Background paper

Financial standing and performance of European universities – an international data comparison

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Financial standing and performance of European universities – an international comparison

1. Introduction

- **Situation of statistical data**

The data situation for the financing and spending of individual universities in a comparable way is unfortunately very poor. In general this information might be available within the statistical offices of Member States, however, this data is not harmonized throughout the EU and certainly not collected at EU-level. Therefore, one has to estimate the financial situation primarily using macroeconomic data such as the share of higher education research expenditure (HERD) of governments R&D expenditure (GERD) or the percentage of GERD, performed by the higher education sector.

- **Higher education sector**

The higher education sector does not only contain 'universities'. Furthermore, what is statistically counted as a 'university' differs by country and international organisation. Therefore, the question, how many universities does a country host, is clearly a non-trivial one and sources differ. Using UNESCO data, it is possible to calculate for example the number of members in the 'International Association of Universities', but not every institution is a member. UNESCO covers in general as the higher education sector public and private universities, technical colleges, liberal art institutions, business schools etc.
What should be counted as 'research performing university' is a moot point that goes beyond this paper. However, one should bear in mind that the sector is relatively broad and a convenient denominator 'number of universities per country' is less easy to compile.

- **Further structural data**
  - *Input data*

The financial situation of universities goes certainly hand in hand with available human resources – in particular researchers, but equally the teaching burden (nr. of students enrolled) can be used as proxy variables.

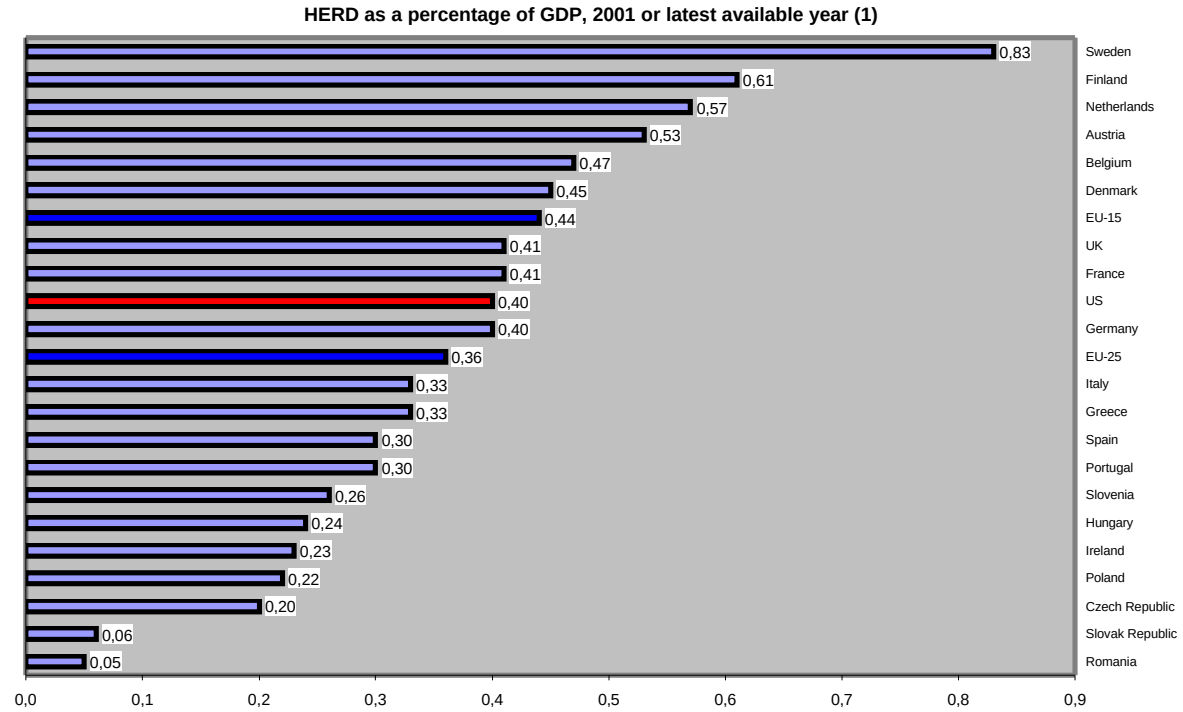
  - *Output data*

Data that could determine a research intensive university like the number of Ph.D's awarded or the number of publications or citations is not available for all universities in all Member States. In fact, this data is only available at country level. In terms of bibliometric data, there have been some attempts to determine the top 100 European universities measured by publication output and impact by scientific field; however, these attempts include country quotas.

- **Missing country data**

A number of Acceding countries are not yet Members of the OECD, of which most data has been used (MSTI, BSTI-databases). Therefore, data for Estonia, Latvia, Lithuania and Malta are not included in most data analysis. Despite the fact that Luxembourg is a member and data is often available, Luxembourg has been left out due to the very low numbers and levels.

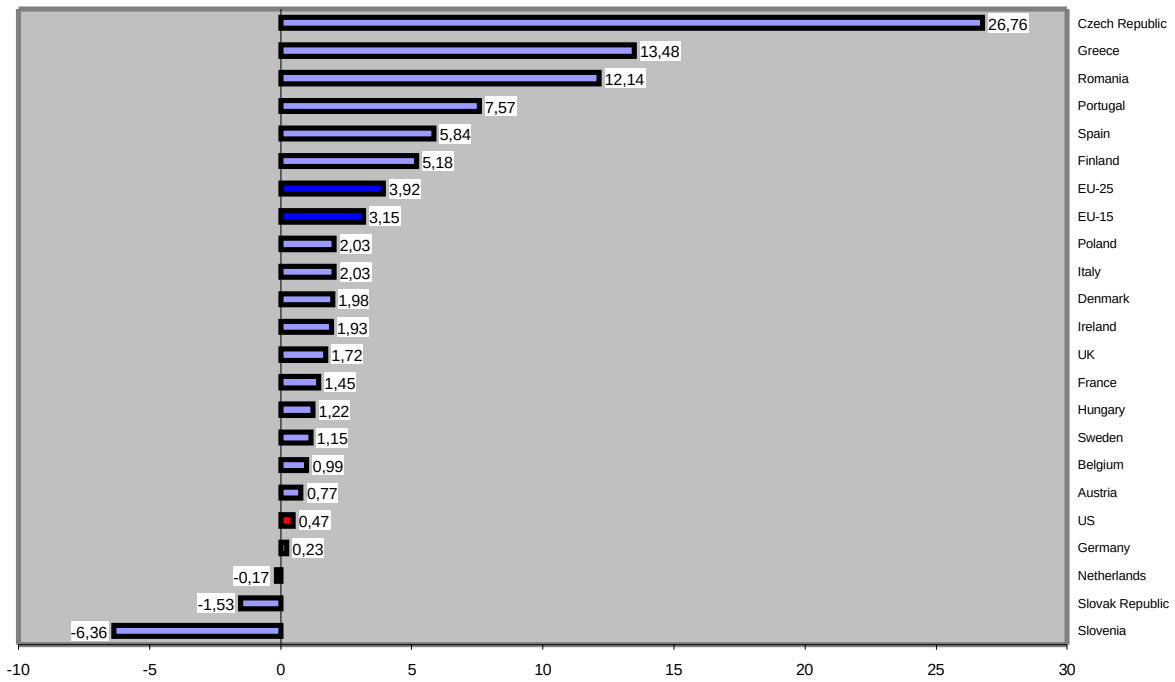
2. Macroeconomic data on the financing of the higher education sector



Source: DG-Research
Data: OECD
Note: (1) AT: 1998, BE, EL: 1999; DK, IE, IT, NL: 2000

- Higher education expenditure in R&D (HERD) as percentage of the gross domestic product (GDP) gives the intensity of the part of a country's R&D investment in the higher education sector.
- Compared to the R&D intensity GERD as percentage of GDP, there are slight changes in position, however, the trends remain similar (see KF 2003-2004, p.22 f).
- EU-15 average is with 0.44 slightly higher than EU-25 average (0.36). The US' share is with 0.41% slightly below EU-15 average.
- In relative terms Sweden and Finland spent the highest percentage of HERD on GDP (above 0.60%), while the smallest share is spent in the Slovakia and Romania (below 0.01%).
- Southern European Member States (MS) (IT, PT, EL, ES) as well as Ireland spend below EU-15 as well as EU-25 average, the large MS (DE, UK, FR) are placed between the two averages. Slovenia and Hungary spend shares roughly as high as Portugal or Ireland.

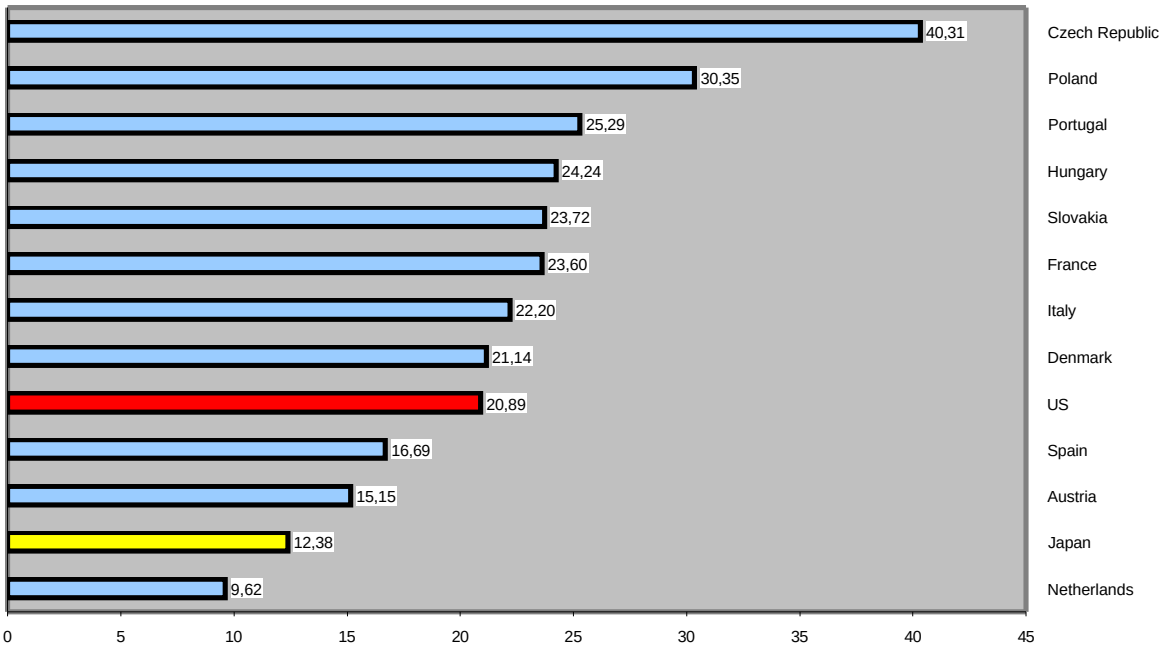
Growth of share HERD as percentage of GDP, 1990 to latest available year (1)



Source: DG-Research
Data: OECD
Note: (1) DK, HU, IE, IT, NL: 1990-2000; FI, FR, DE, PT, SK, ES, UK, US: 1990-2001; BE, EL: 1991-1999; CZ, SE: 1991-2001; AT: 1993-1998; SI, RO: 1993-2001; PL: 1994-2001

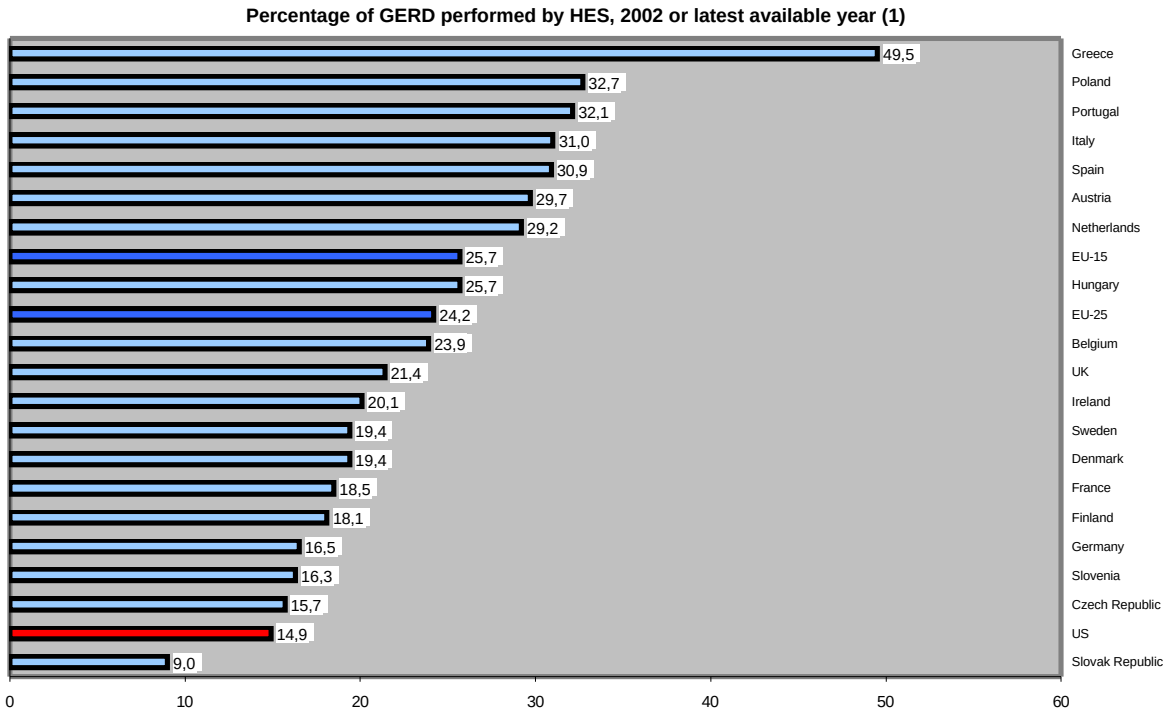
- EU-15 and EU-25 averages are fairly equal with 3.9 and 3.1 respectively. The US's growth rate is relatively small with 0.47%.
- In terms of growth rates, one of the in relative terms smallest spender, the Czech Republic, shows by far the highest growth rate (26.7%), followed by the southern MS Greece, Portugal and Spain, the Candidate country Romania and more surprisingly, Finland. While for the former larger growth rates can be expected, Finland is already on a high level but apparently still increasing its HERD on GDP share.
- Negative growth was recorded for the Netherlands, but also Slovakia and Slovenia.

