5 | 3 | 24.5 | -6.2 | 0.6 | 1.3 |
| FI | 222 | 715 | 669 | 26.3 | -1.3 | 128.2 | 258.0 |
| SE | 245 | 639 | 559 | 21.1 | -2.6 | 62.3 | 121.9 |
| UK | 831 | 1 673 | 1 333 | 15.0 | -4.5 | 22.3 | 44.8 |
| IS | 4 | 20 | 3 | 39.7 | -29.7 | 11.8 | 21.4 |
| LI | : | 2 | 1 | : | -24.2 | 14.6 | : |
| NO | 12 | 56 | 75 | 36.7 | 5.9 | 16.3 | 31.4 |
| CH | 189 | 370 | 407 | 14.4 | 1.9 | 55.2 | : |
| HR | 2 | 1 | 1 | -6.2 | 1.0 | 0.3 | 0.7 |
| TR | 1 | 2 | 5 | 37.1 | 17.1 | 0.1 | 0.2 |
| CN | 4 | 43 | 496 | 62.9 | 63.2 | 0.4 | 0.6 |
| JP | 3 354 | 5 943 | 6 898 | 12.1 | 3.0 | 54.0 | 103.9 |
| RU | 18 | 46 | 47 | 21.0 | 0.1 | 0.3 | 0.6 |
| US | 5 990 | 10 916 | 9 981 | 12.8 | -1.8 | 34.0 | 67.0 |

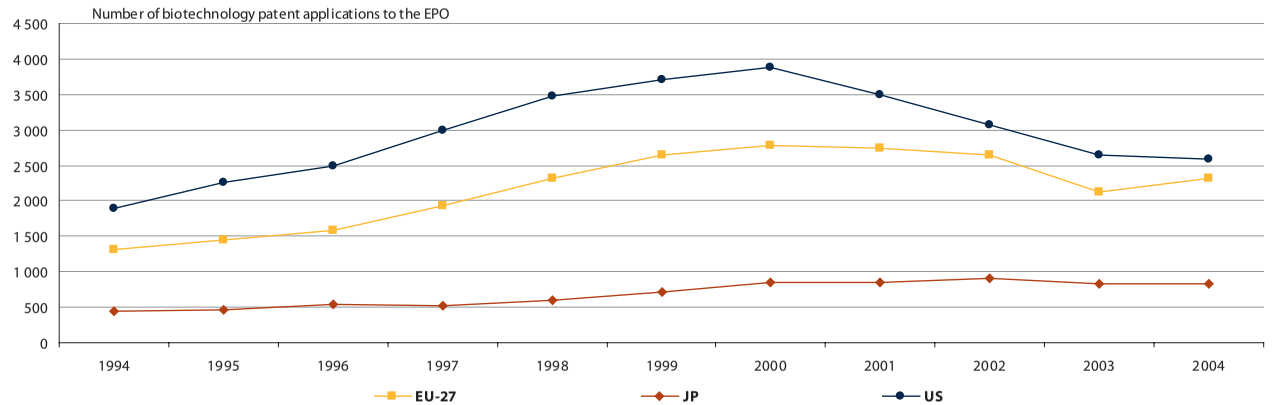
*Source:* Eurostat, Patent statistics.

**Figure 6.4:** Triadic patent families, EU-27, Japan and United States — 1992-2002



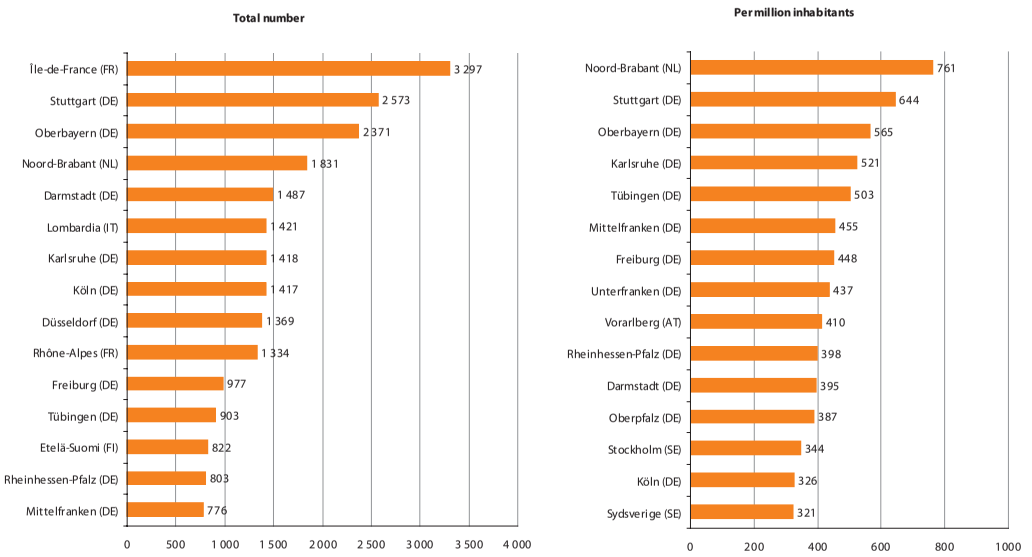

*Source:* Eurostat, Patent statistics.

**Figure 6.5:** Biotechnology patent applications to the EPO, EU-27, Japan and United States — 1994-2004



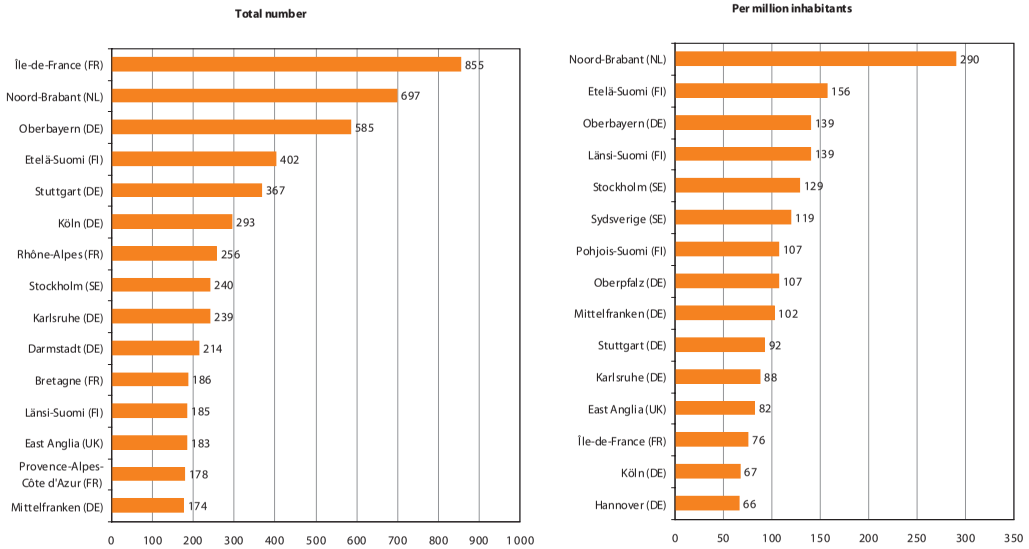

*Source:* Eurostat, Patent statistics.

