

High-technology patent applications to the European Patent Office

Communication technology at the forefront of EU high-tech patenting

Statistics in focus

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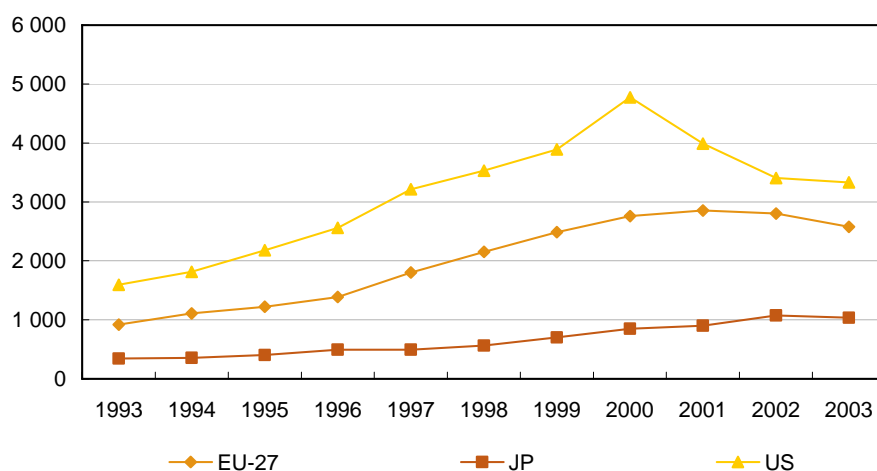
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Figure 1: Biotechnology patent applications to the European Patent Office (EPO) from 1993 to 2003 for EU-27, Japan and the United States



Source: Eurostat, patent statistics

Main findings

- The United States led the field in biotechnology patenting in 2003, but the gap with EU-27 was much narrower than in 2000.
- In high-tech patenting the European Union and to a lesser extent also Japan specialised in 'Communication technology', whereas the United States focused its patenting on 'Computer and automated business equipment'.
- Whereas the European Union as a whole did not show a real specialisation in one ICT group, Finland and Sweden specialised in 'telecommunications', which accounted for more than 50% of their ICT patent applications to the EPO among those countries with a significant number of applications.
- More than half of the EU-27 EPO patent applications come from one of the two NACE subsections 'Manufacture of electrical and optical equipment' (DL) and 'Manufacture of chemicals, chemical products and man-made fibre' (DG).
- The shares of foreign ownership of domestic inventions are high in small countries and in the new Member States.



The United States still lead the field in biotechnology and high-tech patenting

Patent applications to the EPO are classified according to the International Patent Classification (IPC). The IPC codes attributed to each patent application also offer the possibility of aggregating patent applications to different technology areas. This publication takes a closer look at the areas of biotechnology, high technology and Information and Communication Technology (ICT).

Countries that applied for fewer than one hundred patents to the EPO were not taken into account.

As shown in Figure 1, the number of biotechnology patents increased steadily in the three main economies, the EU-27, Japan and the United States, during the ten years observed. The United States reached a peak in 2000 with close to 5 000 biotechnology patent applications.

Table 2: High-technology patent applications to the EPO, total number and by high-tech group as a percentage of total and by country, 2003