Domestic expenditure on basic research as % of GERD, 2001 or latest available year



Source: DG-Research
Data: OECD
Note: (1) NL: 1995; IT: 1996; PT: 1997; AT: 1998; DK: 1999; JP, US, FR, HU: 2000

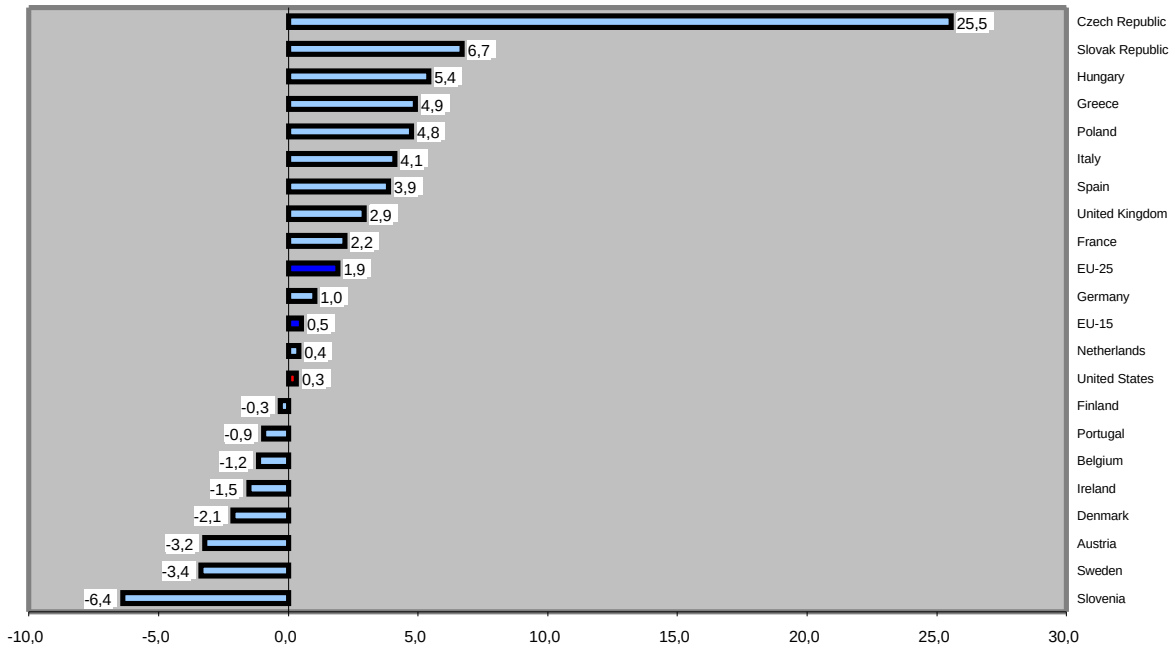
- Note that data is only available for a very limited number of countries as the distinction between basic and applied research is not always followed in the same way in all statistical offices in all countries observed. Due to different interpretation and blurred boundaries of the definitions on basic, oriented, and applied research by statistical offices, these figures have to be interpreted with caution.
- In terms of basic research, several former eastern bloc countries still hold high shares in basic research.
- While less than 10% are spent on basic research in the Netherlands, 40% are spent in the Czech Republic.
- Countries relying heavily on universities as prime innovator (e.g., the southern European Member States), show high shares of basic research - as can be expected.



Source: DG-Research
Data: OECD
Note: (1) DK, BE, PT, EL: 1999; IE, HU, AT: 2000; SK, FI, FR, SE, UK, NL, IT, PL: 2001

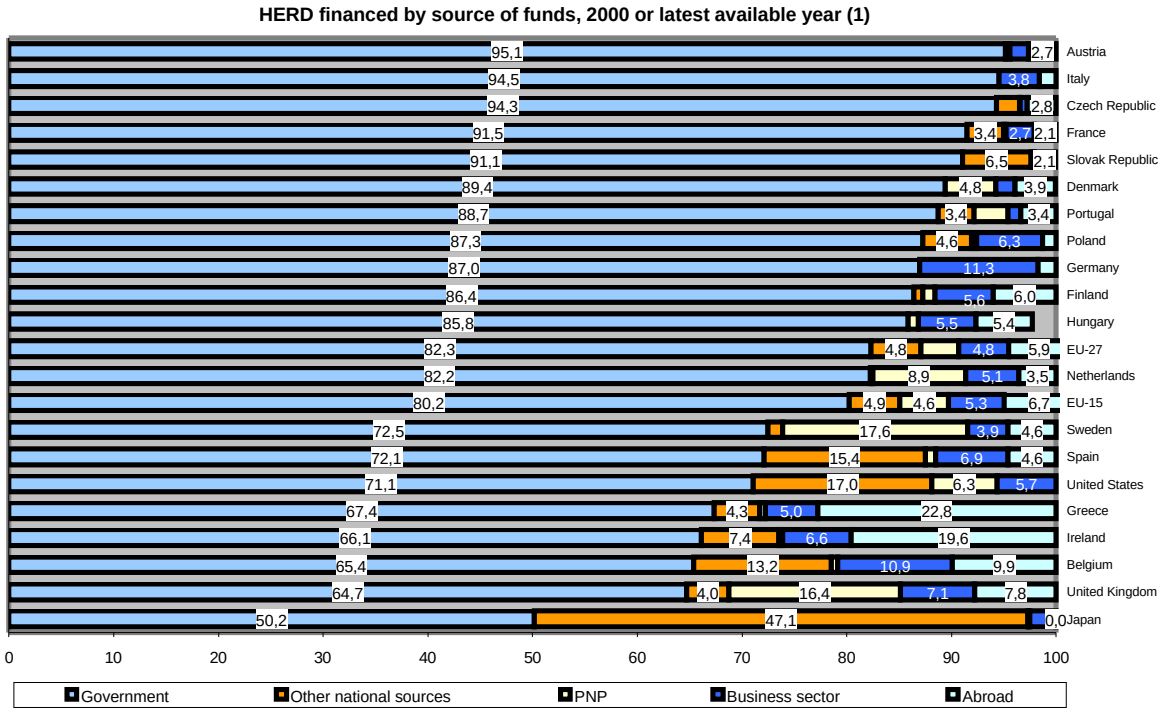
- The Higher education sector acts also as performer of public R&D investment. The percentage of GERD performed by the Higher education sector shows to what extend public investment is performed in this sector.
- EU-15 average is with 25.7% slightly above the EU-25 average of 24.2%. The US higher education sector performs only about 15% of government R&D expenditure.
- In terms of GERD performed by the higher education sector, the southern European MS and Poland have the highest shares with over 30%. Beside Poland, these MS devote only below EU-average financial means of higher education expenditure.
- The lowest shares are found in the Slovenia, the Czech and Slovac Republics and the US. This might be linked to an extensive public research institute sector as main performer of GERD in those countries with the smaller shares. In fact, if the performance of public sector research institutes would be compared, the graph would be mirrored having the countries on the lower scale on top and vice versa.

Growth of share of GERD performed by HES, 1990 to latest available year (1)



Source: DG-Research
Data: OECD
Note: (1) DK: 1990-1999; IE, NL: 1990-2000; FI, UK, IT, HU: 1990-2001; PT, US, DE, FR, ES: 1990-2002; BE, EL; 1991-1999; SE, CZ: 1991-2001; AT: 1993-1998; SI: 1993-2001; PL: 1994-2001

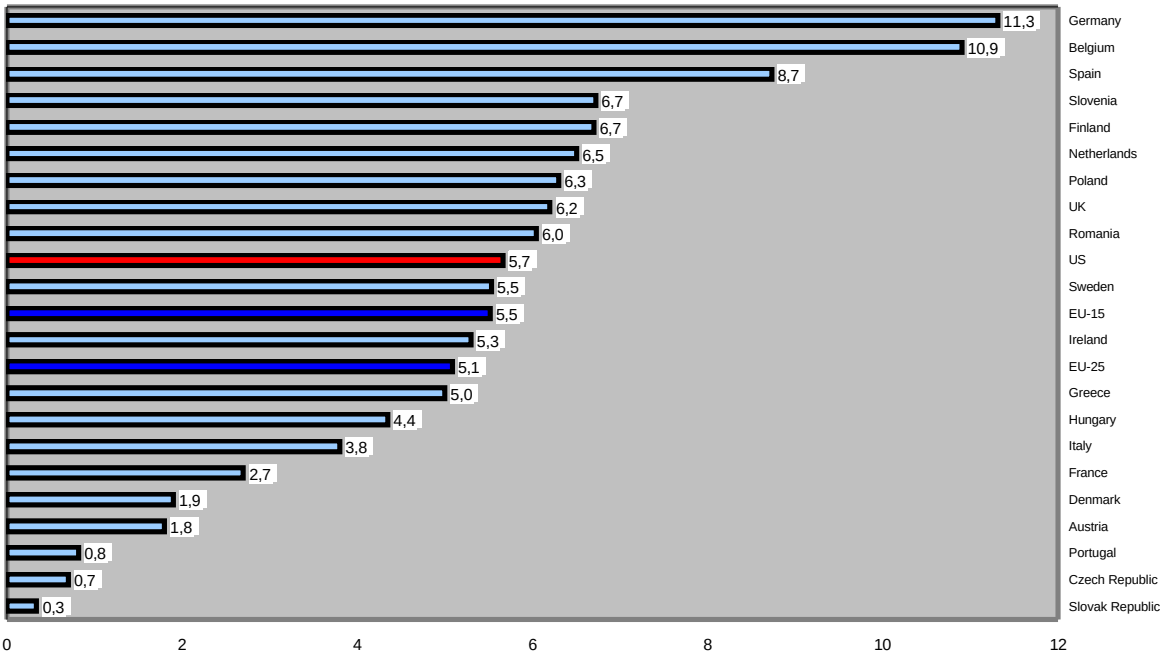
- The EU-25 average is with 1.9 % higher than the EU-25 average (0.3%), signalling a catching up of former eastern countries. The US showed a slight positive growth of 0.3%.
- In terms of growth the Czech Republic shows the highest growth rates with over 25%.
- A number of smaller European countries have experienced a negative growth in terms of performance of the higher education sector ranging from -0.3% in Finland to -6.4% in Slovenia.



Source: DG-Research
Data: OECD
Note: (1) IT: 1996, AT: 1998; BE, IE, EL, SE, NL, PT: 1999, US, DE, PL, SK, CZ: 2001

- In terms of funding, in all countries the biggest part of higher education financing is done by the government ranging from 50% in Japan to 95% in Austria.
- The EU-15 average of the government's share of financing is 80%, the EU-25 average slightly higher with 82%.
- In terms of other national sources, Japan dominates with 47%, while this source is of lesser importance in all other countries. However, in Belgium, Spain and the US, where regional or state governments add funding, this source is important.
- When it comes to funding by the public non profit sector, the UK receives about 16% and Sweden about 17% from this sector. In all other countries it is less important. The European average is 4.6%
- The business sector is an important source of financing especially in Germany and Belgium, where over 10% are funded from this sector (see next figure).