**Figure 6.6:** Top 15 regions in terms of patent applications to the EPO, total number and per million inhabitants — 2004




*Source:* Eurostat, Patent statistics.

**Figure 6.7:** Top 15 regions in terms of high-tech patent applications to the EPO, total number and per million inhabitants — 2004




*Source:* Eurostat, Patent statistics.

# Chapter 7 - High-technology

In 2007, early-stage venture capital investment (VCI) in the EU-15 amounted to slightly more than EUR 2 billion (0.02 % of GDP), far from the EUR 56 billion (0.49 % of GDP) invested in buyouts and the EUR 12 billion (0.105 % of GDP) for VCI at expansion and replacement stage.

With 0.086 % of GDP, Sweden registered the highest share of early-stage VCI, followed by Denmark with 0.047 % of GDP. At the expansion and replacement stage, the United Kingdom was in the lead, with 0.31 % of GDP, and also ranked first in terms of buyouts, which accounted for 1.35 % of GDP.

In 2005, Italy counted the most high-tech manufacturing enterprises (31 409). The United Kingdom recorded the most enterprises in high-tech knowledge-intensive services (KIS) with 121 528, followed by Italy (105 358).

Wide variations were noted in the world market shares of high-tech exports between 1995 and 2006. Although it accounted for only 2.1 % of high-tech exports worldwide in 1995, China took the lead in 2006, accounting for 16.9 % of global high-tech exports, followed by the United States (16.8 %) and the EU-27 (15.0 %). The latter's share of high-tech exports fell noticeably between 2005 and 2006.

In 2006, high-tech exports exceeded imports in the United States and the EU-27. These two economies led the way in terms of high-tech imports, with 17.3 % and 17.0 % respectively, closely followed by China, with 15.4 % of the world market share.

Within the EU-27, Germany was the leading exporter of high-tech products, with a share of 7.68 %, followed by the United Kingdom (5.86 %), France (4.37 %) and the Netherlands (4.18 %).

High-tech products represented 16.6 % of total exports in the EU-27. In Malta, high-tech products accounted for 54.6 % of exports.

In 2006, 'electronics and telecommunications' accounted for the largest share of high-tech exports in 18 Member States plus Norway and Croatia. This was also the leading group of products in terms of high-tech exports in Japan and the United States.

While in 2006 the United States was the leading exporter in 'armament' and 'aerospace', with 48.4 % and 46.8 % of the world share respectively, the EU was the main exporter in 'pharmacy' and China led the way in 'computers-office machines'.

In all EU Member States except Portugal, Malta, Finland, Slovenia and Sweden, more than half of high-tech exports were made within the EU.

In 2007, more than 2 million persons were employed in high-tech manufacturing in the EU-27, representing 1.1 % of total EU employment. Medium-high-tech manufacturing and high-tech KIS accounted for respectively 5.6 % and 3.3 % of total EU employment. Between 2002 and 2007, employment in the high-tech sectors generally increased: the high-tech KIS sector registered the largest increase with an average annual growth rate of 2.3 %. Women as employees were under-represented in all these sectors.

At regional level, capital regions and regions within commuting distance of the capital region often ranked high in terms of employment in high-tech sectors. In 2007, the leading region was Berkshire, Buckinghamshire and Oxfordshire (UK), with high-tech sectors accounting for 10.7 % of total employment.

**Table 7.1:** Description of venture captital investments (VCI) at early stage, expansion and replacement stage and buyout stage, EU-15 and selected countries — 2007

| | VCI at early stage | | | | VCI at expansion and replacement stage | | | | Buyouts | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Amount invested | | Number of investments | Number of companies | Amount invested | | Number of investments | Number of companies | Amount invested | | Number of investments | Number of companies |
| | EUR million | percentage of GDP | | | EUR million | percentage of GDP | | | EUR million | percentage of GDP | | |
| **EU-15** | 2 279.4 i | 0.020 i | 2 974 i | 2 019 i | 12 026.9 i | 0.105 i | 2 873 i | 2 044 i | 56 421.3 i | 0.493 i | 1 900 i | 1 293 i |
| BE | 108.7 | 0.033 | 90 | 75 | 338.4 | 0.102 | 109 | 84 | 490.8 | 0.148 | 40 | 36 |
| CZ | 0.0 | 0.000 | 1 | 1 | 16.4 | 0.013 | 7 | 6 | 113.4 | 0.089 | 10 | 10 |
| DK | 106.2 | 0.047 | 78 | 69 | 104.5 | 0.046 | 58 | 54 | 1 001.3 | 0.440 | 26 | 26 |
| DE | 426.5 | 0.018 | 815 | 483 | 851.3 | 0.035 | 670 | 540 | 6 172.5 | 0.255 | 210 | 157 |
| IE | 32.3 | 0.017 | 56 | 49 | 77.7 | 0.042 | 36 | 31 | 175.2 | 0.094 | 7 | 7 |
| EL | 0.3 | 0.000 | 1 | 1 | 18.8 | 0.008 | 3 | 3 | 435.8 | 0.190 | 7 | 7 |
| ES | 111.9 | 0.011 | 134 | 126 | 1 144.4 | 0.109 | 111 | 91 | 1 795.1 | 0.171 | 91 | 65 |
| FR | 319.9 | 0.017 | 367 | 153 | 1 298.2 | 0.069 | 518 | 286 | 10 600.6 | 0.560 | 503 | 303 |
| IT | 22.6 | 0.001 | 15 | 12 | 327.0 | 0.021 | 34 | 29 | 1 109.3 | 0.072 | 64 | 51 |
| HU | 2.1 | 0.002 | 6 | 6 | 9.2 | 0.009 | 9 | 9 | 30.4 | 0.030 | 3 | 3 |
| NL | 120.8 | 0.022 | 202 | 193 | 505.3 | 0.090 | 155 | 131 | 3 287.0 | 0.587 | 144 | 99 |

*Source:* Eurostat, High-tech statistics.

**Table 7.1:** Description of venture captital investments (VCI) at early stage, expansion and replacement stage and buyout stage, EU-15 and selected countries — 2007

| | VCI at early stage | | | | VCI at expansion and replacement stage | | | | Buyouts | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Amount invested | | Number of investments | Number of companies | Amount invested | | Number of investments | Number of companies | Amount invested | | Number of investments | Number of companies |
| | EUR million | percentage of GDP | | | EUR million | percentage of GDP | | | EUR million | percentage of GDP | | |
| AT | 15.5 | 0.006 | 51 | 44 | 85.8 | 0.032 | 24 | 18 | 154.9 | 0.057 | 6 | 6 |
| PL | 2.4 | 0.001 | 4 | 4 | 72.4 | 0.024 | 27 | 19 | 495.4 | 0.161 | 30 | 26 |
| PT | 38.8 | 0.024 | 39 | 38 | 77.9 | 0.048 | 29 | 23 | 39.1 | 0.024 | 12 | 11 |
| RO | 0.0 | 0.000 | 0 | 0 | 76.1 | 0.063 | 10 | 8 | 216.9 | 0.179 | 9 | 8 |
| SK | 0.4 | 0.001 | 7 | 7 | 0.5 | 0.001 | 3 | 8 | 0.5 | 0.001 | 1 | 2 |
| FI | 70.8 | 0.039 | 255 | 169 | 314.9 | 0.175 | 79 | 60 | 606.6 | 0.337 | 66 | 49 |
| SE | 285.0 | 0.086 | 487 | 338 | 622.2 | 0.187 | 269 | 198 | 3 260.8 | 0.982 | 112 | 77 |
| UK | 620.2 | 0.031 | 384 | 269 | 6 260.6 | 0.310 | 778 | 496 | 27 292.3 | 1.352 | 612 | 399 |
| NO | 183.5 | 0.065 | 215 | 173 | 225.9 | 0.080 | 82 | 67 | 554.2 | 0.195 | 27 | 26 |
| CH | 171.1 | 0.055 | 75 | 69 | 299.5 | 0.097 | 51 | 43 | 434.2 | 0.140 | 16 | 13 |
| US | 4 630.1 | 0.033 | 1 410 | : | 16 826.1 | 0.122 | 2 403 | : | : | : | : | : |