	Total number of high-tech patent applications	in %	Aviation	Computer and automated business equipment	Communication and technology	Lasers	Micro-organism and genetic engineering	Semi-conductors
EU-27	10 840	100	2.4	29.9	45.5	1.1	12.4	8.7
EU-25	10 834	100	2.4	29.9	45.5	1.1	12.4	8.7
BE	242	100	1.2	24.4	36.5	0.0	25.5	12.3
BG	3	100	0.0	46.2	0.0	7.7	30.8	15.4
CZ	10	100	19.9	10.0	11.6	0.0	58.5	0.0
DK	246	100	1.6	16.3	41.6	1.5	36.4	2.6
DE	3 635	100	3.0	30.1	41.0	1.3	12.7	11.9
EE	8	100	0.0	37.8	25.2	0.0	16.8	20.2
IE	63	100	0.0	42.9	32.9	3.7	2.8	17.7
EL	21	100	2.4	30.3	56.3	0.0	9.3	1.6
ES	165	100	1.8	29.2	39.5	1.5	26.1	1.9
FR	1 980	100	3.9	29.3	47.9	1.0	10.0	7.8
IT	481	100	2.2	31.1	42.3	1.8	11.7	11.0
CY	4	100	27.6	0.0	44.8	0.0	27.6	0.0
LV	1	100	100.0	0.0	0.0	0.0	0.0	0.0
LT	2	100	52.1	0.0	0.0	0.0	34.9	13.0
LU	6	100	0.0	68.4	31.6	0.0	0.0	0.0
HU	34	100	2.9	19.1	65.2	0.0	12.7	0.0
MT	0	0	0.0	0.0	0.0	0.0	0.0	0.0
NL	908	100	0.5	36.5	40.4	0.3	10.4	11.9
AT	235	100	0.9	24.5	47.9	2.5	11.8	12.4
PL	23	100	8.8	32.2	30.7	0.0	19.7	8.6
PT	15	100	0.0	20.6	24.0	6.9	41.6	6.9
RO	3	100	0.0	48.4	41.9	0.0	0.0	9.7
SI	9	100	0.0	7.7	69.2	0.0	11.5	11.5
SK	5	100	0.0	30.0	70.0	0.0	0.0	0.0
FI	654	100	0.6	23.2	70.9	0.2	3.7	1.4
SE	562	100	0.7	20.7	67.6	0.5	8.4	2.0
UK	1 526	100	1.8	36.0	41.0	1.3	14.2	5.8
HR	4	100	0.0	55.9	37.2	0.0	7.0	0.0
TR	13	100	0.0	34.8	40.5	0.0	17.1	7.6
CH	331	100	2.0	31.4	38.8	2.8	18.1	6.9
IS	15	100	0.0	27.5	22.0	0.0	50.5	0.0
LI	2	100	0.0	0.0	0.0	0.0	50.0	50.0
NO	90	100	1.1	27.2	56.1	0.0	14.5	1.1
AU	396	100	0.3	47.8	21.8	0.9	25.1	4.2
CA	793	100	1.3	29.0	49.9	1.0	15.8	3.0
CN	703	100	0.7	18.7	64.0	0.0	12.7	3.9
IL	490	100	1.2	36.6	41.8	1.6	14.4	4.3
IN	164	100	0.0	51.2	21.1	0.6	24.5	2.7
JP	6 834	100	0.3	30.5	37.8	1.3	10.3	19.8
KR	1 924	100	0.1	20.5	62.5	0.8	5.3	10.8
RU	108	100	9.2	27.3	38.0	2.2	13.7	9.7
SG	196	100	0.0	38.2	36.1	0.5	11.5	13.6
TW	119	100	0.0	48.1	21.4	0.0	9.6	21.0
US	13 845	100	1.1	39.6	32.3	1.1	14.9	11.0

Source: Eurostat, patent statistics

Figure 3a: EU-27 high-technology patent applications to the EPO by high-tech group, 2003

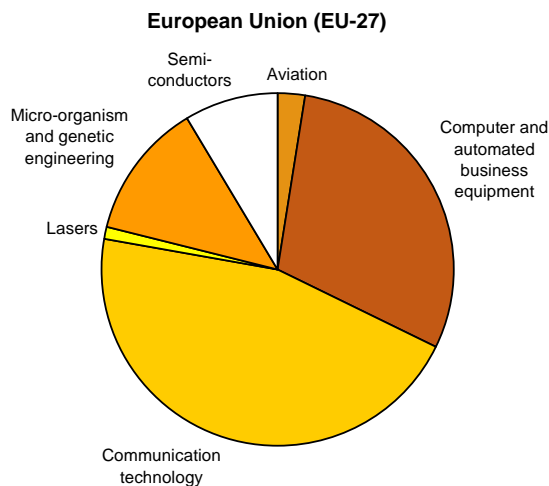


Figure 3b: Japan high-technology patent applications to the EPO by high-tech group, 2003