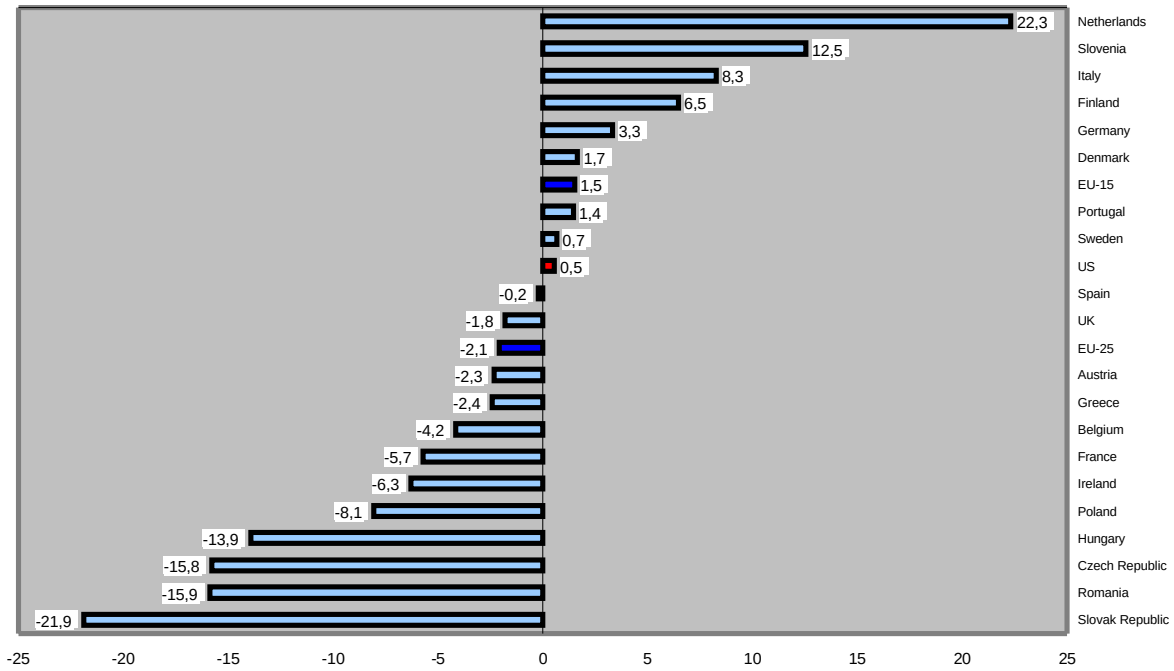
Percentage of HERD financed by industry, 2001 or latest available year (1)



Source: DG-Research
Data: OECD
Note: (1) IT: 1996; AT: 1998; BE, EL: 1999; DK, IE, FR, NL: 2000

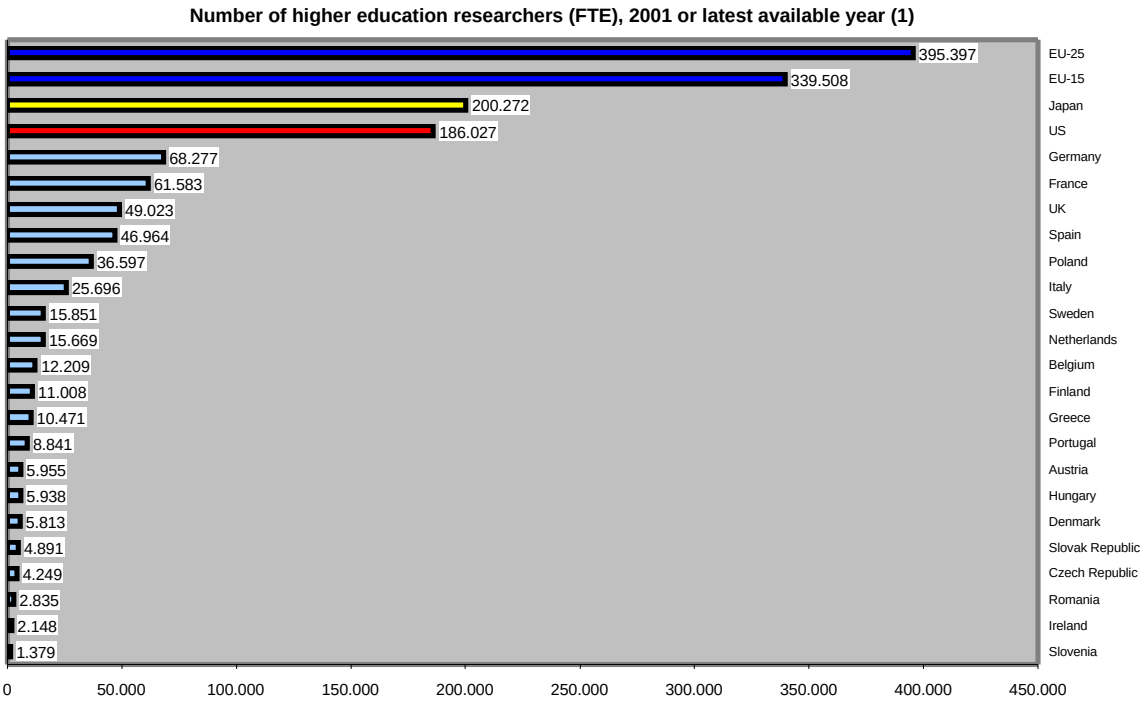
- The percentage of the Higher education sector's financing coming from industry is often associated with an existing knowledge transfer.
- The US share of business spending is with 5.7% only slightly above the EU-15 average of 5.5%. Also the EU-25 average is relatively close with 5.1%.
- There is a wide variance between the several countries observed, ranging from Germany with a share of 11.3% down to Portugal, the Czech and Slovak Republics that receive less than 1% of their monies from industry.

Growth of share HERD fianced by industry, 1990 to latest available year (1)



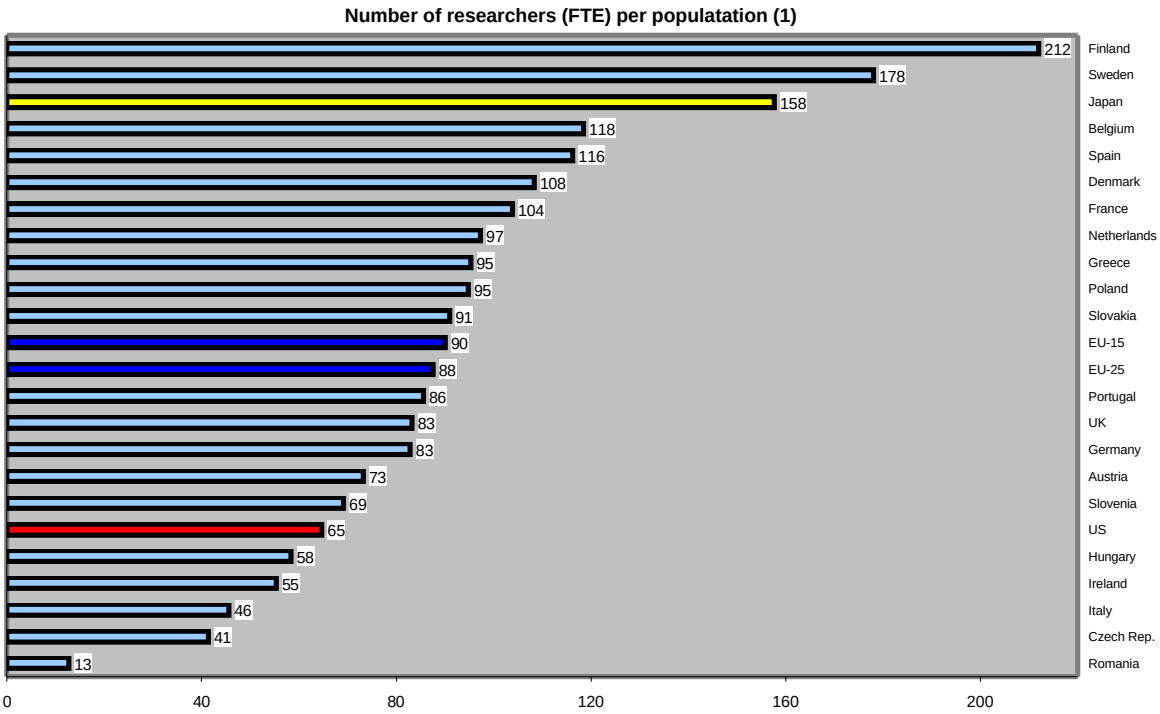
Source: DG-Research
Data: OECD
Note: (1) SE: 1990-1996; FI, SK, US: 1990-2000; SI, PT, IT, NL, IE, HU, DK, AT: 1990-2001; DE, FR: 11991-1999; ES, PL: 1991-2001; EL: 1993-1998; UK, RO, BE: 1993-2001; CZ: 1995-2001

- The EU-15 growth rate is with 1.5% far above the US one with 0.5%. However, the enlarged EU-27 accounts for a negative growth of 0.2% reflecting that quite a substantial number of countries have recorded negative growth rates, offsetting the positive trend of the present MS.
- In terms of growth rate, the Netherlands recorded the highest growth with more than 22%. This may compensate the decreases in government spending on the higher education sector.
- A number of Acceding countries have recorded negative growth rates in the two-digit level. This explains partly the small shares of the Czech and Slovak Republics.



Source: DG-Research
Data: OECD
Note: (1) AT, UK: 1998; BE, EL, US: 1999; IE, DK, IT, FR, NL: 2000

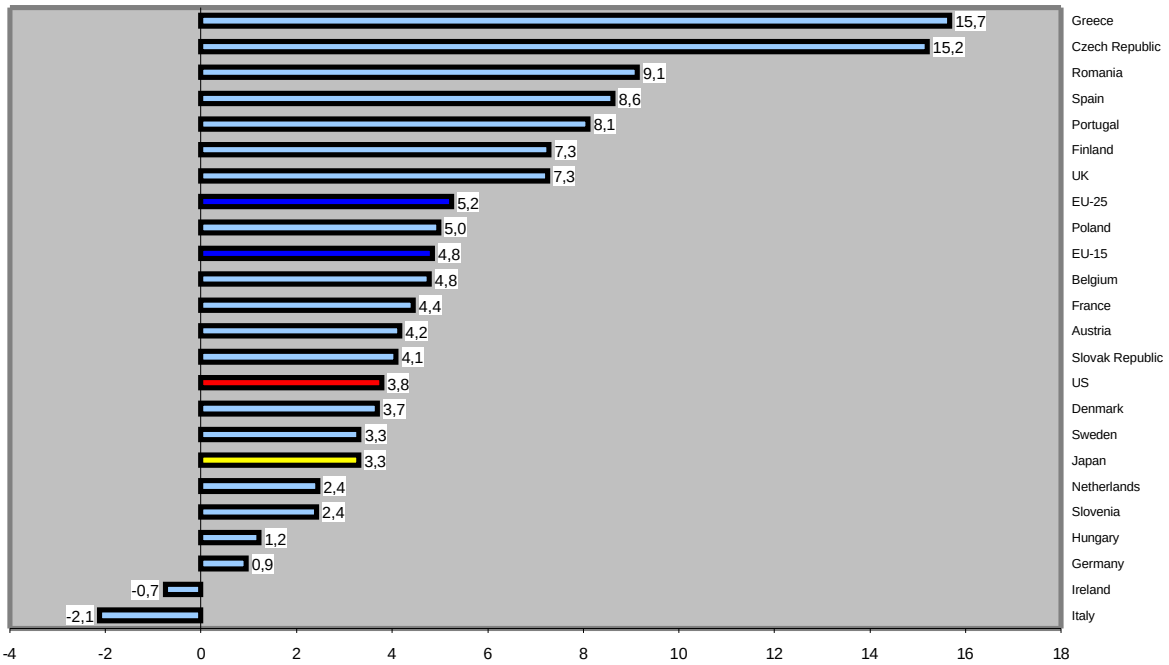
- In absolute terms, about 55.000 researchers will be added, when the EU-15 gets enlarged. Then, in terms of full-time equivalents (FTE), the EU-25 will possess the highest number of researchers with 396.000, followed by 200.000 in Japan and 186.000 in the US.
- The number of researchers correlates widely with the size of population: while Germany has about 68.000 researchers, Slovenia has only about 1.400. However, in terms of researchers by population, the picture is different (see next figure).



Source: DG-Research
Data: OECD
Note: (1) in 000. Population: 2002. Researchers: 2001. AT, UK: 1998; BE, EL, US: 1999; IE, DK, IT, FR, NL: 2000

- The EU-15 average is with 90 researchers per 1.00 population slightly above the 88 researchers in the EU-25. The US is with 65 researchers per population among the lower ratios.
- Finland and Sweden have per capita the highest number of researchers with 212 and 178 respectively followed by Japan with 158.
- From the present EU Member States, Italy has the lowest ratio with only 46, from the Acceding countries, the Czech Republic comes lowest with 41.