Exception to the reference year: 2005: SK.

*Source:* Eurostat, High-tech statistics.

**Table 7.2:** Number of enterprises, turnover, production value and value added in the high-tech manufacturing sector and in high-tech KIS, EU-27 — 2005

| | High-tech manufacturing | | | | High-tech knowledge-intensive services (KIS) | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of enterprises | Turnover in EUR million | Prod. value in EUR million | Value added in EUR million | Number of enterprises | Turnover in EUR million | Prod. value in EUR million | Value added in EUR million |
| **EU-27** | : | : | : | : | : | : | : | : |
| BE | 1 986 | 15 358 | 17 134 | 6 838 | 14 957 | 26 433 | 26 143 | 12 402 |
| BG | 1 265 | 514 | 466 | : | 4 069 | 2 098 | 1 981 | 1 037 |
| CZ | 8 682 | 9 013 | 8 689 | 1 556 | 24 868 | 7 344 | 6 746 | 3 561 |
| DK | 1 115 | 10 400 | 10 438 | 4 416 | 9 087 | 16 658 | 15 143 | 7 744 |
| DE | 21 694 | 161 176 | 137 793 | 53 065 | 60 131 | 163 235 | 145 341 | 82 662 |
| EE | 244 | : | : | : | 1 152 | 855 | 817 | 377 |
| IE | 309 | 30 458 | 30 036 | 8 714 | 6 045 | 16 348 | 11 205 | 8 077 |
| EL | 2 249 | 1 804 | 1 750 | 703 | 9 081 | 10 262 | 7 488 | 4 880 |
| ES | 8 213 | 24 518 | 22 229 | 6 836 | 36 772 | 60 320 | 46 391 | 28 748 |
| FR | 16 179 | 146 244 | 134 025 | 35 302 | 61 811 | 130 403 | 124 851 | 63 448 |
| IT | 31 409 | 61 391 | 58 095 | 18 932 | 105 358 | 102 537 | 99 277 | 47 036 |
| CY | 85 | 90 | 89 | 37 | 318 | 628 | 621 | 473 |
| LV | 259 | : | : | : | 1 477 | 940 | 866 | 502 |

Exceptions to the reference year in high-tech manufacturing: 2004: BG and CZ; 2003: EL; 2001: CY — Exceptions to the reference year in high-tech KIS: 2004: CZ and IE.

*Source:* Eurostat, High-tech statistics.

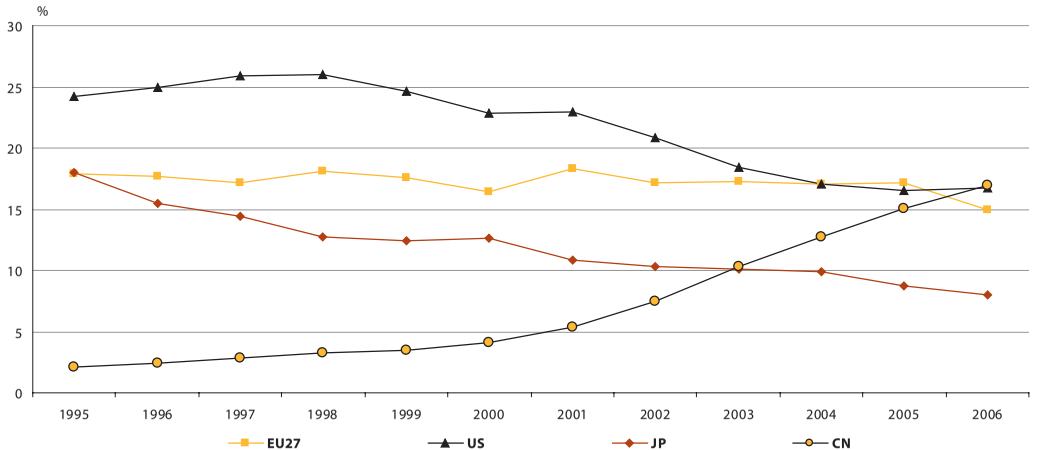
**Table 7.2:** Number of enterprises, turnover, production value and value added in the high-tech manufacturing sector and in high-tech KIS, EU-27 — 2005

| | High-tech manufacturing | | | | High-tech knowledge-intensive services (KIS) | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of enterprises | Turnover in EUR million | Prod. value in EUR million | Value added in EUR million | Number of enterprises | Turnover in EUR million | Prod. value in EUR million | Value added in EUR million |
| LT | 392 | 475 | 415 | 114 | 1 792 | 1 157 | 1 015 | 478 |
| LU | 62 | : | : | : | 1 095 | 2 210 | 1 964 | 1 211 |
| HU | 5 937 | 18 386 | 16 714 | 3 354 | 28 167 | 8 615 | 5 779 | 3 492 |
| MT | : | : | : | : | 684 | 314 | 312 | 230 |
| NL | 2 905 | : | : | : | 23 395 | 41 490 | 40 549 | 20 672 |
| AT | 1 875 | 11 577 | 10 324 | 4 680 | 13 825 | 16 275 | 11 821 | 7 670 |
| PL | 14 158 | 8 673 | 7 906 | 2 656 | 33 618 | 15 877 | 14 149 | 8 078 |
| PT | 1 644 | 5 002 | 4 814 | 1 215 | 15 644 | 10 755 | 10 365 | 4 618 |
| RO | 1 784 | 1 121 | 1 005 | 359 | 14 303 | 5 149 | 4 862 | 2 628 |
| SI | 913 | 2 022 | 1 882 | 908 | 3 351 | 2 217 | 1 916 | 981 |
| SK | 467 | 2 567 | 2 493 | 343 | 1 604 | 2 549 | 2 325 | 1 263 |
| FI | 1 266 | 34 098 | 20 851 | 6 651 | 5 557 | 12 860 | 12 840 | 5 340 |
| SE | 3 697 | 25 499 | 26 536 | 10 766 | 32 588 | 28 659 | 26 945 | 12 550 |
| UK | 11 359 | 87 474 | 81 927 | 35 313 | 121 528 | 207 519 | 196 003 | 107 389 |

Exceptions to the reference year in high-tech manufacturing: 2004: RO; 2003: SI — Exceptions to the reference year in high-tech KIS: 2004: SE; 2002: LU and MT.