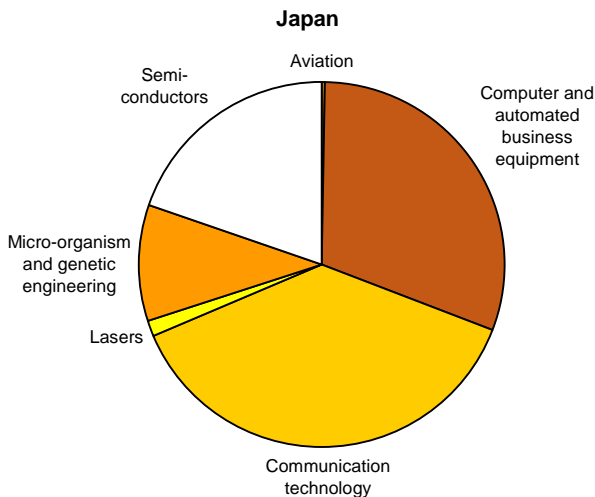
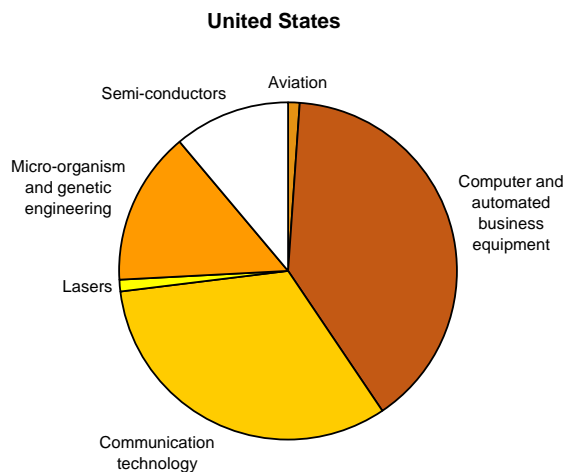


Figure 3c: United States high-technology patent applications to the EPO by high-tech group, 2003



Source: Eurostat, patent statistics

Since 2000 the level of American biotechnology patent applications has decreased, but with 3 331 patent applications in 2003 the United States was still in the lead, ahead of the European Union and Japan with 2 576 and 1 035 patent applications respectively.

The technology area of **high-tech patenting** is divided into six groups: aviation; computer and automated business equipment; communication technology; lasers; micro-organism and genetic engineering; and semi-conductors.

In absolute numbers the United States was the most active in 2003 in high-tech patenting with 13 845 patent applications to the EPO, followed by the EU-27 with 10 840 applications and Japan with 6 834 applications.

Among the EU Member States Germany was in the lead with 3 635 high-tech patent applications to the EPO; France ranked second with 1 980 patent applications and the United Kingdom third with 1 526.

The breakdown by high-tech group varies across countries. In the European Union nearly half of the high-tech patent applications were limited to 'communication technology' and close to one third dealt with 'computer and automated business equipment'. The third domain of European high-tech patenting was 'micro-organism and genetic engineering' (12%).

In Japan, in 2003, less than 40% of EPO patent applications were in 'communication technology', one third of the high-tech patent applications were limited to 'computer and automated business equipment' and close to 20% of the high-tech patent applications concerned 'semi-conductors'.

In 2003, nearly 40% of American high-tech patent applications related to the high-tech group 'computer and automated business equipment'. One third of US high-tech patent applications belonged to the group 'communication technology'. Like the EU-27, 'micro-organism and genetic engineering' was also the third group of high-tech patenting in the US: about 15% of American high-tech patent applications were limited to this group.

Table 2 gives insights into the specialisation of the European countries in high-tech groups in 2003. For the analysis only countries with at least 100 high-tech patent applications are taken into account.

In all Member States 'communication technology' was the leading high-tech group with percentages varying between 36.5% in Belgium and 70.9% in Finland.

Table 4 and Figure 5 shed light on **ICT patent applications** to the EPO. ICT patent applications are broken down into four groups: Consumer electronics; computer, office machinery; telecommunications; and other ICT. The group 'other ICT' includes especially various measuring arrangements and instruments, weighing and discharge tubes.

European ICT patent applications nearly neck-and-neck with American applications

Table 4: ICT (Information & Communication Technologies) patent applications to the EPO, total number and by ICT group as percentage of total and by country, 2003