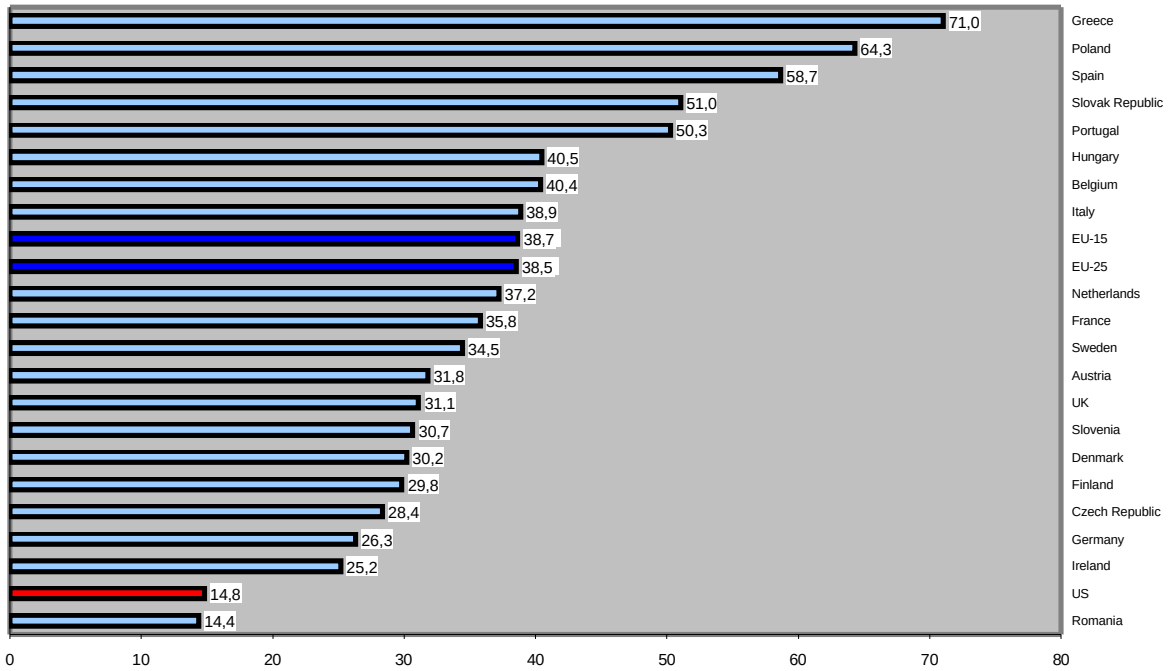
Growth of number of higher education researchers (FTE); 1990 to latest availbale year (1)



Source: DG-Research
Data: OECD
Note: (1) UK: 1990-1998; DK, FR, IE, IT, NL, HU, PT: 1990-2001; BE, EL, US: 1991-1999; FI, DE, SE: 1991-2001; AT; 1993-1998; RO, SI: 1993-2001; PL, SK: 1994-2001

- The EU-15 average growth is with 4.8% lower then the EU-25 ones with 5.2%. Japan recorded a growth of 3.3% while the US managed 3.8%.
- While Italy and Ireland are the only countries recording negative growth rates, Hungary and Slovenia, countries with low levels of researchers per capita remain equally low in terms of growth rates. Contrary to that, the low level Czech Republic and Romania show very high growth rates that are only surpassed by Greece (15.7%). Spain, Portugal, but also Finland and the UK show above EU-25 average growth rates.

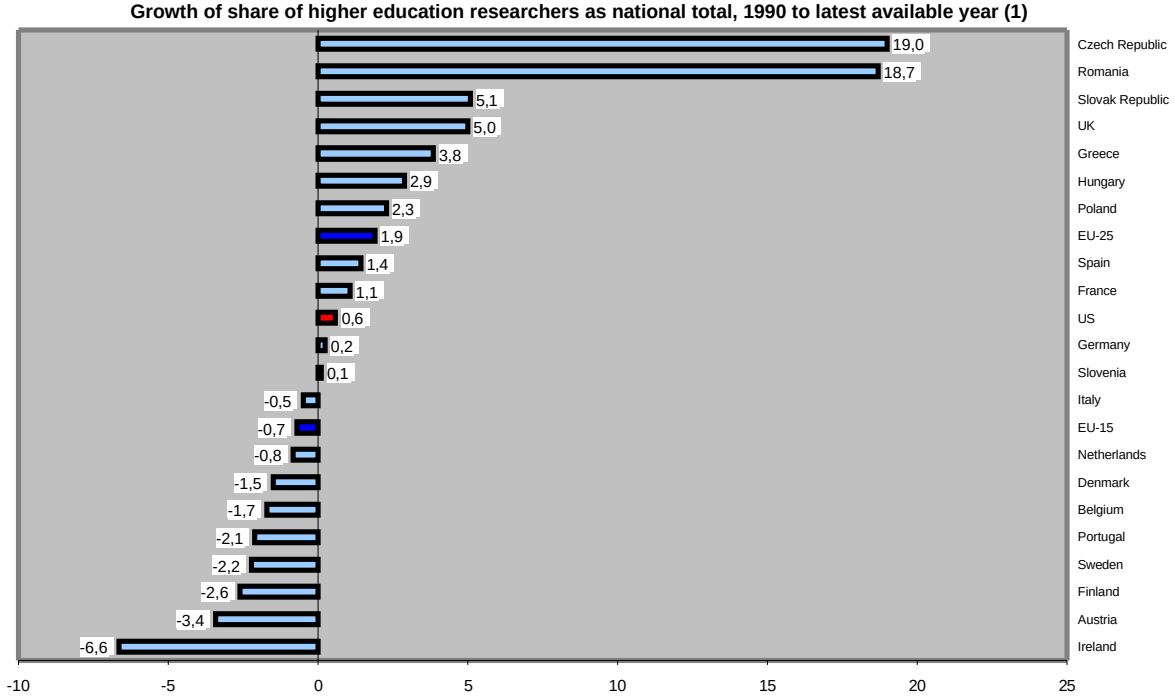
Higher education researchers as share of national total, 2001 or latest available year (1)



Source: DG-Research
Data: OECD
Note: (1) AT, UK: 1998; DK, BE, EL, US: 1999; IE, FR, IT, NL: 2000

- The share of Higher education researchers on the national total is another indicator showing the relative importance of the sector for a given country.
- With almost 39% as European average, a substantial amount of researchers is working in the higher education sector. This is in sharp contrast to the US, where only about 15% of researchers are working in this sector.
- The importance of the sector is once again indicated with these figures for the Southern European Member States where the number of researchers is above the EU-15 and EU-25 averages.

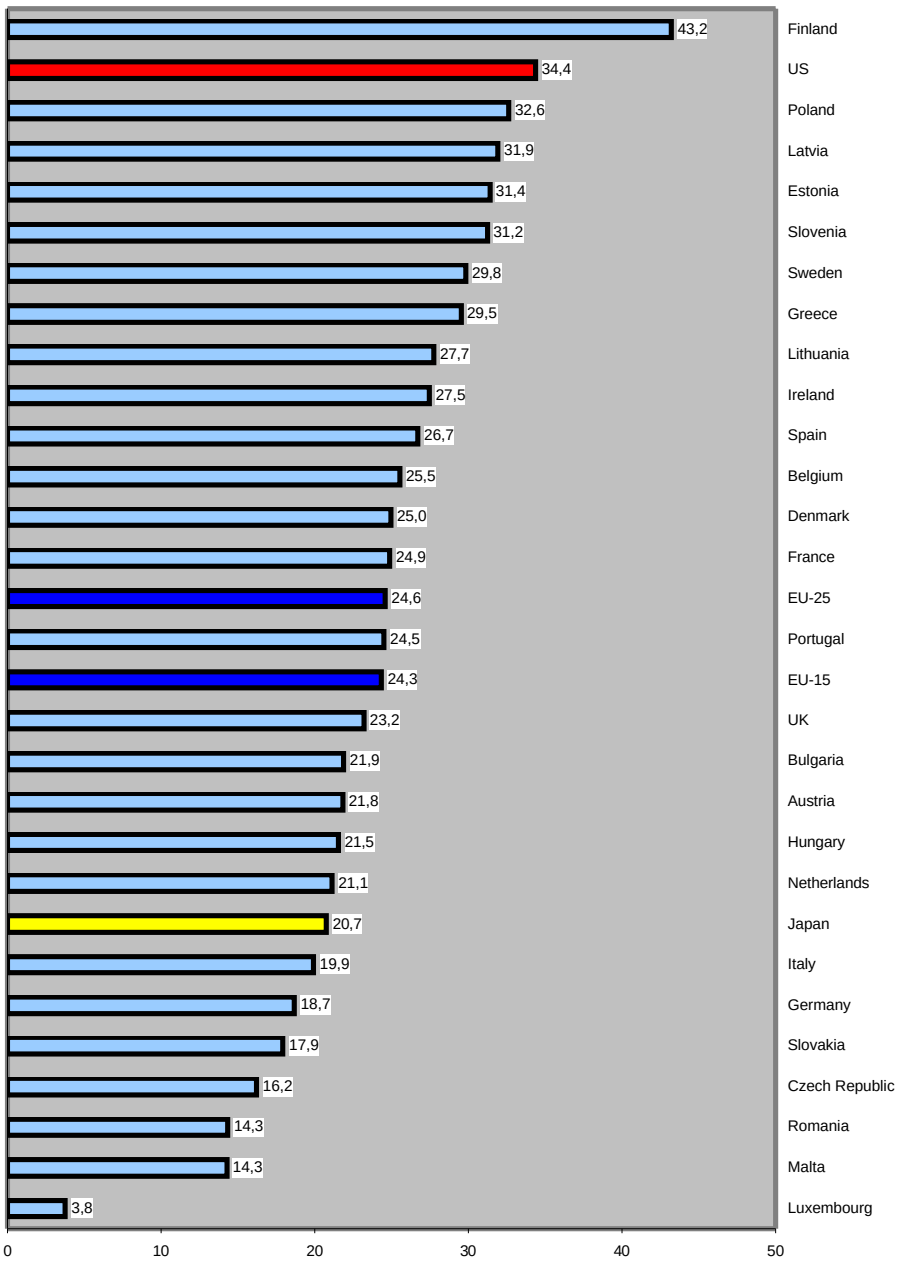
Growth of share of higher education researchers as national total, 1990 to latest available year (1)



Source: DG-Research
Data: OECD
Note: (1) UK: 1990-1998; DK: 1990-1999; IE, IT FR: 1990-2000; PT, ES, HU: 1990-2001; BE, EL, US: 1991-1999; FI, SE, DE: 1991-2001; CZ: 1992-2001; AT: 1993-1998; NL: 1993-2000; SO, RO: 1993-2001; PL, SK: 1994-2001

- In terms of growth of share, a contrast between the EU-15 and EU-25 can be observed: While the EU-25 obtains a growth rate of 1.9%, the EU-15 records a negative growth of 0.7%. This mirrors the sharper increases in the Acceding countries which might be due to the fact of institutional changes of the Academy of Sciences.
- The US has a small growth with 0.6%.

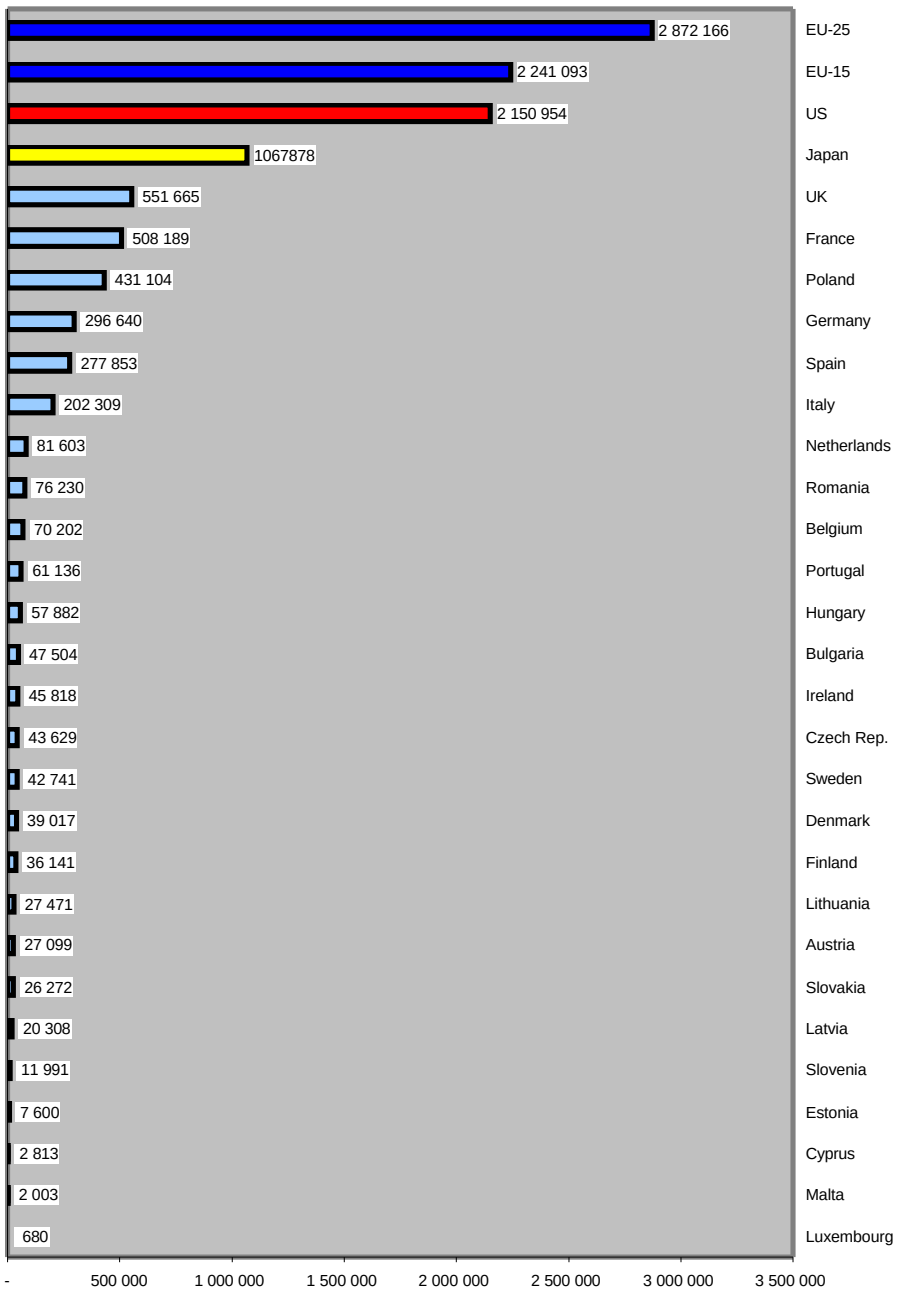
Enrolment of tertiary students (ISCED 5 and 6) as share of young population (age 25-34) 2000/2001