*Source:* Eurostat, High-tech statistics.

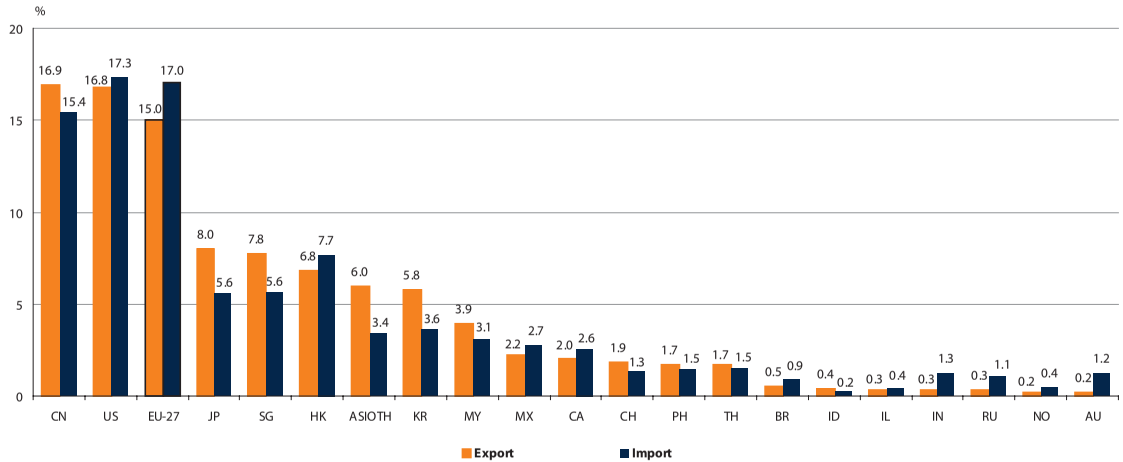
**Figure 7.3:** World market shares of high-tech exports, EU-27, China, Japan and United States — 1995-2006




EU-27: excluding intra-EU trade — CN: excluding HK.

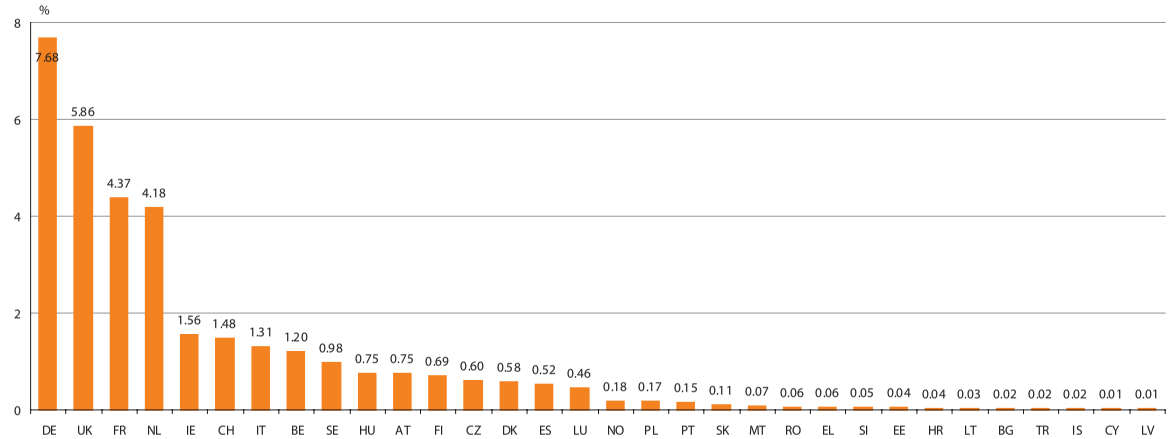
*Source:* Eurostat, High-tech statistics.

**Figure 7.4:** World market shares of high-tech imports and exports, EU-27 and main exporting countries — 2006




*Source:* Eurostat, High-tech statistics.

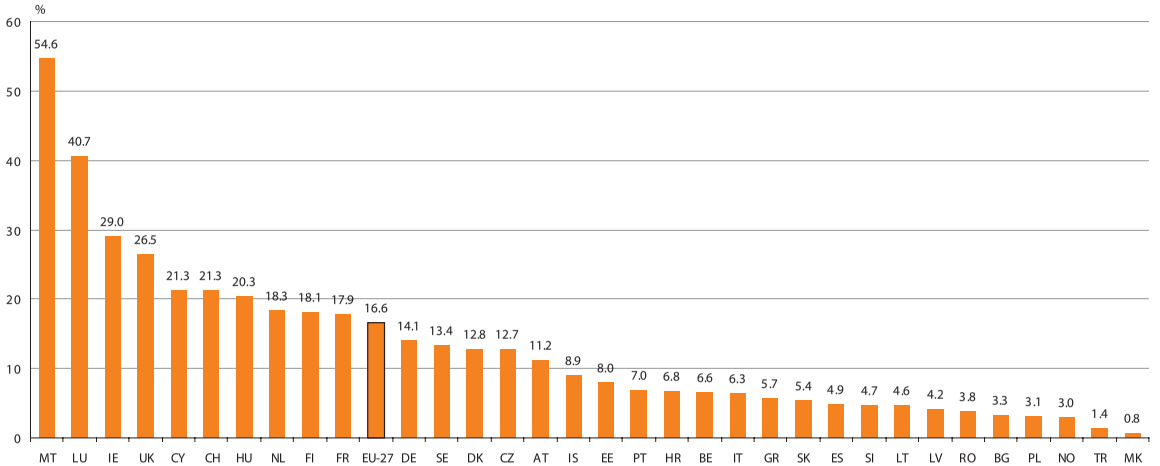
**Figure 7.5:** World market shares of high-tech exports, EU-27 Member States and selected countries — 2006




EU-27: excluding intra-EU trade — CN: excluding HK.

*Source:* Eurostat, High-tech statistics.

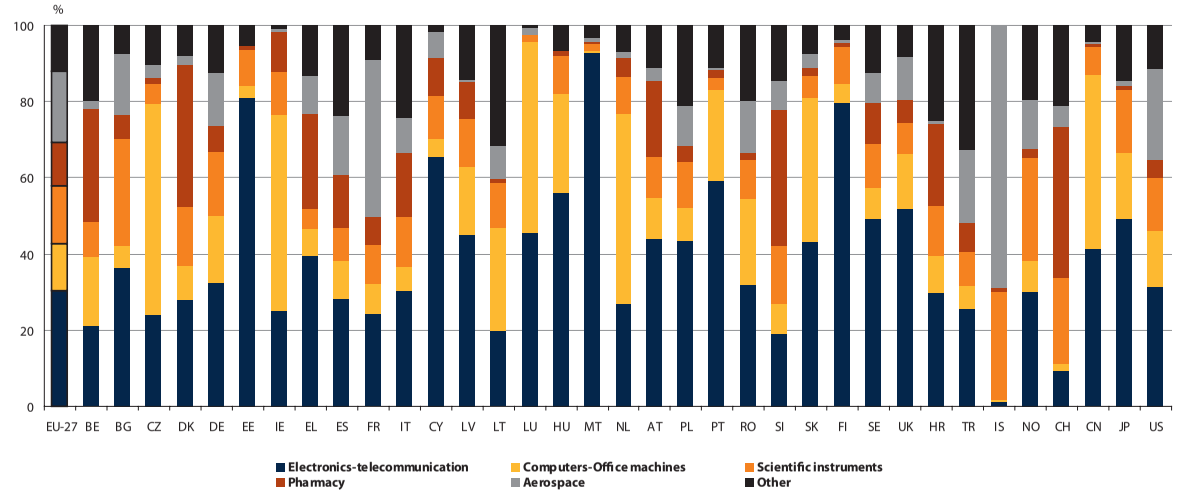
**Figure 7.6:** High-tech exports as a percentage of total exports, EU-27 Member States and selected countries — 2006




EU-27: excluding intra-EU trade — MK: provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the United Nations.