	Total number of ICT patent applications	in %	Consumer electronics	Computer, office machinery	Tele- communications	Other ICT
EU-27	16 010	100	10.9	29.6	30.1	29.4
EU-25	15 994	100	10.9	29.6	30.1	29.4
BE	283	100	5.1	33.3	31.6	30.0
BG	10	100	0.0	24.5	49.0	26.5
CZ	14	100	0.0	48.4	29.2	22.4
DK	258	100	19.9	22.7	29.4	28.0
DE	5 859	100	7.6	27.5	26.7	38.2
EE	8	100	0.0	35.7	23.8	40.5
IE	114	100	5.4	45.9	19.4	29.3
EL	33	100	6.1	25.5	38.9	29.4
ES	197	100	6.7	35.6	36.2	21.5
FR	2 616	100	12.2	29.1	34.5	24.3
IT	735	100	6.8	31.3	28.9	33.0
CY	2	100	13.4	0.0	73.3	13.4
LT	12	100	0.0	89.9	0.0	10.1
LU	13	100	0.0	32.3	37.3	30.4
HU	37	100	8.0	25.4	54.6	12.0
MT	2	100	0.0	0.0	0.0	100.0
NL	1 618	100	29.0	35.0	15.0	20.9
AT	323	100	15.6	29.1	26.9	28.4
PL	30	100	13.2	34.0	16.5	36.3
PT	12	100	4.1	24.4	39.0	32.5
RO	6	100	12.7	38.0	11.3	38.0
SI	17	100	6.0	22.0	30.0	42.0
SK	8	100	12.2	30.4	30.4	27.1
FI	787	100	7.1	24.8	57.5	10.5
SE	783	100	6.7	21.6	52.6	19.1
UK	2 232	100	9.2	34.4	27.8	28.6
HR	8	100	13.1	39.2	17.4	30.4
TR	16	100	18.3	35.5	14.2	32.0
CH	589	100	10.0	27.0	20.6	42.4
IS	17	100	5.9	44.4	19.7	30.0
LI	3	100	0.0	0.0	0.0	100.0
NO	137	100	27.7	23.1	24.3	25.0
AU	453	100	5.9	49.0	19.2	26.0
CA	909	100	7.2	33.1	41.8	17.9
CN	764	100	10.3	22.2	55.9	11.6
IL	595	100	10.5	36.3	32.2	21.1
IN	162	100	5.4	58.4	19.0	17.2
JP	10 507	100	20.7	30.8	18.8	29.7
KR	2 704	100	23.7	23.8	36.9	15.5
RU	139	100	7.8	24.7	37.1	30.4
SG	232	100	16.1	40.1	20.1	23.7
TW	147	100	13.3	47.7	9.5	29.6
US	16 823	100	8.3	39.8	24.7	27.1

Source: Eurostat, patent statistics

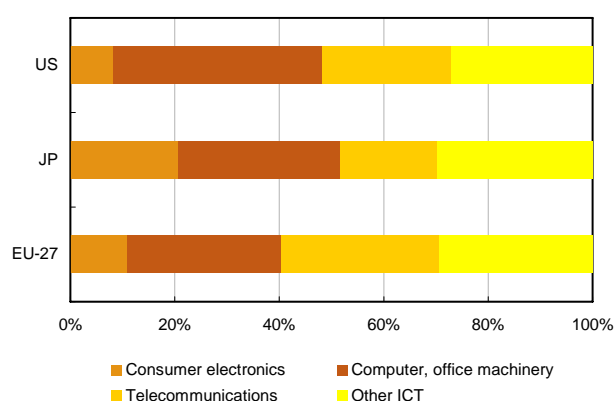
In absolute numbers the United States was in the lead in 2003 with 16 823 ICT patent applications to the EPO, followed very closely by the EU-27 with 16 010 applications. Japanese ICT patent applications ranked third with 10 507.

The EU-27 taken as a whole did not specialise in one of the ICT groups. Whereas the groups 'computer, office machinery', 'telecommunications' and 'other ICT' were almost equal with around 30% of ICT applications, the group 'consumer electronics' accounted for only 10%.

Among the EU-27, the Netherlands and Denmark applied for more patents involving 'consumer electronics' than the EU average, with 29.0% and 19.9% respectively. The Asian countries Japan and South Korea, with 20.7% and 23.7%, scored highly in this ICT group.

Spain, Ireland, the Netherlands and the United Kingdom exceeded the EU average in the ICT group 'computer, office machinery' with 35.6%, 45.9%, 35.0% and 34.4% respectively. Other countries also produce relatively large numbers of patents in this area, such as Australia (49.0%), India (58.4%), Singapore (40.1%), Taiwan (47.7%) and the United States (39.8%).

Figure 5: ICT patent applications to the EPO by ICT group for EU-27, US and JP, 2003



Source: Eurostat, patent statistics

Finland and Sweden specialised in 'telecommunications', with more than half of their ICT patent applications to the EPO in that group. Spain also exceeded the EU average, albeit to a lesser extent, with 36.2%.

Canada and China, with 41.8% and 55.9%, were very active in 'telecommunications' patenting.

