

Regional distribution of human resources in science and technology

From graduation to employment

Statistics in focus

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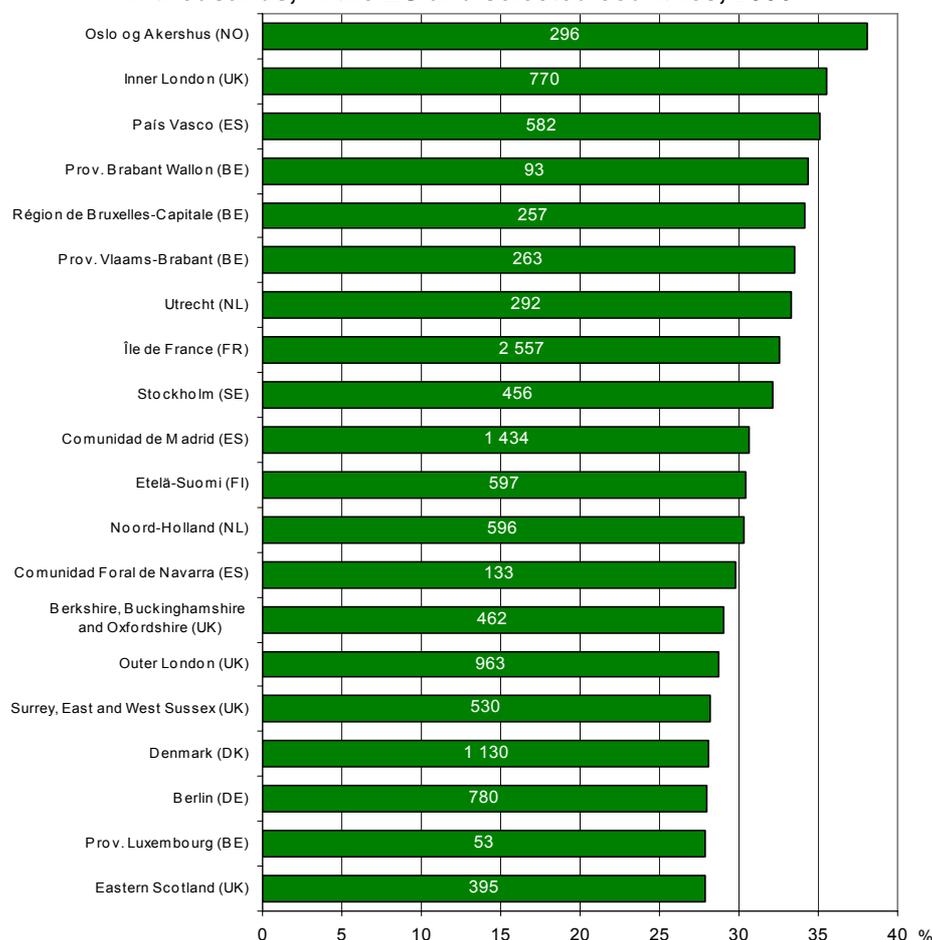


Developing a favourable and dynamic regional economy through the cohesion and convergence of the European regions is a major objective of the European Union. More growth and jobs for all regions and cities of the EU is one of the main focuses of the new regional policy between 2007 and 2013. Measurements of inflows and stocks of human resources in science and technology are often considered good indicators of the growth of the knowledge-based economy. However, pools of highly skilled persons are not equally distributed across regions, concentration in capital regions is clearly apparent and there are differences in and between countries.

38.1% of people in the region Oslo og Akershus were tertiary educated

Human resources in science and technology in terms of education (HRSTE) are persons having successfully completed third level education. The representativeness of HRSTE in Europe varies widely from one region to another. In Figure 1, the highest proportion of HRSTE among the regional population is found in Oslo og Akershus (NO), with 38.1%. Inner London (UK) and País Vasco (ES) followed, with an HRSTE share of 35.5% and 35.1% respectively. Among the 20 leading regions in terms of HRSTE, some countries are more represented than others: five were located in the United Kingdom, four in Belgium and three in Spain.

Figure 1: Top 20 leading regions (NUTS level 2) regarding human resources in S&T in terms of education (HRSTE) as a percentage of the regional population aged 15-74 years and in thousands, in the EU and selected countries, 2006



Exceptions to the reference year: LU, IS and CH 2005. Source: Eurostat HRST database
 BG not available due to change of NUTS codes.
 For HRST, NUTS and population definitions see methodological notes on page 7.