*Source:* Eurostat, High-tech statistics.

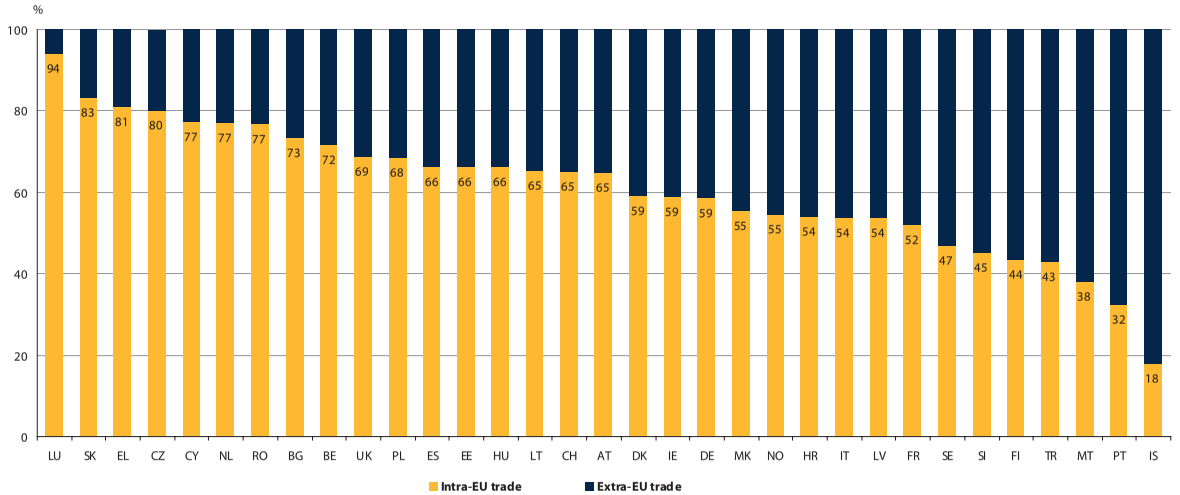
**Figure 7.7:** Exports by high-tech group of products, EU-27 Member States and selected countries — 2006




EU-27: excluding intra-EU trade — 'Other' includes 'electrical machinery', 'chemistry', 'non-electrical machinery' and 'armament' — CN: excluding HK.

*Source:* Eurostat, High-tech statistics.

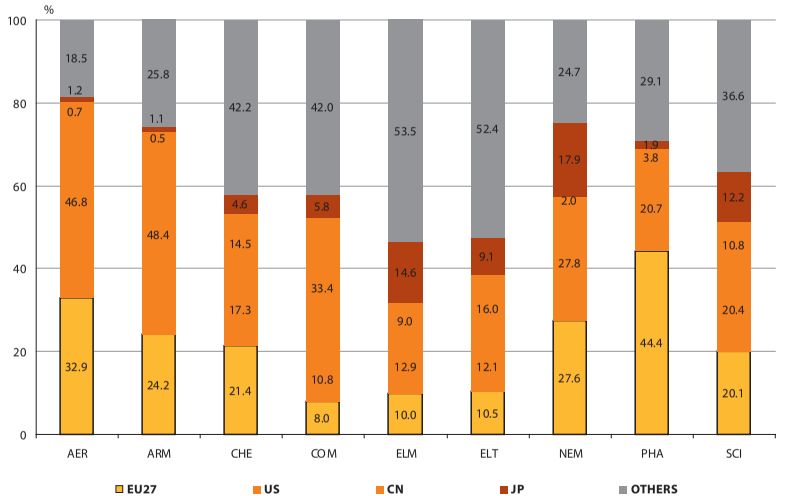
**Figure 7.8:** Share of intra-EU trade in high-tech products in total exports, EU-27 Member States and selected countries — 2006




MK: provisional code which does not prejudge in any way the definitive nomenclature for this country, which will be agreed on following the conclusion of negotiations currently taking place on this subject at the United Nations.

Source: Eurostat, High-tech statistics.

**Figure 7.9:** World market share of high-tech exports by group of products, EU-27, United States, Japan and China — 2006




EU-27: excluding intra-EU trade — CN: excluding HK — Abbrevations used: AER - Aerospace; ARM - Armament; CHE - Chemistry; COM - Computers-Office machines; ELM - Electrical machinery; ELT - Eletronics-Telecommunication; NEM - Non-electrical machinery; PHA - Pharmacy; SCI - Scientific instruments.

*Source:* Eurostat, High-tech statistics.

**Table 7.10:** Employment in high-tech sectors, total, as a percentage of total employment, percentage of women in 2007 and AAGR 2002-2007, EU-27 and selected countries