More than one third of EU patent applications involve 'Manufacture of electrical and optical equipment'

All patent applications can be limited to industrial sectors (NACE section D). Four subsections are the largest ones: 'Manufacture of chemicals, chemical products and man-made fibre', 'Manufacture of machinery and equipment not elsewhere classified', 'Manufacture of electrical and optical equipment' and 'Manufacture of transport equipment'.

With 35.0% of the total for EU-27, the NACE subsection 'Manufacture of electrical and optical equipment' (DL) was in 2003 the economic activity producing the most EU patent applications.

More than 30% of EPO patent applications from Belgium, Czech Republic, Denmark, Hungary and Slovenia were produced by the subsection 'Manufacture of chemicals, chemical products and man-made fibre' (DG).

Table 6: Patent applications to the EPO by economic activity (NACE) and by country, 2003

	Total number	in %	Manufacture of chemicals, chemical products and man-made fibres (DG)	Manufacture of machinery and equipment n.e.c. (DK)	Manufacture of electrical and optical equipment (DL)	Manufacture of transport equipment (DM)	Other manufacturing subsections
EU-27	62 036	100	22.0	12.5	35.0	13.7	16.8
EU-25	61 977	100	22.0	12.5	35.0	13.7	16.8
BE	1 493	100	33.2	10.2	27.5	8.9	20.3
BG	34	100	24.2	9.1	35.7	9.4	21.7
CZ	162	100	30.7	16.2	21.7	10.1	21.3
DK	1 269	100	32.9	10.0	31.0	8.5	17.6
DE	25 640	100	20.3	13.6	33.1	16.8	16.3
EE	21	100	24.6	6.5	46.5	6.5	15.8
IE	303	100	22.5	8.2	47.9	7.3	14.1
EL	123	100	23.4	12.4	35.3	9.5	19.5
ES	1 272	100	25.4	13.5	26.4	12.9	21.7
FR	9 168	100	22.7	10.9	36.7	13.9	15.8
IT	4 992	100	21.5	16.2	27.4	13.5	21.4
CY	12	100	15.0	12.0	25.9	26.5	20.7
LV	14	100	33.3	13.8	11.1	7.7	34.1
LT	20	100	18.4	5.1	58.7	7.7	10.0
LU	90	100	14.8	16.3	22.9	21.2	24.8
HU	192	100	35.6	8.9	30.3	9.5	15.8
MT	3	100	11.2	10.6	43.3	21.5	13.5
NL	3 941	100	19.9	10.2	47.8	7.3	14.8
AT	1 576	100	19.1	14.5	32.1	13.0	21.4
PL	160	100	22.7	13.6	29.5	10.8	23.4
PT	78	100	28.2	10.4	27.2	15.8	18.5
RO	25	100	23.2	15.6	33.1	10.8	17.2
SI	101	100	32.1	10.2	29.2	10.7	17.8
SK	44	100	26.8	10.3	28.9	12.2	21.8
FI	1 580	100	15.1	11.0	53.3	8.1	12.5
SE	2 540	100	18.6	12.0	40.5	13.7	15.2
UK	7 184	100	26.6	10.4	37.1	9.7	16.1
HR	81	100	39.5	7.6	24.8	11.5	16.7
TR	133	100	21.1	20.0	30.0	11.7	17.3
CH	3 103	100	25.6	13.0	34.0	9.3	18.1
IS	43	100	31.2	12.6	37.4	5.1	13.9
LI	25	100	17.5	15.9	28.1	17.6	20.8
NO	533	100	21.7	16.0	31.9	11.3	19.0
AU	1 948	100	25.3	12.1	33.1	9.4	20.1
CA	2 721	100	25.2	9.6	41.0	9.7	14.5
CN	1 891	100	22.3	8.7	47.4	8.0	13.6
IL	1 583	100	28.0	6.7	47.5	6.1	11.8
IN	999	100	60.1	3.9	18.8	3.3	13.8
JP	27 934	100	20.5	9.3	46.0	11.1	13.1
KR	5 390	100	15.3	10.1	54.9	7.8	11.9
RU	640	100	26.5	11.6	32.9	10.8	18.2
SG	413	100	18.1	7.1	56.5	6.6	11.7
TW	572	100	16.4	10.8	39.7	12.9	20.2
US	48 556	100	27.9	8.1	42.7	7.5	13.8

Source: Eurostat, patent statistics

Some EU countries surpassed even 45% of all national patent applications in the subsection 'Manufacture of electrical and optical equipment' (DL). These are Estonia (46.5%), Ireland (47.9%), Lithuania (58.7%), the Netherlands (47.8%) and Finland (53.3%).