Some European regions combine a high concentration of tertiary students with a large stock of human resources in science and technology in terms of education

Table 2 illustrates the regional supply of human resources in science and technology in terms of education (HRSTE). By showing the potential transfer of tertiary students to the stock of highly qualified persons, possible flows in and out of the regions can be spotted.

Unsurprisingly, one of the main highlights is that capital regions are well represented when looking at both the flow and the stock of highly qualified persons. Capital regions are often described as dynamic in terms of the knowledge economy and innovation.

As more than 95% of the population in Finland and Portugal is concentrated in only one region, the exceptionally high shares of tertiary students and HRSTE among the national population in Manner-Suomi (FI) and Continente (PT) is explained. The remaining population in Finland and Portugal are found in the autonomous island regions of Åland (FI) respective Região Autónoma dos Açores (PT) and Região Autónoma da Madeira (PT).

With the exception of these two regions, in 2004 two countries had more than half of their tertiary students

gathered in one region. Ostösterreich (AT) scored a share of 56.2% and West-Nederland (NL) 50.1%. In terms of the stock of HRSTE, these two regions are also found in the top five leading regions, with 48.7% and 51.9% respectively. Île de France (FR) had the largest HRSTE stock in 2004.

Ostösterreich (AT) is especially interesting as its share of Austrian HRSTE stock (48.7%) is much smaller. In contrast, Vlaams Gewest (BE) has a higher share of HRSTE than the potential inflow. Close to three out of five tertiary educated persons in S&T are found in this Belgian region. This could mean that the region attracts graduates from other regions to fill the demand for highly educated people.

Overall, regions having a high concentration of tertiary students are often also regions with a high concentration of human resources in S&T in terms of education. Naturally, the respective countries' regional structure (as in the case of Finland and Portugal) has an effect, but there is concordance between regions where tertiary students are educated and their endowment in human capital.

Table 2: Top 20 regions (NUTS level 1) regarding the regional share of the national stock of tertiary students (ISCED 5-6) and the regional share of the national stock of human resources in S&T in terms of education (HRSTE), in the EU, 2004



Potential Flow			Stock				
	Region NUTS level1	Students ISCED 5-6 at regional level as % of total students ISCED 5-6 at national level		Region NUTS level1	HRSTE in 1000s	HRSTE at regional level as % of total HRSTE population at national level	
20 first regions	1	Manner-Suomi (FI)	99.9	1	Manner-Suomi (FI)	1 042	99.5
	2	Continente (PT)	98.4	2	Continente (PT)	787	97.2
	3	Ostösterreich (AT)	56.2	3	Vlaams Gewest (BE)	1 124	58.0
	4	West-Nederland (NL)	50.1	4	West-Nederland (NL)	1 535	51.9
	5	Vlaams Gewest (BE)	46.9	5	Ostösterreich (AT)	460	48.7
	6	Közep-Magyarország (HU)	44.0	6	Attiki (GR)	642	48.2
	7	Attiki (GR)	41.9	7	Közep-Magyarország (HU)	460	43.9
	8	Voreia Ellada (GR)	33.7	8	Macroregiunea Trei (RO)	505	36.8
	9	Alfold Es Eszak (HU)	32.4	9	Westösterreich (AT)	307	32.5
	10	Région Wallonne (BE)	30.4	10	Alfold Es Eszak (HU)	322	30.7
	11	Île De France (FR)	26.7	11	Région Wallonne (BE)	570	29.4
	12	Centralny (PL)	26.6	12	Voreia Ellada (GR)	376	28.2
	13	Westösterreich (AT)	26.5	13	Este (ES)	2 014	28.1
	14	Nordrhein-Westfalen (DE)	26.5	14	Île De France (FR)	2 405	27.8
	15	Centro (IT)	26.3	15	Nord-Ovest (IT)	1 091	27.3
	16	Sud (IT)	24.0	16	Centralny (PL)	911	25.6
	17	Este (ES)	23.6	17	Dunantul (HU)	267	25.5
	18	Dunantul (HU)	23.6	18	Centro (IT)	960	24.0
	19	Région De Bruxelles-Capitale (BE)	21.0	19	Macroregiunea Doi (RO)	301	21.9
	20	Nord-Ovest (IT)	20.5	20	Macroregiunea Unu (RO)	300	21.8

No NUTS detail at level 1 for CY, CZ, DK, EE, IE, LT, LV, LU, MT, SI, SK and SE.