| | High-tech manufacturing | | | | Medium high-tech manufacturing | | | | High-tech KIS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000's | % of total employment | % of female | AAGR 2002-2007 | 1000's | % of total employment | % of female | AAGR 2002-2007 | 1000's | % of total employment | % of female | AAGR 2002-2007 |
| **EU-27** | 2 415.9 | 1.1 | 36.1 | 0.3 | 12 149 | 5.6 | 23.6 | 1.4 | 7 162 | 3.3 | 33.1 | 2.3 |
| BE | 34.3 | 0.8 | 33.3 u | -0.4 | 241 | 5.5 | 21.7 | 0.7 | 170 | 3.9 | 28.7 | 2.1 |
| BG | 17.9 | 0.6 | 53.6 | 5.7 b | 149 | 4.6 | 33.3 | 1.9 b | 82 | 2.5 | 45.3 | 2.1 b |
| CZ | 90.8 | 1.9 | 48.1 | 6.5 b | 443 | 9.0 | 33.7 | 4.4 b | 147 | 3.0 | 42.5 | 0.1 b |
| DK | 30.2 | 1.1 | 38.2 | 0.2 b | 139 | 5.0 | 28.1 | -0.6 b | 118 | 4.2 | 32.5 | -1.9 b |
| DE | 663.3 | 1.7 | 36.3 | -1.2 b | 3 426 | 9.0 | 20.6 | 0.1 b | 1 313 | 3.4 | 32.8 | 1.7 b |
| EE | 6.9 u | 1.1 u | : | -4.2 | 19 | 2.9 | : | 2.0 b | 17 | 2.6 | 47.4 u | 0.0 b |
| IE | 52.3 | 2.5 | 38.8 | -1.0 b | 58 | 2.8 | 32.3 | -2.4 b | 77 | 3.7 | 30.0 | 0.6 b |
| EL | 12.4 | 0.3 | 22.9 u | 0.5 b | 95 | 2.1 | 20.8 | 3.4 b | 88 | 2.0 | 32.5 | 3.8 b |
| ES | 86.4 | 0.4 | 29.9 | 2.2 b | 824 | 4.1 | 21.1 | 0.6 b | 600 | 3.0 | 34.7 | 7.7 b |
| FR | 328.9 | 1.3 | 32.3 | 0.9 b | 1 295 | 5.1 | 24.9 | -0.3 b | 875 | 3.4 | 38.4 | -2.1 b |
| IT | 296.8 | 1.3 | 33.0 | 5.2 b | 1 463 | 6.3 | 22.0 | 1.3 b | 722 | 3.1 | 34.5 | 2.0 b |
| CY | 0.5 u | 0.1 u | : | : | 3 | 0.9 | 37.8 u | -1.8 b | 7 | 2.0 | 31.1 | 3.2 b |
| LV | : | : | : | : | 18 | 1.6 | 36.4 u | 0.3 b | 28 | 2.5 | 52.3 | 4.4 b |
| LT | 6.9 u | 0.5 u | : | -5.8 | 31 | 2.0 | 30.3 u | 1.5 | 32 | 2.1 | 52.6 u | 6.0 b |
| LU | 0.7 u | 0.4 u | : | 1.7 | 1 u | 0.7 u | : | -2.1 | 7 | 3.4 | 30.9 | 10.2 |
| HU | 101.1 | 2.6 | 47.7 | 0.0 b | 245 | 6.2 | 33.1 | 1.6 b | 129 | 3.3 | 41.2 | 1.8 b |
| MT | 4.2 | 2.7 | 48.5 u | -5.2 b | 5 | 3.5 | : | -4.2 b | 5 | 3.3 | : | 2.5 b |

Exception to the reference year: 2006: CY — b: break in series: at least one occurence between 2002 and 2007 — Exceptions to the reference period: 2003-2007: EE; 2002-2006: CY.

*Source:* Eurostat, High-tech statistics.

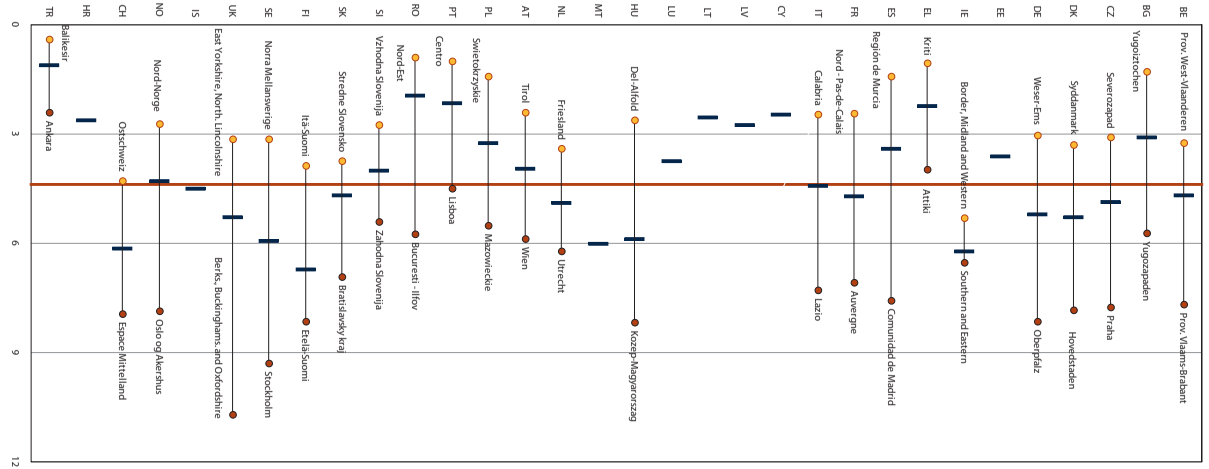
**Table 7.10:** Employment in high-tech sectors, total, as a percentage of total employment, percentage of women in 2007 and AAGR 2002-2007, EU-27 and selected countries

| | High-tech manufacturing | | | | Medium high-tech manufacturing | | | | High-tech KIS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000's | % of total employment | % of female | AAGR 2002-2007 | 1000's | % of total employment | % of female | AAGR 2002-2007 | 1000's | % of total employment | % of female | AAGR 2002-2007 |
| NL | 51.9 | 0.6 | 25.3 | -10.2 b | 211 | 2.5 | 16.4 | -2.8 b | 356 | 4.3 | 22.3 | 3.2 b |
| AT | 54.4 | 1.4 | 31.1 | -3.6 b | 213 | 5.3 | 20.1 | 3.9 b | 104 | 2.6 | 29.8 | -3.8 b |
| PL | 103.0 | 0.7 | 49.4 | 14.2 b | 733 | 4.8 | 26.5 | 6.9 b | 390 | 2.6 | 36.2 | 10.2 b |
| PT | 21.7 | 0.4 | 42.0 | 2.8 b | 154 | 3.0 | 28.2 | 0.5 b | 86 | 1.7 | 28.3 | 2.6 b |
| RO | 37.5 | 0.4 | 39.6 | 2.1 b | 492 | 5.3 | 33.7 | -0.5 b | 142 | 1.5 | 43.0 | -1.5 b |
| SI | 11.5 | 1.2 | 42.0 | 7.6 b | 77 | 7.9 | 32.9 | 0.1 b | 27 | 2.8 | 27.9 | 4.9 b |
| SK | 41.9 | 1.8 | 56.7 | 5.3 b | 191 | 8.1 | 32.1 | 6.3 b | 68 | 2.9 | 44.8 | 2.7 b |
| FI | 53.4 | 2.1 | 30.5 | 2.2 b | 122 | 4.9 | 18.4 | -1.2 b | 114 | 4.6 | 37.7 | 0.0 b |
| SE | 39.2 | 0.9 | 34.5 | -9.2 b | 243 | 5.3 | 22.8 | -0.8 b | 230 | 5.1 | 31.0 | 0.3 b |
| UK | 264.9 | 0.9 | 29.6 | -6.0 b | 1 260 | 4.5 | 21.2 | -2.9 b | 1 227 | 4.3 | 26.1 | 0.4 b |
| IS | : | : | : | : | 2 | 1.3 | : | -4.8 b | 7 | 4.1 | 42.3 | -2.0 b |
| NO | 11.2 | 0.5 | 30.5 u | -5.1 b | 91 | 3.8 | 12.7 | 0.1 b | 93 | 3.8 | 32.1 | -0.2 b |
| CH | 97.2 | 2.4 | 36.7 | 2.5 b | 197 | 4.8 | 21.2 | -1.2 b | 154 | 3.8 | 32.1 | -0.9 b |
| HR | 7.8 u | 0.5 u | 44.4 bu | 5.6 | 66 | 4.2 | 20.0 u | 0.8 b | 33 | 2.1 | 41.3 bu | -3.7 b |
| TR | 55.9 | 0.3 | 22.6 | : b | 705 | 3.3 | 10.9 | : b | 176 | 0.8 | 20.2 | : b |

Exceptions to the reference year : 2006: IS, HR — b: break in series: at least one occurence between 2002 and 2007 — Exceptions to the reference period: 2004-2007: PL; 2002-2006: IS, HR.