Source: DG-Research
Data: UNESCO, Eurostat
Note: (1) DE: 1998/99

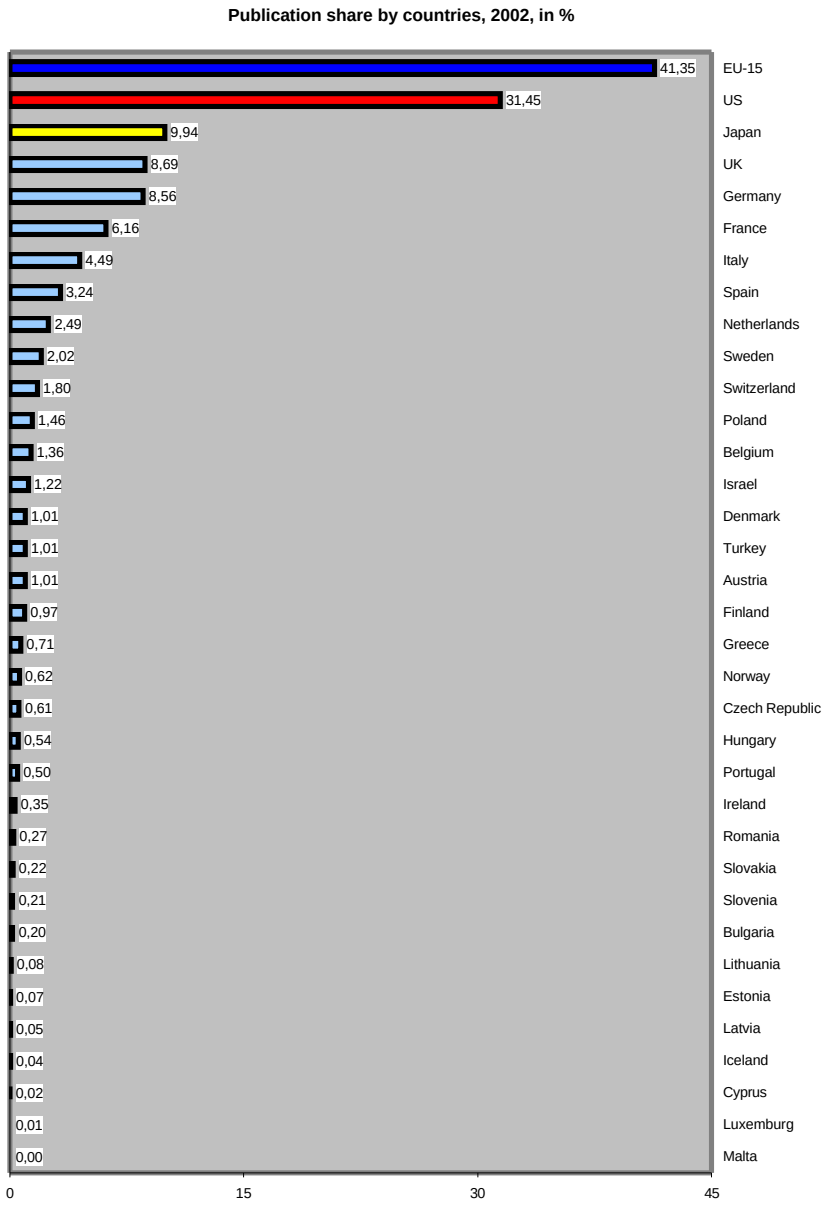
- Compared to the US, where almost 35% of the young population aged between 35 and 34 is enrolled in a tertiary program, the EU figures are ten percentage points lower. The US is certainly benefiting from large shares of foreign, in particular Asian students.
- In Europe, Finland is having the highest share of its young population enrolled in university education, the lowest share is recorded for Luxembourg (which does not have a full university system), and Malta. While in Japan most students are already graduated by the age of 25, Germany offers with its dual education system an alternative for university education.

Number of university graduates (ISCED 5 and 6), 2001 (1)



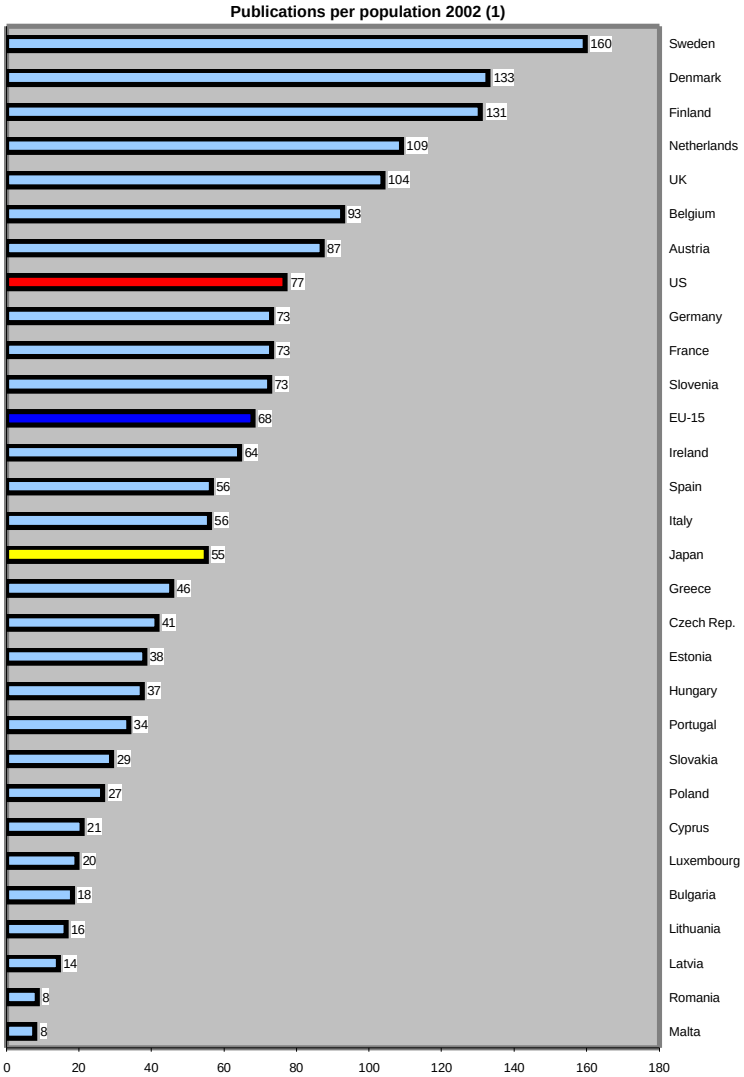
Source: DG-Research
Data: UNESCO, Eurostat
Note: (1) DK, FR, IT, LU, FI, CY, HU: 2000

- While the enlarged European Union counts for 2.8 Million university graduates in 2001, the US market graduated 2.1 Million. Japan manages a million graduates.
- The smaller the country, the lower the graduation data, however, not Germany, the largest country in terms of population is on top rather then the UK, France and Poland are ranging in front of it. Luxembourg, with no university so far, has the lowest number of graduates.



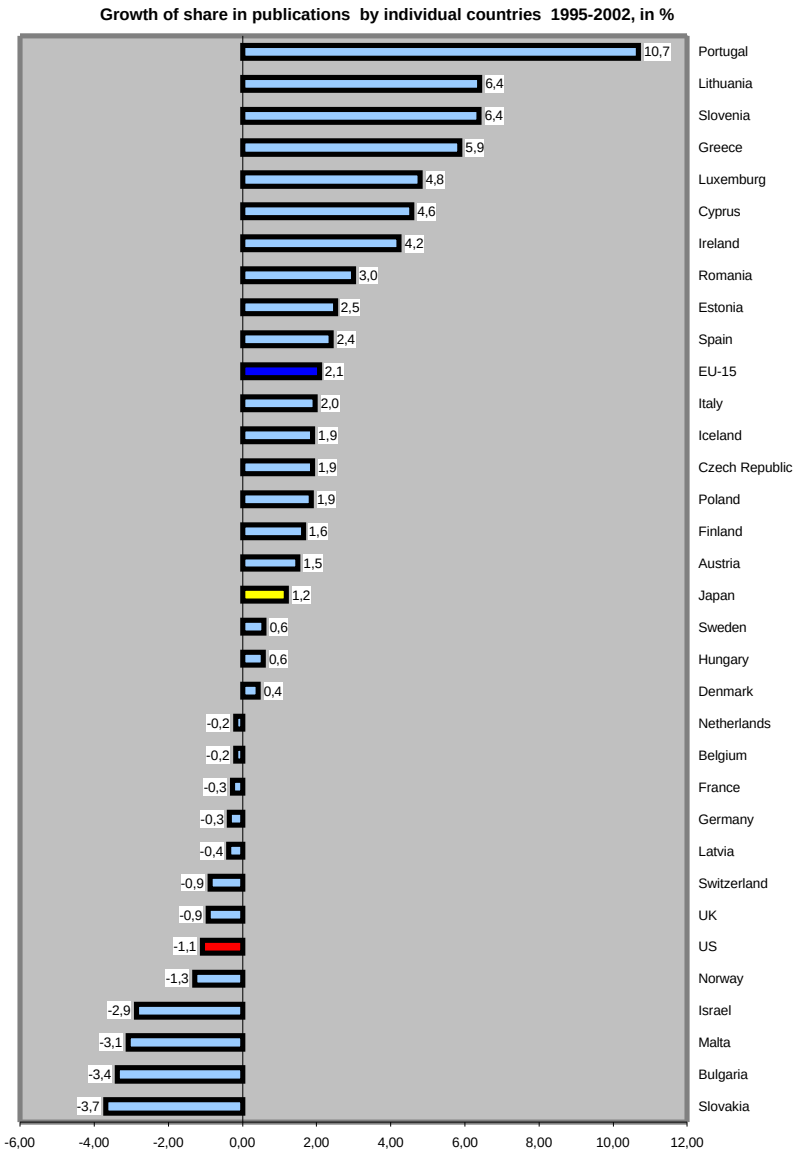
Source: DG-Research
Data: ISI, CWTS (treatments)

- The EU-15 has with 41% the highest share, followed by the US with 30% and Japan with almost 10%.
- Despite the fact of a language bias, national specialisation profiles and differing publication behaviour, as a single country, the US has the highest publication share with more than 30%. The second largest publishing countries are Japan (10%), the UK (8.7%) and Germany (8.6%). The smaller and smallest countries publish in absolute terms considerably less.



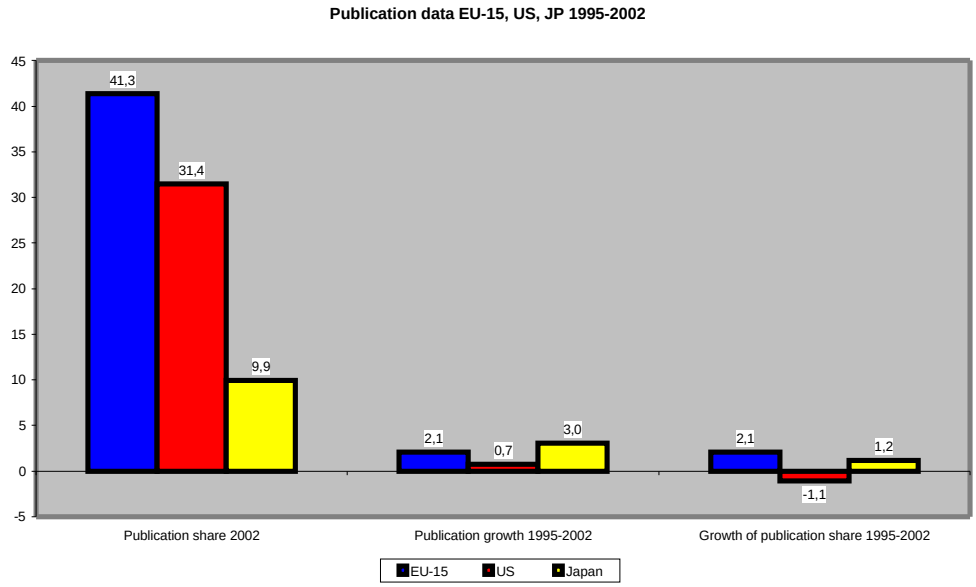
Source: DG-Research
Data: ISI, CWTS (treatments)
Note: Population per 000

- Comparing the EU-15, US and Japan in terms of publications per 1.000 population, the US leads with 77, followed by the EU-15 with 68 and Japan with 55 publications.
- Most of the countries below EU-15 average are either very small or they 'suffer' from being relatively unimportant contributors to the underlying US-American based database. This is in particular the case for the former Eastern bloc countries – with notable exceptions like Slovenia, who despite the fact of belonging to the very small countries, has a high share of international co-publications that help it to move above EU-average.