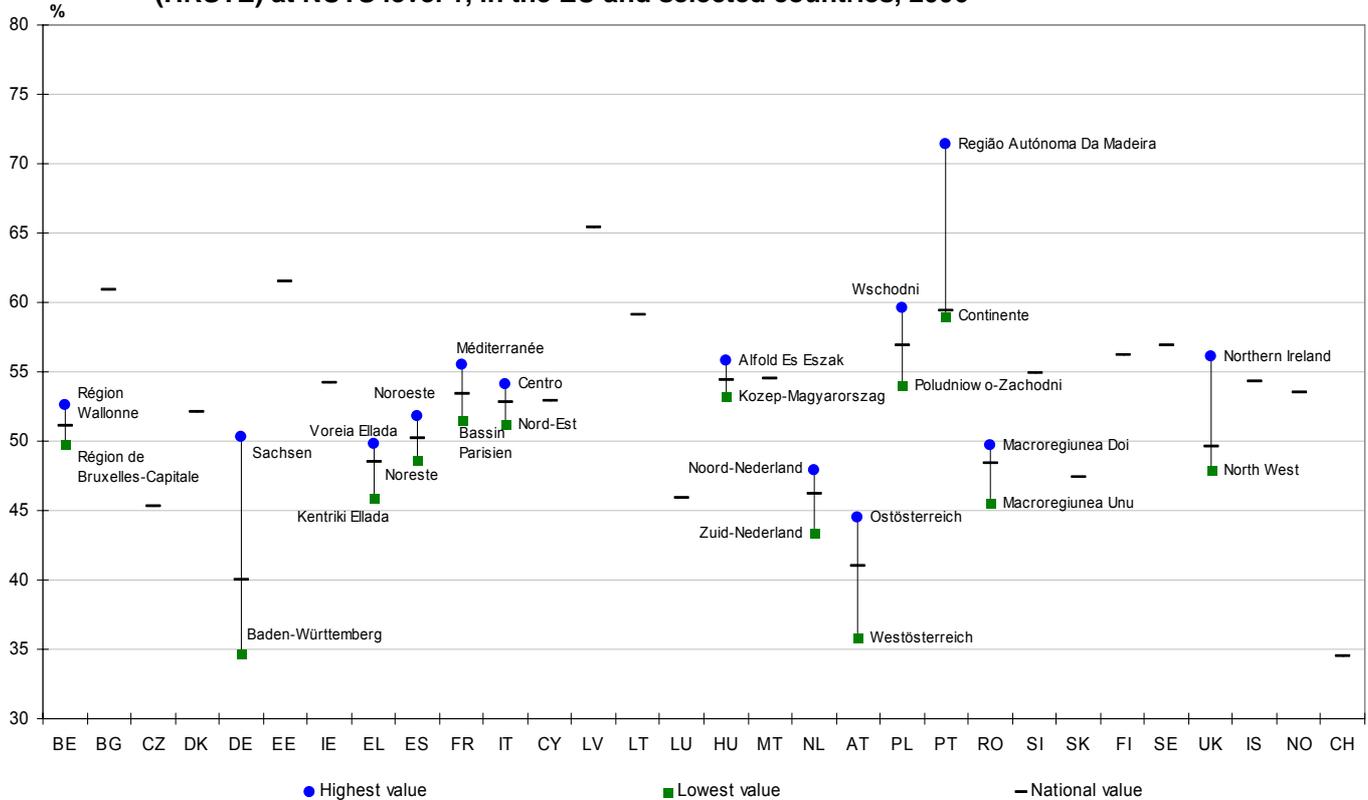
Source: Eurostat Education and HRST database

At NUTS level 1 Manner-Suomi (FI) and Continente (PT) include most of the national population.

Student data missing for BG and RO and HRSTE data missing for BG due to change of NUTS codes.

The gender distribution of human resources in science and technology in terms of education is widely dispersed among the German regions

Figure 3: Regional disparities of the share of female human resources in S&T in terms of education (HRSTE) at NUTS level 1, in the EU and selected countries, 2006



Exceptions to the reference year: LU, IS and CH 2005.
For FI only national value can be shown as data for one of the two regions is unavailable.
For BG only national value can be shown due to change of NUTS codes.