India was, with 60.1% of patent applications in the subsection 'Manufacture of chemicals, chemical products and man-made fibre' (DG), very active in patenting.

Most non-EU countries active in patenting had percentages close to 50% in the subsection 'Manufacture of electrical and optical equipment' (DL). The highest percentages can be found in China (47.4%), Israel (47.5%), Japan (46.0%), South Korea (54.9%) and Singapore (56.5%).

Slight downward trend in foreign ownership of patent applications

Figure 7 shows the situation of foreign ownership of domestic inventions in 1998 and 2003 and the annual average growth rates for EU Member States, candidate countries, Japan and the United States.

Taking the EU-25 as a whole, the percentage of foreign ownership of national patent applications amounts to less than 15%. The figures are, however, very heterogeneous between countries.

The six countries with high percentages of foreign ownership of national patents (over 50%) were either small countries such as Luxembourg or new Member States such as Slovakia, or both, such as Estonia. In Lithuania, in 1998 all domestic inventions were carried out in collaboration with foreign inventors. For all six countries the annual average growth rates are negative, which shows a decreasing trend in international cooperation in patenting in smaller economies.

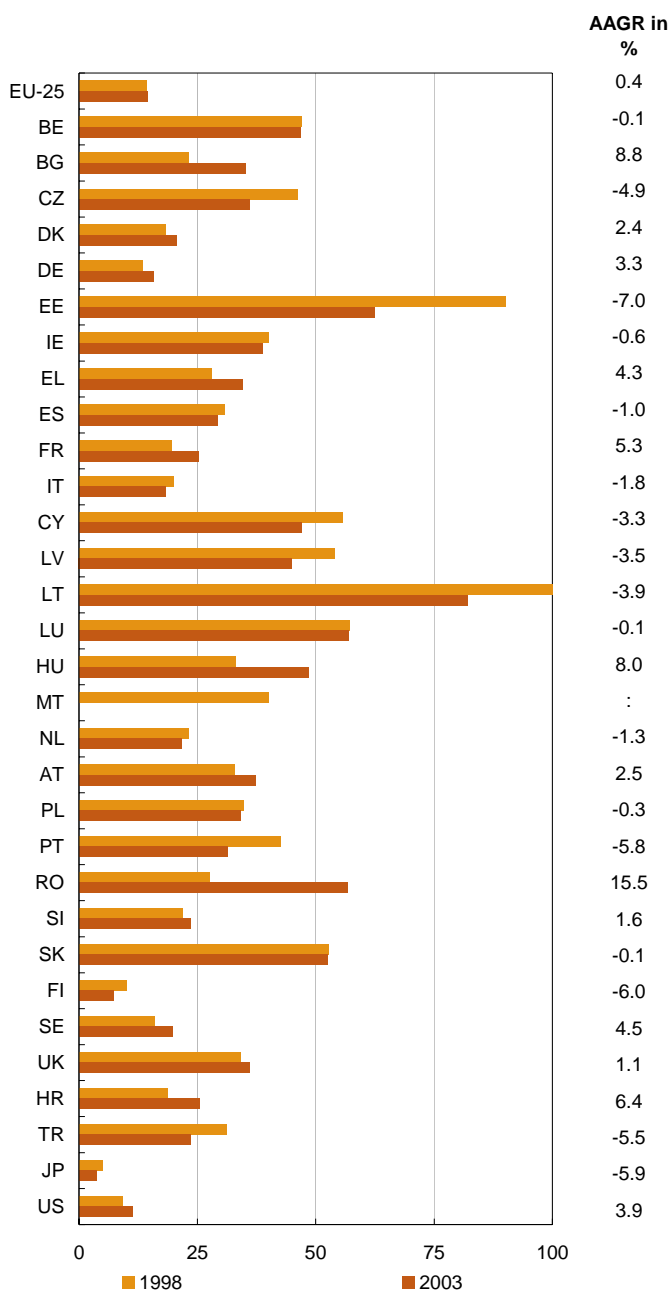
In 1998, Finland was, with 10%, the EU Member State with the lowest share of domestic inventions with foreign ownership. This share fell in 2003 to only 7.3%. Another EU country with a low share of domestic inventions with foreign ownership is Germany. But there the trend was increasing (1998: 13.3%, 2003: 15.7%).