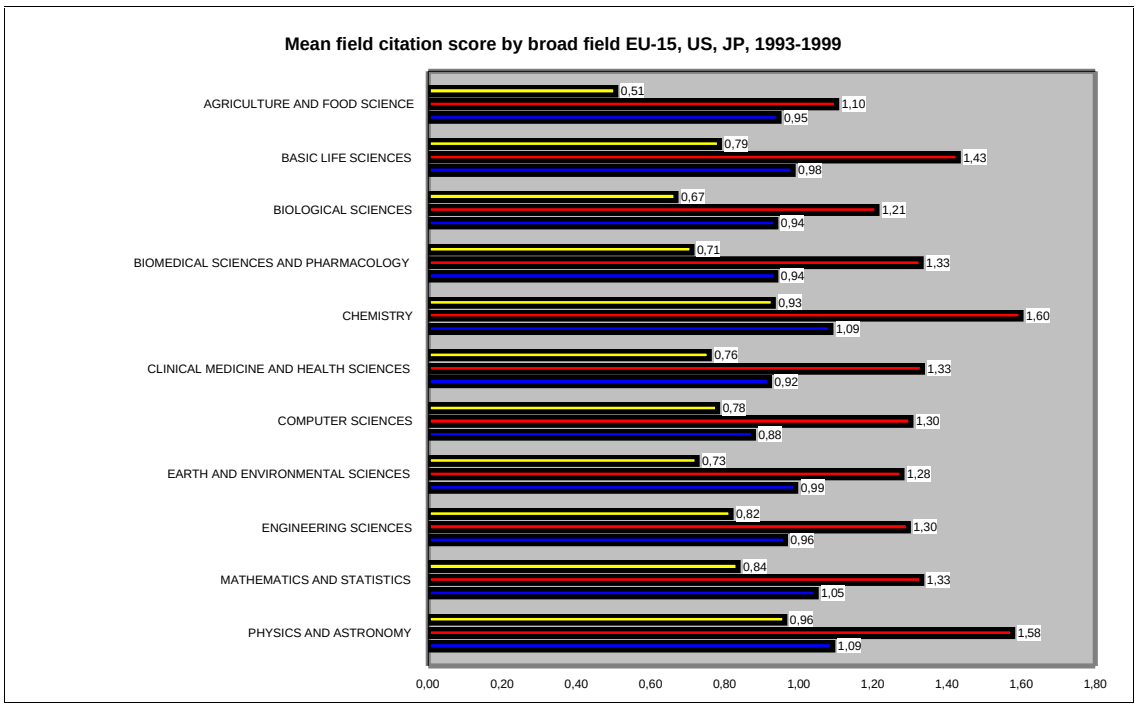
Source: DG-Research
Data: ISI, CWTS (treatments)
Note: EU-25 average was not calculated.

- In terms of growth of share of publications, 13 countries – among those four of the largest producers – recorded negative growth rates while another 20 showed positive growth rates. Among the latter, Japan recorded a growth rate of 2.1%.
- Not surprisingly, mostly the smallest and small producers of scientific literature recorded positive growth rates.



Source: DG-Research
Data: ISI, CWTS (treatments)

- Comparing the publication shares, growth of share as well as real growth in terms of absolute numbers, the EU-15 has increased its shares as well as Japan. In terms of growth, Japan did fairly better than Europe. The US encountered a smaller publication growth and a slightly negative growth in its publication share.



Source: DG-Research
Data: ISI, CWTS (treatments)

- In terms of mean field citation score, the US is leading in all broad fields.
- While the US is dominating all fields with above world average scores[1] (>1.20), the EU-15 scores around world average (~0.80-1.20) while Japan scores in several fields slightly below world average.

[1] The world average is largely influenced by the sheer number of US publications. Therefore, it can be expected that the US is at least around world average or above.

	GDP		Population		Young population	
	in bn € 2002	av. Annual real growth (%) 1997-2002	in 1000 2002	av. annual growth (%) 1997-2002	in 1000 2002 (2)	av. annual growth (%) 1997-2002 (3)
Belgium	261	2,1	10310	0,27	1407	-1,79
Denmark	183	2,2	5368	0,35	768	-1,14
Germany	2108	1,5	82440	0,10	11171	-4,01
Greece	141	3,8	*10988*	0,94	1621	0,79
Spain	*694*	3,5	40409	0,55	6865	1,36
France	1521	2,7	*59344*	0,42	8166	-0,93
Ireland	*128*	8,3	*3883*	1,23	*609*	2,93
Italy	1258	1,8	*56332*	-0,40	*9104*	-0,41
Luxembourg	22	5,3	*444*	1,20	*68*	-0,54
Netherlands	444	2,6	16105	0,68	2386	-1,77
Austria	217	2,4	8139	0,18	1213	-2,80
Portugal	*129*	2,8	10336	0,52	1581	1,02
Finland	140	3,2	5195	0,24	647	-1,89
Sweden	255	3,1	8909	0,15	1200	-0,91
UK	1659	2,5	*58928*	0,01	*8915*	-1,29
EU-15	9161	2,4	377131	0,19	*55410*	-1,36
Cyprus	11	4,2	*706*	-0,98	103	-1,42
Czech Rep.	74	1,5	*10270*	-0,08	*1602*	2,71
Estonia	7	4,4	*1361*	-1,42	*184*	-2,65
Hungary	70	4,3	10175	-0,25	1535	2,94
Lithuania	15	4,5	*3476*	-1,28	*491*	-3,21
Latvia	9	5,7	2346	-1,11	322	-1,94
Malta	4	2,7	*395*	1,08	*53*	1,90
Poland	200	5,3	38632	0,00	5441	1,55
Slovenia	23	3,9	1994	0,07	293	-0,46
Slovakia	25	3,0	5379	0,00	804	1,44
EU-25	9599	2,5	451864	0,13	*66226*	-0,95
Bulgaria	17	4,1	7891	-1,10	1129	0,21
Romania	48	1,3	*22392*	-0,17	3723	3,48
Turkey	192	1,0	68612	1,59	12101	3,01
Switzerland	284	1,6	*7261*	0,50	*1027*	-2,22
Iceland	9	3,5	287	1,21	42	0,40
Liechtenstein	:	:	34	1,48	5	-0,44
Norway	*202*	2,0	4524	0,59	667	-0,34
Israel						
US	11048	3,0	287676	1,06	39575	-0,94
Japan	4235	0,5	127066	0,18	19148	1,59

Source: DG-Research, Key Figures 2003-2004
Data: OECD, Eurostat

3. Concluding remarks

Financing

- While the EU-15 as a whole spends relatively more on the higher education sector than the US, an enlarged EU spends less. Within the enlarged EU, wide differences prevail. There is a north-south, as well as east-west divide in terms of investment.
- In terms of who is funding the higher education sector, in all countries, governments are the main source ranging from 50% in Japan to 95% in Austria. Other national sources play a major role in Japan (another 47%), as well as in countries with regional funding bodies like the US, Belgium, or Spain.
- Funding from industry is with about 10% in particular important in Germany and Belgium, far above EU-averages and US share (~ 5.5%).
- International funding, probably stemming from the EU's Framework Programmes add a considerable amount to Greece, Ireland, Belgium, and the UK.

Performance

- The higher education sector in Europe is with 25% much more important as performer of GERD than in the US, where it performs only 15%. In particular in the southern countries as well as Poland, the universities perform above 30%.
- In terms of enrolment of students as share of the young population, Finland is having the highest share, followed by the USA and Poland. In particular in the Nordic and Baltic states, high shares are attained.
- In terms of publications per population, the Scandinavian countries obtain the highest numbers, followed by the UK, Netherlands, Belgium and Austria. The lowest numbers are recorded in the smallest countries as well as in the Eastern countries.
- In terms of citation impact, the US dominates all broad fields followed by the EU-15 and Japan.

Researchers & graduates

- In absolute terms, the EU-15 and EU-25 hosts the highest number of researchers in their higher education system. With 395.000, the enlarged EU has more than double the number of researchers than the US with 186.000.
- In terms of researchers in the higher education sector, it is the most important sector in the several southern European states as well as in Poland and the Slovak Republic. Also, compared to the EU-average with 39%, it is a relatively small sector in the US with only 15%. It is a sector of growing importance in particular in the Acceding countries.
- In terms of graduates, Europe produces in absolute terms the highest number of university graduates, followed by the US and Japan. In Europe, the UK, France and Poland produce the largest number of graduates.

Importance of the higher education sector

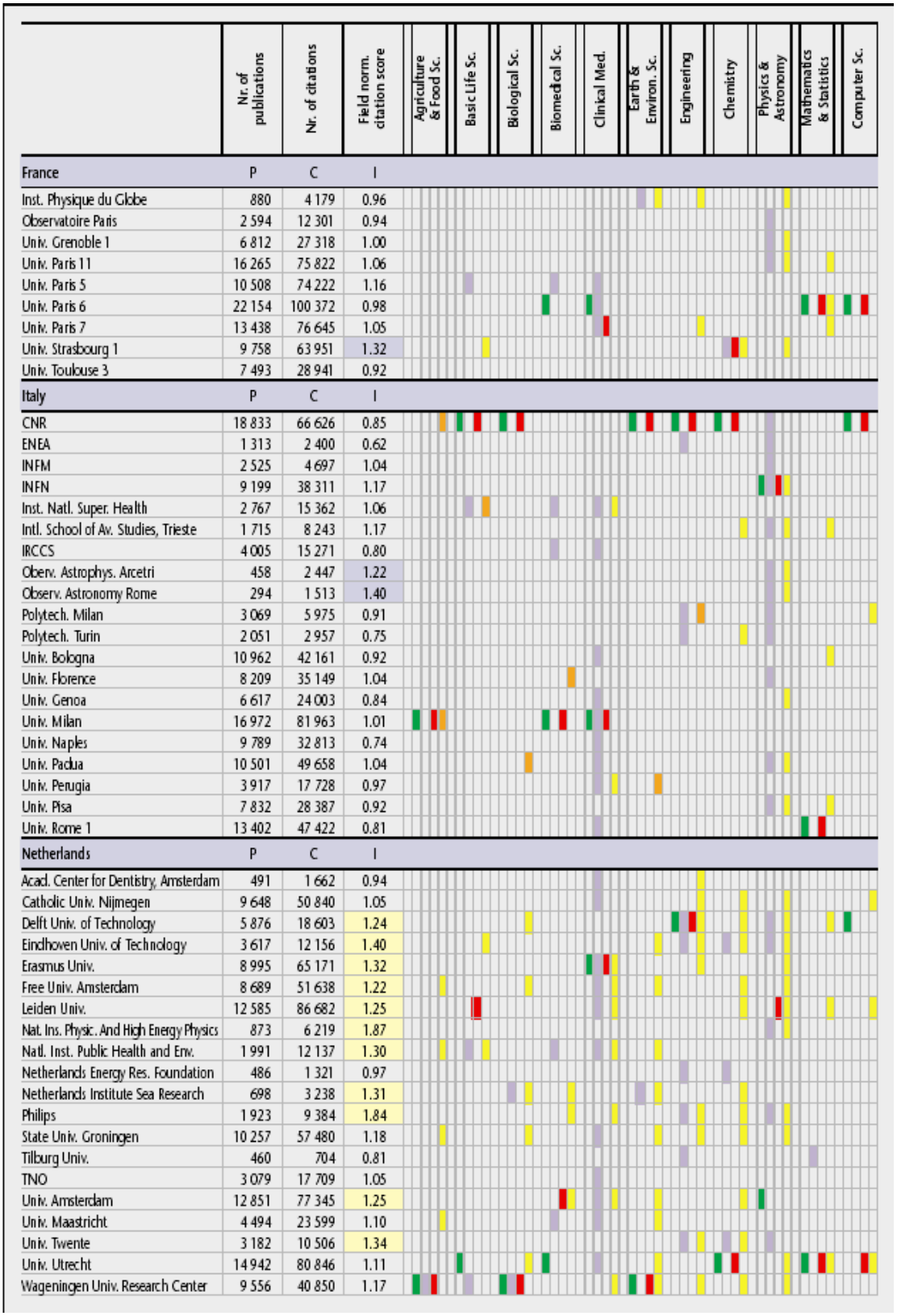
- In the southern European countries, the higher education sector has played and still plays a major role as performer of GERD and employer of public researchers.
- In the Eastern acceding countries, the transformation of the innovation system, including restructuring the Academy of Sciences system and adding research at the