Source: Eurostat HRST database

Regional disparities also exist regarding the share of females in the stock of human resources in science and technology in terms of education (HRSTE).

The national shares of females among the HRSTE (also shown in the figure) were between around 35% and 65% in 2006. Latvia, with 65.4%, scored the highest national share of female HRSTE. Estonia and Bulgaria came next, with a national share of female HRSTE of 61.5% and 60.9% respectively. In Switzerland only one third of HRSTE were female.

Dispersions between the leading region and the bottom region vary a lot in terms of female proportion between one country and another. Germany showed the largest disparity between its top and lowest regions: Sachsen had a share of 50.3% female HRSTE while Baden-Württemberg had only 34.7%. In fact, females in the former German Democratic Republic part are better integrated into the stock of HRSTE than women in the former German Federal Republic.

In Austria, Portugal and the United Kingdom a lesser but relatively large gap was found between the top and bottom region. In Austria, Ostösterreich showed

the highest share (44.5%) while Westösterreich showed the lowest (35.8%). In the UK, Northern Ireland was highest (56.1%) and North West lowest (47.9%) The Portuguese region Região Autónoma da Madeira (PT) had the highest share of females among its human resources in S&T in terms of education. Almost three quarters of the HRSTE in this region were women in 2006, and in the mainland of Portugal there was also a large share of women (59%) among the tertiary educated.

Conversely, in other member states the dispersion between the leading region and the bottom region is remarkably low. In 8 of the 14 member states that have regions at NUTS level 1, the gap between the highest and lowest share was less than five percentage points.

Finally, in only two cases the largest regional shares of female HRSTE were registered by the capital region. These cases are Centro in Italy and Ostösterreich in Austria, where 54.1% and 44.5% respectively of the HRSTE in these regions were females.

Polish regions had the largest shares of human resources in S&T in terms of education aged 25-34

The age groups of the regional stocks of human resources in science and technology in terms of education (HRSTE) were not homogeneously distributed in 2006 (Table 4). Poland stands out as having the youngest HRSTE population: five of the six Polish regions scored among the six highest shares of HRSTE in the age group 25-34. Poludniowy (PL), with 40.6%, is the region with the largest share of HRSTE aged 25-34 in the EU. Six of the seven Spanish regions were also found in the top 20 regions with large shares of HRSTE aged 25-34. In Sur (ES), almost two out of five HRSTE were between 25 to 34 years old.

Conversely, German regions had a much older HRSTE population: nine German regions are found in the top 10 positions in terms of share of HRSTE aged 45-64. Mecklenburg-Vorpommern (DE) ranks first, having more than half of its human resources in S&T in terms of education aged 45-64.

The United Kingdom stands out by having regions on both lists. London seems to attract the younger HRSTE while older HRSTE are more dominant in regions within commuting distance of London.

Table 4: Top 20 regions (NUTS level 1) for the share of human resources in S&T in terms of education (HRSTE) aged 25-34 years and 45-64 years among the regional HRSTE population aged 15-74 years, in the EU and selected countries, 2006

		Regions	% of HRSTE aged 25-34 among the total HRSTE population aged 15-74			Regions	% of HRSTE aged 45-64 among the total HRSTE population aged 15-74
20 first regions	1	Poludniowy (PL)	40.6	1	Mecklenburg-Vorpommern (DE)	51.4	
	2	Wschodni (PL)	39.3	2	Sachsen-Anhalt (DE)	47.6	
	3	Polnocno-Zachodni (PL)	39.1	3	Thüringen (DE)	47.5	
	4	Centralny (PL)	38.9	4	Bremen (DE)	47.4	
	5	Sur (ES)	38.1	5	Brandenburg (DE)	45.6	
	6	Polnocny (PL)	38.1	6	Niedersachsen (DE)	44.9	
	7	Continente (PT)	37.6	7	Rheinland-Pfalz (DE)	43.9	
	8	Centro (ES)	37.6	8	Saarland (DE)	43.9	
	9	Macroregiunea Unu (RO)	37.5	9	Sachsen (DE)	43.2	
	10	Este (ES)	37.2	10	Manner-Suomi (FI)	41.9	
	11	Comunidad De Madrid (ES)	36.8	11	South West (UK)	41.2	
	12	Noroeste (ES)	36.7	12	Schleswig-Holstein (DE)	41.0	
	13	Ireland (IE)	36.7	13	Danmark (DK)	40.6	
	14	Canarias (ES)	36.5	14	Kozep-Magyarország (HU)	40.1	
	15	Malta (MT)	36.4	15	Noord-Nederland (NL)	39.8	
	16	Ouest (FR)	36.1	16	Südösterreich (AT)	39.5	
	17	Kypros / Kibris (CY)	35.7	17	Oost-Nederland (NL)	39.5	
	18	London (UK)	35.3	18	Nordrhein-Westfalen (DE)	39.4	
	19	Centre-Est (FR)	35.2	19	South East (UK)	39.3	
	20	Est (FR)	35.1	20	East Midlands (UK)	39.2	