*Source:* Eurostat, High-tech statistics.

**Figure 7.11:** Regional disparities in employment in high-tech sectors as a percentage of total employment — 2007




Data lack reliability due to small sample size but are publishable for regions in BG, EL, PL — Exceptions to the reference year: 2006: HR and IS — At least one region missing due to lack of reliability: AT, DE, ES, FI, FR, EL, IT, NL, PT, UK, TR.

*Source:* Eurostat, High-tech statistics.

# Methodological notes

## GBAORD

### 1. Concepts and Definition

Government budget appropriations or outlays on R&D (GBAORD) are all appropriations 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, 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, which are not available in their final form until some time after the end of the budget year concerned, 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 using data for public budgets. These measure government support for R&D activities, or, in other words, how much priority governments place on the public funding of R&D.

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

### 2. Sources

The basic data are forwarded to Eurostat by the national administrations of Member States and other countries. Data for Japan and the United States come from the OECD's Main Science and Technology Indicators (MSTI).

### 3. Statistical data compilation

Until 2003, data on GBAORD were collected under a gentlemen's agreement. From the reference year 2004 on, data collection is 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 budget appropriations or outlays on R&D are broken down by socio-economic objectives on the basis of NABS — *Nomenclature for the analysis and comparison of scientific programmes and budgets*, Eurostat, 1994. The 1993 edition of NABS applies from the 1993 final and the 1994 provisional budgets onwards. Not all countries collect the data directly using NABS: some follow other compatible classifications (OECD, Nordforsk), which are then converted to the NABS classification (see Table 8.2 of the *Frascati Manual*).

**5. Exceptions**

No GBAORD data exist for Bulgaria and Luxembourg before 2000, and therefore EU aggregates exclude them before that year.

No GBAORD data exist for Cyprus and Malta before 2004, and therefore EU aggregates exclude Cyprus and Malta before that year.

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

**6. Time series**

The analysis in the present publication covers the period 1996–2007.

## R&D expenditure and personnel

### 1. Concepts and definitions

The basic concepts and guidelines for collecting data and the classifications used in compiling statistics on research and experimental development are provided in the *Frascati Manual*, OECD, 2002. More details on R&D expenditure and personnel are available in chapters 5 and 6. 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 for 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.

For the computation of R&D intensity at national level (EEA countries), GDP from national accounts is used as reference data. At regional level, GDP data are taken from the regional accounts. Both data series were extracted from NewCronos.

R&D personnel

Data on R&D personnel measure the resources going directly to R&D activities. The total R&D personnel is defined as 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. Thus, someone who normally devotes 40% of his/her time to R&D and the rest to other activities (e.g. teaching, university administration or counselling) should be counted as only 0.4 FTE.

Personnel in head count — HC

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

**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 China, Japan and the United States come from the OECD's Main Science and Technology Indicators (MSTI).

**4. Statistical data compilation**

Until 2003, data on R&D were collected under a gentlemen's agreement. From the reference year 2003 on, data collection is 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, candidate countries, Iceland, Norway, Switzerland, China, Japan, Russia 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. Where data are missing, estimates are first made for the country in question, reference period, institutional sector or relevant R&D variable, as appropriate. This method is not applied identically to the calculation of R&D personnel in head count (HC). The estimates for R&D personnel in full-time equivalents (FTE) serve as a basis for the HC calculation. An FTE/HC ratio based on available FTE and HC personnel data at national level is estimated for the EU aggregates, by institutional sector and by year. This ratio is then applied to the FTE data to calculate the EU totals in HC.

- EU and EEA aggregates are estimated values.
- EEA: Liechtenstein is not included.

**7. Time series**

Data are presented for the period 2000–2007. However, data series in NewCronos are available from 1981 onwards with differences in terms of availability according to variables and institutional sectors. Not all years are complete, and therefore the latest year available for each country is presented in the analysis.

Additional information on the methodology used may be found in Eurostat's NewCronos 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 the demand for, and supply of, highly qualified personnel. The data presented in this publication focus on two main aspects: stocks and flows. The former serves to show the needs 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 one of the following conditions:

- successfully completed education at the third level (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).

The conditions of the above educational or occupational requirements are considered according to internationally harmonised standards:

- the International Standard Classification of Education (ISCED), which provides the achieved level of formal education;
- the International Standard Classification of Occupation (ISCO), which provides information on the type of occupation.

According to the OECD Canberra Manual, the seven broad S&T fields of study include 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 given point in time. Data on HRST stocks relate to the employment status as well as the occupational and educational profiles of individuals in the given year.

HRST stocks data and their derived indicators are extracted and created 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.

Readers should note that the population used excludes anyone below the age of 15 or over the age of 74. This is because no person below the age of 15 fulfils 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 (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 (ISCED '97 version levels 5a, 5b or 6).

**HRSTC** — Human resources in science and technology — core

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

**NHRSTU** — Unemployed non-HRST

- no education at the third level and are 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 fulfil at least one of them during the period. The number of graduates from a country's higher education system represents the main inflow into the national stock of HRST.

HRST education inflow data are extracted from the Eurostat Education database, building on data from the UNESCO/OECD/Eurostat questionnaire on education, which is based on the ISCED classification. Users should note that European education systems differ between countries and that duplications of degrees may 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, and computing (codes 42, 44, 46, 48).

**Engineering** comprises the fields of education in engineering and engineering trades, manufacturing and processing, and architecture and building (codes 52, 54, 58).

**The following sectors of economic activity** based on NACE Rev. 1.1 (*Statistical classification of economic activities in the European Communities*) used in this publication are defined as follows:

- total manufacturing (NACE D);
- high- and medium-high-technology manufacturing (NACE 24+29+30+31+32+33+34+35);
- total services (NACE G to Q);
- knowledge-intensive services (KIS) (NACE 61+62+64 to 67+70 to 74+80+85+92);

- total high-technology sector is the sum of high-tech manufacturing and knowledge-intensive high-technology services (NACE 24+30+32+33+35+64+72+73).

**2. Sector of activity**

HRST data by sector of activity are collected according to the statistical classification of economic activities in the European Community — NACE Rev. 1.1. For further information on the sector groups, please refer to the General Information part.

**3. Nationality**

HRST data by nationality are based according the citizenship of the person. It is defined as the particular legal bond between an individual and his/her state acquired by birth or naturalisation whether by declaration, option, marriage or other means in accordance with national legislation. The following aggregates are used in this publication:

- nationals: persons having citizenship of the country of residence;
- non-nationals: persons having a citizenship different to that of the country of residence.

**4. Time series**

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

**5. Sources**

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

## Innovation

### 1. Concepts and definitions

1.1 Community Innovation Survey

At European level, the *Community Innovation Survey (CIS)* data are the main source of information for studying innovation drivers and company behaviour towards innovation.