In the newest Member States, Bulgaria and Romania, the trend for more international cooperation in patenting was also growing as shown by the AAGR of 8.8% and 15.5% respectively.

In Japan, foreign ownership of domestic inventions plays a very minor role. In 1998, only 5.0% of domestic inventions involved foreigners. This share fell to 3.7% in 2003.

In the United States, 9.3% of domestic inventions benefited in 1998 from the input of inventors abroad. The share increased in the following five years to 11.2%.

Figure 7: Foreign ownership of domestic inventions in patent applications to the EPO by country, for the priority years 1998, 2003, as a percentage of total and AAGR



Source: Eurostat, patent statistics

➤ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

The production of patent statistics at Eurostat was reorganised in 2005. This means that the data shown in this Statistics in Focus publication and on the Eurostat webpage are no longer entirely comparable with the data published previously.

In 2005, only a single raw database – mainly compiled on the basis of input from the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japanese Patent Office (JPO) – was used to produce an extended set of tables and indicators on the Eurostat webpage. This will also be done in the years to come. The aggregated patent statistics are produced on a raw data set delivered by the OECD. This raw data set will be replaced by PATSTAT for the next data productions.

Since 2005, Eurostat has produced patent statistics using the priority year of the application, and not the year of filing as previously. The data values are, however, similar. These data are in general less extensive than the data released by Eurostat before 2005. This is because all PCT applications filed to the EPO (i.e. applications made in accordance with the procedure under the Patent Cooperation Treaty) are taken into consideration by Eurostat whereas the OECD datasets do so only in part. The data produced provide a better reflection of the innovation and R&D performance of an economy.

Counting patents with multiple inventors

Where a patent lists several inventors from different countries, the respective contributions from each country are taken into account. This is done in order to eliminate multiple counting of such patents. For example, a patent that lists the applicants as 1 French, 1 American and 2 German residents will be counted as 1/4 of a patent for France, 1/4 for the USA and 1/2 for Germany. The method is called fractional counting.

Counting patents with multiple IPC codes

When several IPC codes are attributed to a patent, only the main IPC code is used for counting. In this database the first-mentioned IPC code is considered to be the main IPC code.

Since 2004 the interinstitutional Patent Statistics Task Force has developed the concept of a worldwide patent statistics database (PATSTAT). PATSTAT has to be understood as a single patent statistics raw database, held by the European Patent Office (EPO) and developed in cooperation with the World Intellectual Property Organisation (WIPO), the OECD and Eurostat. PATSTAT should fulfil the user needs of the various international organisations which will use this raw database for production. Designed to be sustainable over time, PATSTAT will become operational in 2006 and will concentrate on raw data, leaving the indicator production mainly to PATSTAT users such as the OECD, Eurostat and others.

For all further details, please see the Eurostat metadata on patent statistics posted on the webpage.

1. Biotechnology sector

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

2. 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.

3. ICT sector groups in accordance with the International Patent Classification (IPC)

Telecommunications
Consumer electronics
Computers, office machinery
Other ICT

4. NACE sector codes

The IPC-NACE concordance table created by the Fraunhofer Institute for Systems and Innovation Research in Karlsruhe (Germany) links the IPC codes to the following NACE sections.

DA	Manufacture of food products, beverages and tobacco
DB	Manufacture of textiles and textile products
DC	Manufacture of leather and leather products
DD	Manufacture of wood and wood products
DE	Manufacture of pulp, paper and paper products; publishing and printing
DF	Manufacture of coke, refined petroleum products and nuclear fuel
DG	Manufacture of chemicals, chemical products and man-made fibres
DH	Manufacture of rubber and plastic products
DI	Manufacture of other non-metallic mineral products
DJ	Manufacture of basic metals and fabricated metal products
DK	Manufacture of machinery and equipment not elsewhere classified
DL	Manufacture of electrical and optical equipment
DM	Manufacture of transport equipment
DN	Manufacturing not elsewhere classified

5. Foreign ownership

Data on foreign ownership measure the number of patents invented within (or applied for by) a given country that involve at least one foreign applicant (or a foreign inventor).


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
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
Data presented in this Statistics in Focus reflect availability in Eurostat's reference database as at 3 November 2006.


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