Exceptions to the reference year: LU, IS and CH 2005.
BG not available due to change of NUTS codes.

Source: Eurostat HRST database

More human resources in S&T in terms of education are employed in northern Europe and in the north of Spain

Map 5 shows disparities in terms of the share of employed human resources in S&T in terms of education (HRSTE) among total employment.

In 2006, several regions in the north of Europe tended to score at least 30% of employed HRSTE. This was the case for example in Belgium, Denmark,

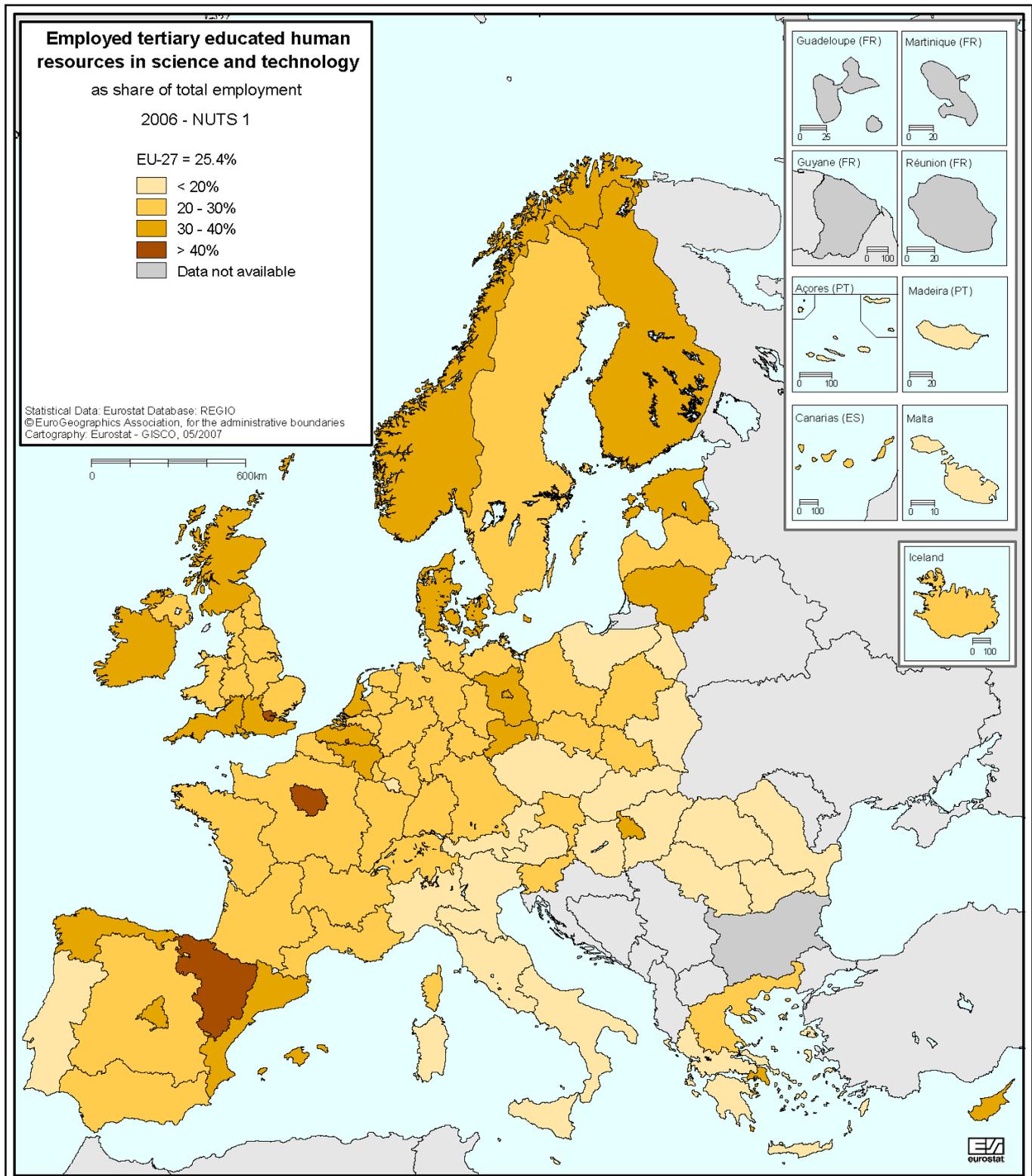
Ireland, Estonia, Lithuania, Finland and some regions in United Kingdom. Also the northern Spanish regions show relatively high shares.