The **Community Innovation Survey** is a survey of innovation activity in enterprises covering EU Member States, candidate countries and Norway.

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

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

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

1.2 Oslo Manual 1997

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

**Enterprises engaged in innovation activity** (propensity to innovate): enterprises that introduce new or significantly improved products (goods or services) to the market or enterprises that implement new or significantly improved processes. Innovations are based on the results of new technological developments, new combinations of existing technology or utilisation of other knowledge acquired by the enterprise. The term covers all types of

innovator, i.e. product innovators, process innovators and enterprises with only ongoing and/or abandoned innovation activities.

**Product innovation** is the introduction to the market of a new good or service or of a good or service with significantly improved capabilities, such as improved software, user-friendliness, components or sub-systems.

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

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

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

**Intramural (in-house) R&D**: creative work undertaken within the enterprise to increase the stock of knowledge and use it to devise new and improved products and processes (including software development).

**Extramural R&D**: same activities as above, but performed by other companies (including other enterprises within the same group) or by public or private research organisations and purchased by the enterprise.

**2. Statistical units**

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

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

### 3. Type of survey

Most countries carried out CIS 2006 using a stratified sample survey, while the rest 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 six sectors used in the publication are:

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

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

### 4. Reference period

CIS 2006 covered the observation period 2004-2006 inclusive, i.e. the three-year period from the beginning of 2004 to the end of 2006. The reference period for CIS 2006 was the year 2006.

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 in a specific geographic area and for a limited period of time. An invention needs to fulfil three criteria to be patented: (1) novelty, (2) inventive step, and (3) industrial applicability. All patent applications and patents granted are published. They provide a useful indicator of innovative developments in all areas of technology, and they can serve as an indicator of innovation 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 "EPO-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 in the calculation of indicators is very similar to the methodology applied at the OECD. 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 as receiving office 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 not be identical. Differences may be explained by the fact that the data sources used and the extraction date of the data can differ.

Nowcasts for EPO data

For the calculation of EPO data for 2005 a linear regression has been carried out using the ratio of direct patent applications to the EPO to all patent applications to the EPO for the years 2001 to 2004. As explained in the methodology for EPO patent indicators,

direct applications and PCT applications in the regional phase are taken into account. The 'nowcasting' methodology is built on the assumption that the relationship between direct applications and PCT applications in the regional phase can be estimated for 2005 using a linear regression of this relationship for the period 2001 to 2004. The estimate has been applied to the number of direct applications for 2005.

**USPTO patents granted by priority year**

Eurostat uses the same methodology as the OECD for patents granted by the USPTO. Differences may be explained by the fact that the data sources are not exactly the same and by the date of data extraction.

Nowcasts for USPTPO data

For the estimation of USPTO data for 2002 a linear regression based on the values for 1998 to 2002 has been used. The estimate has been applied to the total number of patents granted by the USPTO in 2002.

**Triadic patent families by earliest priority year**

According to the most commonly acknowledged definition, 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 if and only if it has been applied for and filed at the European Patent Office (EPO) and the Japan 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 therefore the latest available data refer to 2002 only.

**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 it is chosen in order to be the closest to the date of the invention as patent procedures always take several years. The drawback of this choice is that the data on USPTO

patents granted have declined in recent years, due to administrative delays between the priority date and the grant date. To a lesser extent this is also the case for the EPO data.

**4. Counting patents with multiple inventors from different countries**

Eurostat has chosen fractional counting as the counting method. This means that when several inventors from different countries are assigned to a patent, the respective contributions of each country are taken into account. This is 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. International patent classification**

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

**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 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 |

## High-technology

### 1. Sources and definitions

1.1. Venture capital investments

Venture Capital Investment (VCI) is defined as private equity raised for investment in companies. Management buy-outs, management buy-ins, and venture purchase of quoted shares are excluded.

Data are broken down into two investment stages:

- early stage (seed + start-up) and
- expansion and replacement (expansion and replacement capital).

Venture capital is expressed as a percentage of GDP (Gross domestic product at market prices), which is defined in accordance with the European System of national and regional Accounts in the Community (ESA 95).

The data cover EU-15, EU-27 Member States (except for Bulgaria, Estonia, Cyprus, Latvia, Lithuania, Luxembourg, Malta and Romania), Norway and Switzerland.

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.com

**Definition of indicators**

**Seed** is defined as financing provided to research, assess and develop an initial concept before a business has reached the start-up phase.

**Start-up** is defined as financing provided for product development and initial marketing, manufacturing, and sales. Companies may be in the process of being set up or may have been in business for a short time, but have not sold their product commercially.

**Expansion** is defined as financing provided for the growth and expansion of a company which is breaking even or trading profitably. Capital may be used to finance increased production capacity, market or product development, and/or provide additional working capital. It includes bridge financing for the transition from private to public quoted company, and rescue/turnaround financing.

**Buy-outs:** a buyout is a transaction financed by a mix of debt and equity, in which a business, a business unit or a company is acquired with the help of a financial investor from the current shareholders (the vendor).

**Replacement** capital is defined as purchase of existing shares in a company from another private equity investment organisation or from another shareholder or shareholders. It includes refinancing of bank debt

For further details please refer to the Eurostat metadata on high-technology statistics available on Eurostat's reference website.

### 1.2. High-tech enterprises

Data on high-tech enterprises and derived indicators are extracted and created using data from the Structural Business Statistics — SBS.

**Number of enterprises** includes all units active during at least 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 further information please refer to the Eurostat metadata on high-technology statistics available on Eurostat's reference website.

### 1.3. High-tech trade

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.

It should therefore be noted that data used in this publication originate from two different sources using partly different methodologies. For more information regarding external trade methodologies, please refer to:

http://europa.eu.int/estatref/info/sdds/en/ext/ext_sm.htm

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

1.4. Employment in high-tech

Employment in high-tech data and derived indicators are extracted and created using data from the European Union Labour Force Survey — EU LFS.

For further details please refer to the Eurostat metadata on high-technology statistics available on Eurostat's reference website.

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

2.1. High-tech classification of manufacturing industries

Eurostat uses the following breakdown of the manufacturing industry according to global technological intensity and based on NACE rev. 1.1 at 3-digit level (owing to restrictions of the data source, a different but derived classification based on NACE at 2-digit level was used for data on employment in high-tech and data on earnings in high-tech).

**High-technology**

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

**Medium-high-technology**

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

**Medium-low-technology**

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

**Low-technology**

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

2.2. Knowledge-intensive and less knowledge-intensive services

Following a similar logic as for manufacturing, Eurostat defines the following sectors either as knowledge-intensive services (KIS) or less knowledge-intensive services (LKIS), where both sectors are further divided into sub-sectors:

**Knowledge-intensive services (KIS)**

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

**High-tech KIS**

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

**Market KIS (excl. financial intermediation and high-tech services)**

61 Water transport; 62 Air transport; 70 Real estate activities; 71 Renting of machinery and equipment without operator and of personal and household goods; 74 Other business activities.

**Financial KIS**

65 to 67 Financial intermediation.

**Less knowledge-intensive services (LKIS)**

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

**Market services less KIS**

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

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