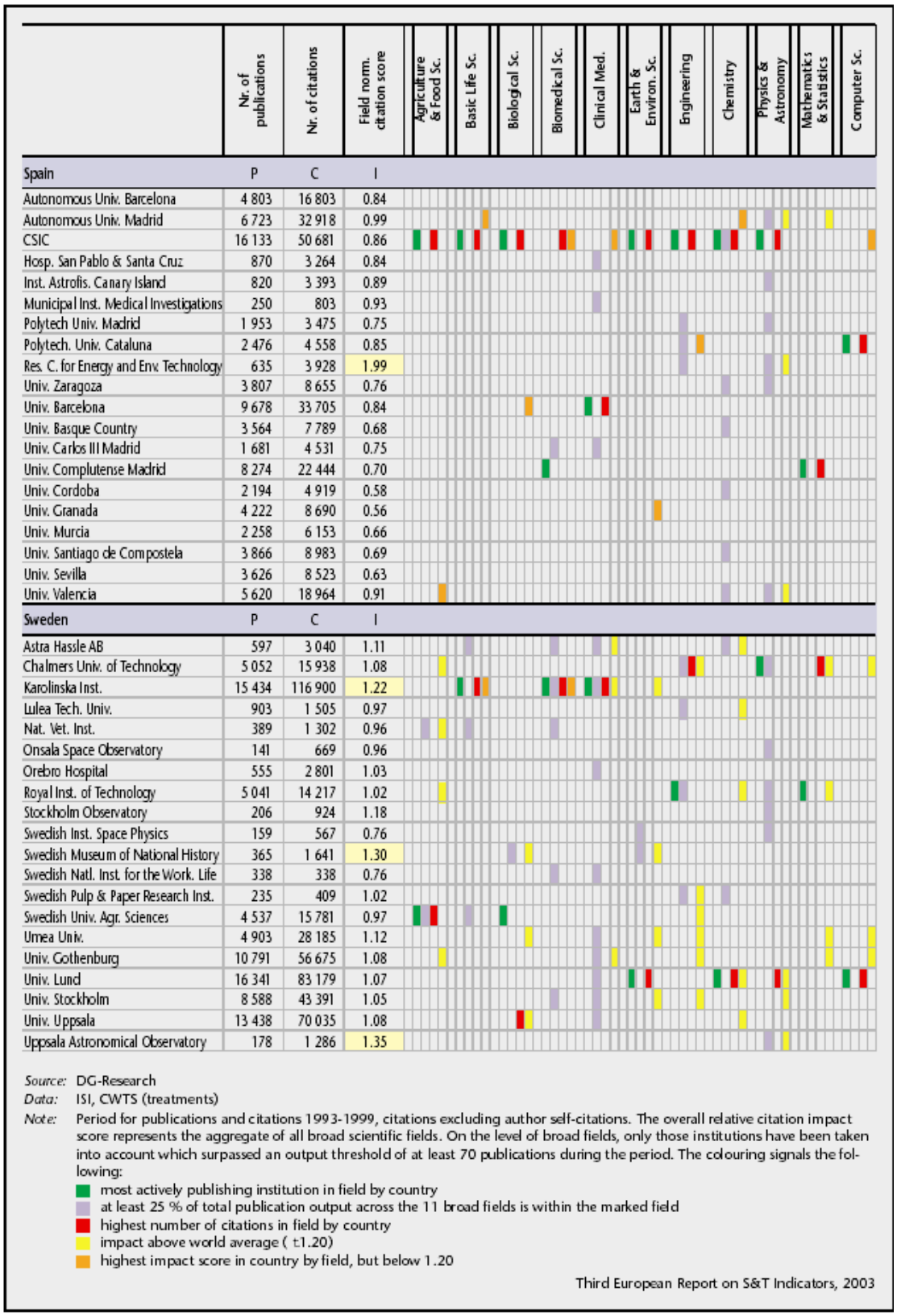
universities has taken place throughout the 1990s, leading sometimes to very high positive as well as negative growth rates – depending on the indicator.

- In several EU-15 member states, the US and Japan, the higher education sector plays an important, but not the most important role as R&D performer as well as in terms of number of researchers. Public research institutions as well as industry are much more important there. This is partly apparent form a performance measure in terms of publications and citation impact [2] done for the EU-15 member states (see tables5.5.1 and 5.5.2 below). Among the top scientific performers are in several countries a number of research institutes as well as large companies.

Table 5.5.1 Top 20 most important and actively publishing research institutions in large EU Member States

	Nr. of publications	Nr. of citations	Field norm. citation score	Agriculture & Food Sc.	Basic Life Sc.	Biological Sc.	Biomedical Sc.	Clinical Med.	Earth & Environ. Sc.	Engineering	Chemistry	Physics & Astronomy	Mathematics & Statistics	Computer Sc.
UK	P	C	I											
Astra Zeneca	1 846	11 732	1.36											
British Telecom	952	3 019	1.46											
Glaxo Wellcome Smithkline Beecham	4 395	49 550	1.93											
Loughborough Univ.	2 915	6 198	0.90											
NERC	1 809	10 378	1.33											
Rutherford Appleton Lab.	3 723	18 673	1.42											
Univ. Bristol	9 861	47 904	1.18											
Univ. Cambridge	26 486	197 887	1.55											
Univ. Edinburgh	13 818	89 077	1.35											
Univ. Glasgow	11 876	62 404	1.14											
Univ. Leeds	9 637	37 592	1.04											
Univ. London	85 182	550 278	1.29											
Univ. Manchester	16 816	76 277	1.03											
Univ. Nottingham	8 985	36 079	1.03											
Univ. Oxford	25 416	190 619	1.48											
Univ. Reading	4 604	14 888	0.95											
Univ. Sheffield	9 700	40 768	1.06											
Univ. Southampton	9 336	38 746	1.03											
Univ. Surrey	3 646	10 460	0.90											
Univ. Wales	14 029	49 505	0.90											
Germany	P	C	I											
DLR	1 707	4 252	1.00											
Free Univ. Berlin	10 830	55 210	1.00											
GSF-Res. Center for the Env. & Health	2 529	13 619	1.16											
GSI- Center for Heavy Ion Research	1 657	6 926	1.28											
Humboldt Univ.	8 947	31 676	1.01											
MPI for Extraterrestrial Physics	1 831	12 693	1.30											
Research Center Julich	6 301	28 812	1.34											
Siemens	1 100	2 380	0.98											
Tech. Univ. Aachen	7 946	24 648	0.95											
Tech. Univ. Munich	10 736	55 317	1.40											
Univ. Bielefeld	2 887	12 686	1.11											
Univ. Erlangen-Nurnberg	12 737	52 355	1.07											
Univ. Freiburg	9 476	63 142	1.34											
Univ. Heidelberg	13 111	86 313	1.32											
Univ. Karlsruhe	5 726	22 540	1.34											
Univ. Kiel	7 466	26 876	0.95											
Univ. Munich	16 208	83 477	1.05											
Univ. Stuttgart	5 083	17 183	1.24											
Univ. Wurzburg	9 210	49 742	1.11											
Vet. Med. School Hannover	1 515	3 445	0.67											
France	P	C	I											
CEA	14 782	72 269	1.21											
CNRS	23 784	130 105	1.19											
Ecole Natl. Vet. Toulouse	407	479	0.45											
France Telecom	1 142	4 740	1.56											
French Natl. Aerospace Research Off.	636	1 641	0.99											
INRA	11 428	42 148	0.86											
INSA	2 598	4 560	0.59											
INSERM	6 851	55 774	1.17											
Inst. Francais du Petrol	878	2 467	0.89											
Inst. Natl. Polytech. Lorraine	1 540	2 749	0.60											
Inst. Pasteur	7 249	79 379	1.39											


Nr. of publications
Nr. of citations
Field norm. citation score
Agriculture & Food Sc.
Basic Life Sc.
Biological Sc.
Biomedical Sc.
Clinical Med.
Earth & Environ. Sc.
Engineering
Chemistry
Physics & Astronomy
Mathematics & Statistics
Computer Sc.
France P C I
Inst. Physique du Globe 880 4 179 0.96
Observatoire Paris 2 594 12 301 0.94
Univ. Grenoble 1 6 812 27 318 1.00
Univ. Paris 11 16 265 75 822 1.06
Univ. Paris 5 10 508 74 222 1.16
Univ. Paris 6 22 154 100 372 0.98
Univ. Paris 7 13 438 76 645 1.05
Univ. Strasbourg 1 9 758 63 951 1.32
Univ. Toulouse 3 7 493 28 941 0.92
Italy P C I
CNR 18 833 66 626 0.85
ENEA 1 313 2 400 0.62
INFM 2 525 4 697 1.04
INFN 9 199 38 311 1.17
Inst. Natl. Super. Health 2 767 15 362 1.06
Intl. School of Av. Studies, Trieste 1 715 8 243 1.17
IRCCS 4 005 15 271 0.80
Oberv. Astrophys. Arcetri 458 2 447 1.22
Observ. Astronomy Rome 294 1 513 1.40
Polytech. Milan 3 069 5 975 0.91
Polytech. Turin 2 051 2 957 0.75
Univ. Bologna 10 962 42 161 0.92
Univ. Florence 8 209 35 149 1.04
Univ. Genoa 6 617 24 003 0.84
Univ. Milan 16 972 81 963 1.01
Univ. Naples 9 789 32 813 0.74
Univ. Padua 10 501 49 658 1.04
Univ. Perugia 3 917 17 728 0.97
Univ. Pisa 7 832 28 387 0.92
Univ. Rome 1 13 402 47 422 0.81
Netherlands P C I
Acad. Center for Dentistry, Amsterdam 491 1 662 0.94
Catholic Univ. Nijmegen 9 648 50 840 1.05
Delft Univ. of Technology 5 876 18 603 1.24
Eindhoven Univ. of Technology 3 617 12 156 1.40
Erasmus Univ. 8 995 65 171 1.32
Free Univ. Amsterdam 8 689 51 638 1.22
Leiden Univ. 12 585 86 682 1.25
Nat. Ins. Physic. And High Energy Physics 873 6 219 1.87
Natl. Inst. Public Health and Env. 1 991 12 137 1.30
Netherlands Energy Res. Foundation 486 1 321 0.97
Netherlands Institute Sea Research 698 3 238 1.31
Philips 1 923 9 384 1.84
State Univ. Groningen 10 257 57 480 1.18
Tilburg Univ. 460 704 0.81
TNO 3 079 17 709 1.05
Univ. Amsterdam 12 851 77 345 1.25
Univ. Maastricht 4 494 23 599 1.10
Univ. Twente 3 182 10 506 1.34
Univ. Utrecht 14 942 80 846 1.11
Wageningen Univ. Research Center 9 556 40 850 1.17



	Nr. of publications	Nr. of citations	Field norm. citation score	Agriculture & Food Sc.	Basic Life Sc.	Biological Sc.	Biomedical Sc.	Clinical Med.	Earth & Environ. Sc.	Engineering	Chemistry	Physics & Astronomy	Mathematics & Statistics	Computer Sc.
Spain	P	C	I											
Autonomous Univ. Barcelona	4 803	16 803	0.84											
Autonomous Univ. Madrid	6 723	32 918	0.99											
CSIC	16 133	50 681	0.86											
Hosp. San Pablo & Santa Cruz	870	3 264	0.84											
Inst. Astrofis. Canary Island	820	3 393	0.89											
Municipal Inst. Medical Investigations	250	803	0.93											
Polytech Univ. Madrid	1 953	3 475	0.75											
Polytech. Univ. Cataluna	2 476	4 558	0.85											
Res. C. for Energy and Env. Technology	635	3 928	1.99											
Univ. Zaragoza	3 807	8 655	0.76											
Univ. Barcelona	9 678	33 705	0.84											
Univ. Basque Country	3 564	7 789	0.68											
Univ. Carlos III Madrid	1 681	4 531	0.75											
Univ. Complutense Madrid	8 274	22 444	0.70											
Univ. Cordoba	2 194	4 919	0.58											
Univ. Granada	4 222	8 690	0.56											
Univ. Murcia	2 258	6 153	0.66											
Univ. Santiago de Compostela	3 866	8 983	0.69											
Univ. Sevilla	3 626	8 523	0.63											
Univ. Valencia	5 620	18 964	0.91											
Sweden	P	C	I											
Astra Hassle AB	597	3 040	1.11											
Chalmers Univ. of Technology	5 052	15 938	1.08											
Karolinska Inst.	15 434	116 900	1.22											
Lulea Tech. Univ.	903	1 505	0.97											
Nat. Vet. Inst.	389	1 302	0.96											
Onsala Space Observatory	141	669	0.96											
Orebro Hospital	555	2 801	1.03											
Royal Inst. of Technology	5 041	14 217	1.02											
Stockholm Observatory	206	924	1.18											
Swedish Inst. Space Physics	159	567	0.76											
Swedish Museum of National History	365	1 641	1.30											
Swedish Natl. Inst. for the Work. Life	338	338	0.76											
Swedish Pulp & Paper Research Inst.	235	409	1.02											
Swedish Univ. Agr. Sciences	4 537	15 781	0.97											
Umea Univ.	4 903	28 185	1.12											
Univ. Gothenburg	10 791	56 675	1.08											
Univ. Lund	16 341	83 179	1.07											
Univ. Stockholm	8 588	43 391	1.05											
Univ. Uppsala	13 438	70 035	1.08											
Uppsala Astronomical Observatory	178	1 286	1.35											