Conversely, regions located in the eastern part of Europe tended to have a lower proportion of employed human resources in S&T in terms of

education among the total employed population. Romanian regions had shares of employed HRSTE of less than 20%. The figure for Macroregiunea Doi (RO) was as low as 10.7%. In Italy also, employed HRSTE were less represented among the total employed population. Finally, the highest shares of over 40% of HRSTE among the employed population

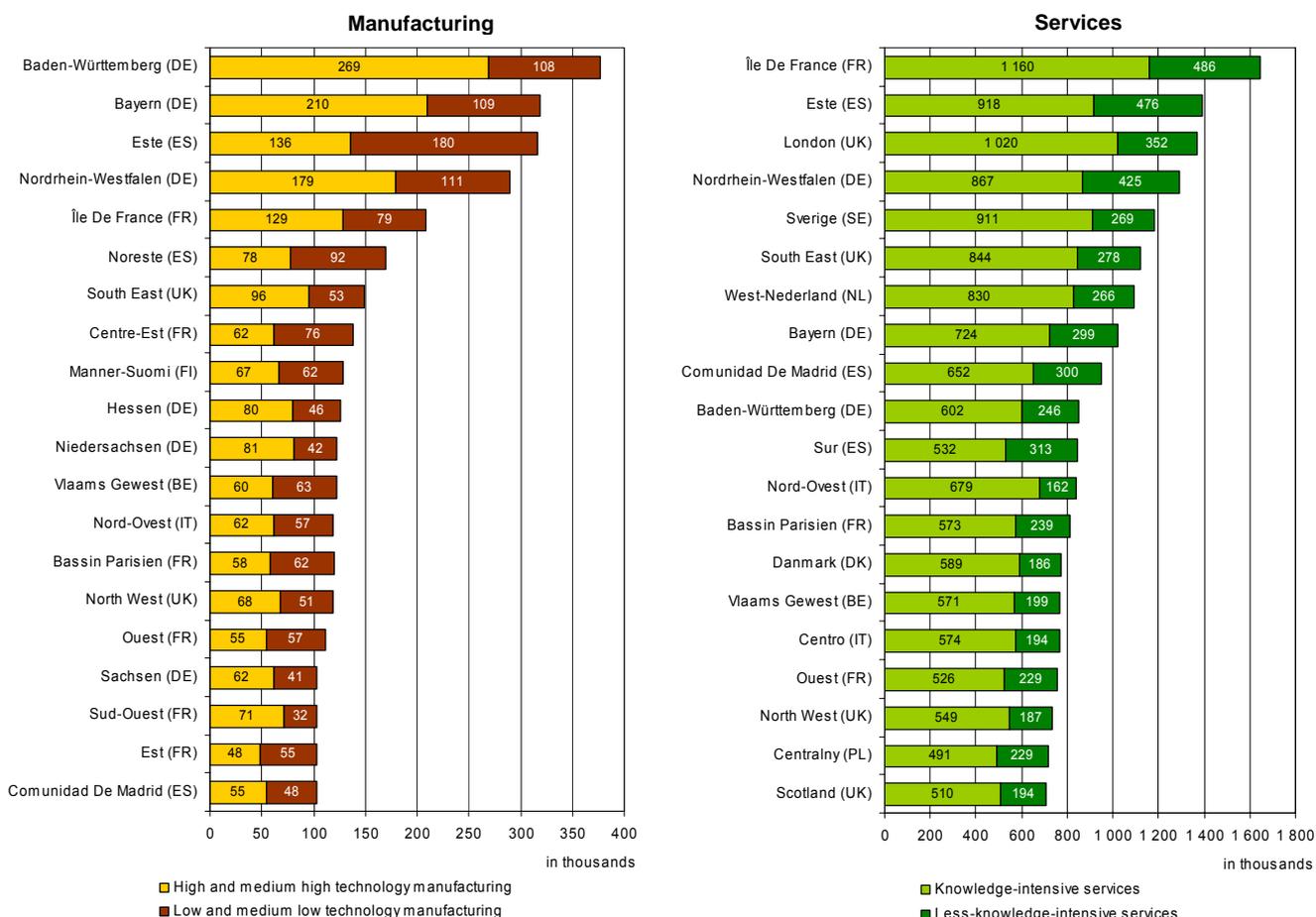
were found in four regions. Three of them were capital regions: Bruxelles-Capitale (BE), Île de France (FR) and London (UK). The last region was Noreste (ES), with 42.1%. However, the Spanish capital region (Comunidad de Madrid) had only a slightly lower share of employed HRSTE (38.6%).