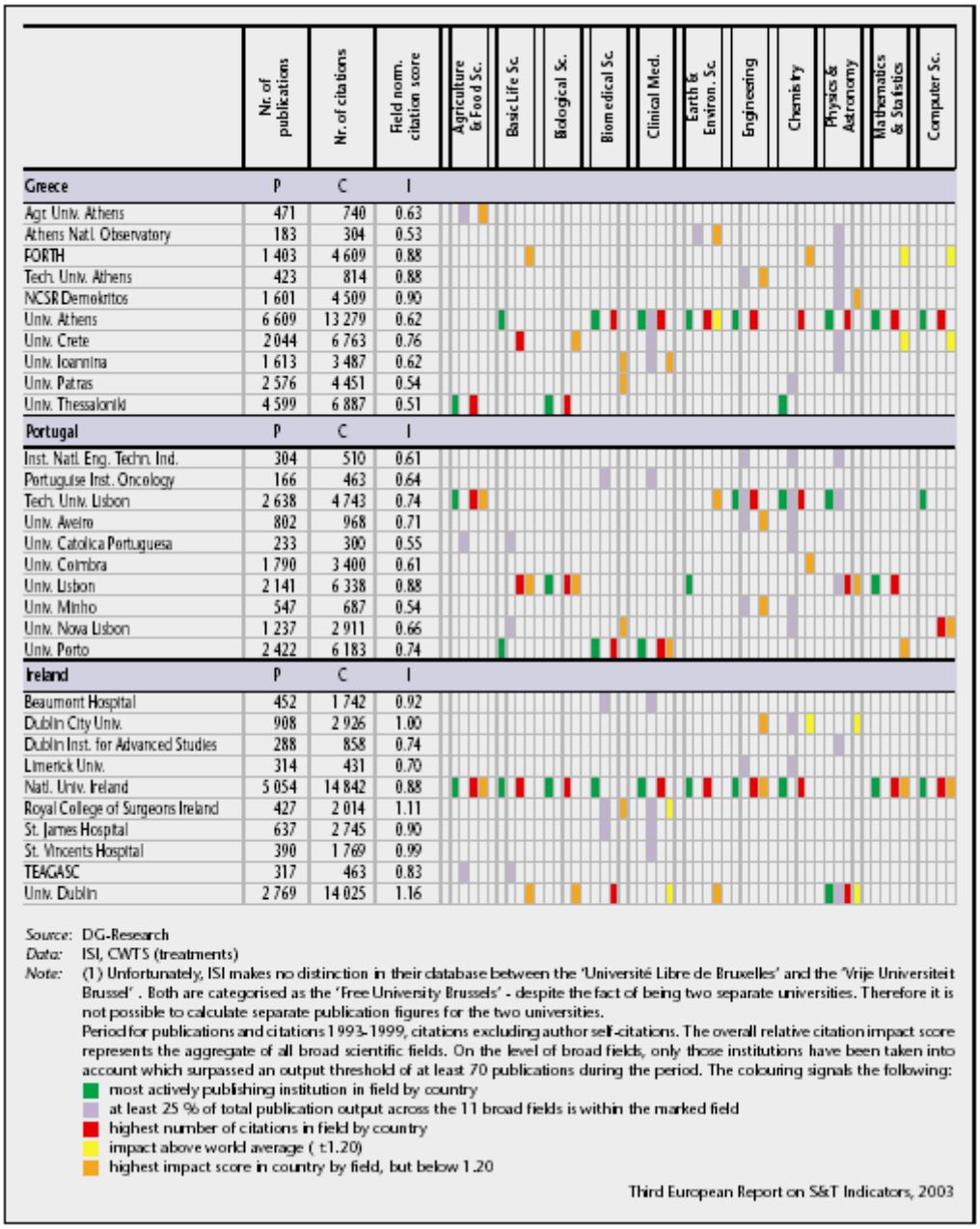
Source: DG-Research
Data: ISI, CWTS (treatments)
Note: Period for publications and citations 1993-1999, citations excluding author self-citations. The overall relative citation impact score represents the aggregate of all broad scientific fields. On the level of broad fields, only those institutions have been taken into account which surpassed an output threshold of at least 70 publications during the period. The colouring signals the following:

- most actively publishing institution in field by country
- at least 25 % of total publication output across the 11 broad fields is within the marked field
- highest number of citations in field by country
- impact above world average (≥1.20)
- highest impact score in country by field, but below 1.20

Third European Report on S&T Indicators, 2003

Table 5.5.2 Top 10 most important and actively publishing research institutions in smaller EU Member States

	Nr. of publications	Nr. of citations	Field norm. citation score	Agriculture & Food Sc.	Basic Life Sc.	Biological Sc.	Biomedical Sc.	Clinical Med.	Earth & Environ. Sc.	Engineering	Chemistry	Physics & Astronomy	Mathematics & Statistics	Computer Sc.
Belgium	P	C	I											
Belgian Nuclear Research Center	180	153	0.34											
Free Univ. Brussels (1)	10 538	53 564	1.07											
Inst. Tropical Med. Prince Leopold	702	3 640	1.28											
Interuniv. Microelec. Center, Leuven	959	1 917	0.88											
KUL Katholieke Univ. Leuven	15 420	68 876	1.07											
Limburg Univ. Center	765	2 527	1.04											
State Univ. Ghent	7 285	30 131	1.09											
UCL Univ. Catholique de Louvain	3 914	26 219	1.30											
Univ. Antwerp	5 133	25 083	1.20											
Univ. Liège	5 357	19 805	0.87											
Denmark	P	C	I											
Danish Inst. Agricultural Sciences	554	746	0.85											
Niels Bohr Inst.	1 311	7 193	1.42											
Riso Natl. Lab.	1 987	8 991	1.53											
Royal Danish School of Pharmacy	801	3 116	0.82											
Tech. Univ. Denmark	4 342	16 138	1.24											
Univ. Aalborg	986	2 299	1.06											
Univ. Aarhus	8 245	43 295	1.09											
Univ. Copenhagen	11 667	63 432	1.02											
Univ. South Jutland	3 425	17 204	1.04											
Vet. and Agr. Univ. Frederiksberg	2 716	8 415	0.92											
Finland	P	C	I											
Abo Academy Univ.	1 376	3 371	0.80											
Finnish Forest Res. Inst.	475	1 101	1.02											
Finnish Meterol. Inst.	306	1 020	0.92											
Helsinki Univ. Tech.	2 882	8 646	1.15											
Natl. Public Health Inst.	2 349	16 035	1.33											
Tampere Univ. Tech.	807	1 545	0.83											
Univ. Helsinki	13 446	81 531	1.29											
Univ. Jyvaskyla	1 677	3 997	0.82											
Univ. Kuopio	2 726	15 052	1.18											
Univ. Turku	5 948	25 876	0.95											
Austria	P	C	I											
Agro Univ. Vienna	1 224	4 527	1.02											
Tech. Univ. Graz	1 897	4 550	0.88											
Tech. Univ. Vienna	4 268	11 037	1.00											
Univ. Graz	4 383	17 698	0.89											
Univ. Innsbruck	5 505	27 342	1.03											
Univ. Linz	1 435	3 672	0.98											
Univ. Min. Metall Leoben	425	376	0.52											
Univ. Salzburg	703	2 229	0.73											
Univ. Veterinary Medicine Vienna	693	1 084	0.61											
Univ. Vienna	12 485	50 255	0.92											



	Nr. of publications	Nr. of citations	Field norm. citation score	Agriculture & Food Sc.	Basic Life Sc.	Biological Sc.	Biomedical Sc.	Clinical Med.	Earth & Environ. Sc.	Engineering	Chemistry	Physics & Astronomy	Mathematics & Statistics	Computer Sc.
Greece	P	C	I											
Agr. Univ. Athens	471	740	0.63											
Athens Natl. Observatory	183	304	0.53											
FORTH	1 403	4 609	0.88											
Tech. Univ. Athens	423	814	0.88											
NCSR Demokritos	1 601	4 509	0.90											
Univ. Athens	6 609	13 279	0.62											
Univ. Crete	2 044	6 763	0.76											
Univ. Ioannina	1 613	3 487	0.62											
Univ. Patras	2 576	4 451	0.54											
Univ. Thessaloniki	4 599	6 887	0.51											
Portugal	P	C	I											
Inst. Natl. Eng. Techn. Ind.	304	510	0.61											
Portuguese Inst. Oncology	166	463	0.64											
Tech. Univ. Lisbon	2 638	4 743	0.74											
Univ. Aveiro	802	968	0.71											
Univ. Catolica Portuguesa	233	300	0.55											
Univ. Coimbra	1 790	3 400	0.61											
Univ. Lisbon	2 141	6 338	0.88											
Univ. Minho	547	687	0.54											
Univ. Nova Lisbon	1 237	2 911	0.66											
Univ. Porto	2 422	6 183	0.74											
Ireland	P	C	I											
Beaumont Hospital	452	1 742	0.92											
Dublin City Univ.	908	2 926	1.00											
Dublin Inst. for Advanced Studies	288	858	0.74											
Limerick Univ.	314	431	0.70											
Natl. Univ. Ireland	5 054	14 842	0.88											
Royal College of Surgeons Ireland	427	2 014	1.11											
St. James Hospital	637	2 745	0.90											
St. Vincents Hospital	390	1 769	0.99											
TEAGASC	317	463	0.83											
Univ. Dublin	2 769	14 025	1.16											

Source: DG-Research
Data: ISI, CWTS (treatments)
Note: (1) Unfortunately, ISI makes no distinction in their database between the 'Université Libre de Bruxelles' and the 'Vrije Universiteit Brussel' . Both are categorised as the 'Free University Brussels' - despite the fact of being two separate universities. Therefore it is not possible to calculate separate publication figures for the two universities.
Period for publications and citations 1993-1999, citations excluding author self-citations. The overall relative citation impact score represents the aggregate of all broad scientific fields. On the level of broad fields, only those institutions have been taken into account which surpassed an output threshold of at least 70 publications during the period. The colouring signals the following:

- most actively publishing institution in field by country
- at least 25 % of total publication output across the 11 broad fields is within the marked field
- highest number of citations in field by country
- impact above world average (±1.20)
- highest impact score in country by field, but below 1.20

Third European Report on S&T Indicators, 2003

[2] Selection of the EU's most active research performing institutions

The selection comprises the top 20 main research-performing institutions – i.e. physical and legal entities at the highly aggregated level– in each of the largest EU-15 countries (France, Germany, Italy, Sweden, Netherlands, Spain and United Kingdom) and the top 10 in the smaller EU-15 countries. The following step-wise procedure was adopted to generate a representative set of the largest institutions in each country while taking into account the relative size of disciplines:

Step 1 – Select the main institutions contributing the largest number of publications in ISI-covered journals for each separate discipline. The disciplines are defined by journal sets according to the CWTS field classification system. The procedure is restricted to the disciplines belonging to the natural sciences, medical sciences, life sciences, mathematics and statistics, and engineering (table A.4). The publication counts are based on the number of papers published in the four-year time-interval 1996-1999 and on a full counting scheme whereby each paper is attributed in the full to each of the main institutions listed in the author address(es). International research institutions are excluded. A lower threshold of 60 papers is set per discipline (an average of 15 per year) in order to be included in the selection. Luxembourg-based institutions were excluded due to insufficient numbers of papers.

Step 2 – If step 1 does not provide the required number of institutions for a country, this procedure is repeated for the 2nd in the ranking of each discipline. This process is continued with the 3rd in the ranking, and so forth, until the required number of institutions is reached. In case of ties or an excess of additional entries in the last stage of the selection, the remaining positions go to those institutions with the largest numbers of papers in the corresponding discipline. Hence, the absence of an institution's name in the final selection indicates that the institution was not amongst the most actively publishing in any discipline, or it did not meet the lower output threshold. This discipline-dependent selection criterion ensures that the larger institutions active in the less prolific disciplines (e.g. the engineering sciences) are also included. The selection of these main research institutions was based solely on the number of their (co-)authored research papers published in scientific and technical journals indexed by ISI, irrespective of the citation impact of those papers or the productivity of the research personnel producing these papers. Hence, the institutions on this list do not necessarily have higher impact scores and/or higher productivity rates than those excluded from this selection.