Map 5: Regional distribution of employed human resources in science and technology in terms of education (HRSTE) as a share of total employment, NUTS level 1, 2006



In Île de France, more than 1.6 million human resources in S&T in terms of education are employed in services

Figure 6: Top 20 regions (NUTS 1 level) in absolute HRSTE employment in Manufacturing and in Services and their distribution in the respective sub-sectors, in thousands, in the EU and selected countries, 2006



Exceptions to the reference year: LU, IS and CH 2005.
BG not available due to change of NUTS codes.

Source: Eurostat HRST database

Figure 6 gives a clear picture of the distribution of human resources in science and technology in terms of education (HRSTE) employed in the *manufacturing* and *services* sectors.

In *manufacturing*, German regions led as 6 out of 20 regions had the highest number of HRSTE employed in this sector. In 2006, Baden-Württemberg (DE) came top, with more than 377 000 persons employed in *manufacturing*. By comparison, Comunidad de Madrid (ES), in 20th place, had 3.5 times less HRSTE employed in this sector. France, with also 6 regions out of 20, had the second largest HRSTE population in *manufacturing*.

Differences can also be seen when looking at the distribution of manufacturing sub-sectors. In most of the regions studied, the *high and medium-high technology manufacturing* sector attracted most of the human resources in S&T in terms of education employed in *manufacturing*.

For example, more than two thirds of the HRSTE employed in manufacturing in the region of Baden-Württemberg (DE) worked in this specific sub-sector. One exception is Este (ES).

The human resources in S&T in terms of education employed in *services* were much more numerous than in *manufacturing*. For example, Île de France (FR), which ranked fifth with more than 200 000 HRSTE employed in *manufacturing*, led in *services* with 8 times more HRSTE. In 2006, four regions in the United Kingdom were found among the top 20 leading regions in terms of the stock of employed HRSTE in *services*. This represented almost 4 million persons.

Finally, of the human resources in S&T in terms of education that were employed in services, the vast majority was employed in the sub-sector *knowledge-intensive services*. In Nord-Ovest (IT), for example, the share of HRSTE employed in this sector reached more than 80%.

➤ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

1. Human resources in science and technology

Human Resources in Science and Technology (HRST) can be divided into different sub-groups measured using characteristics of educational achievement and occupation following the guidelines of the OECD *Canberra Manual*.

This Statistics in Focus publication shows results for the following specific HRST category:

Human Resources in Science and Technology in terms of Education (HRSTE)

HRSTE can be defined as: Individuals who have successfully completed education at the third level in an S&T field of study (ISCED '97 version, levels 5a, 5b or 6).

Note that according to the Canberra manual, § 71, the seven broad fields of study in S&T are: natural sciences, engineering and technology, medical sciences, agricultural sciences, social sciences, humanities and other fields.

Population means in this publication the age group 15-74, unless otherwise specified.

Reference manual

Manual on the measurement of human resources devoted to S&T — Canberra Manual, OECD, 1994.

The International Standard Classification of Education (ISCED)

2. Data sources

Two different data sources are used in this publication.

Stocks of HRSTE are derived from the **European Union Labour Force Survey** (EU LFS). Data on inflows of tertiary students (Table 2) are from Eurostat's **Education database**. Comparability between these two data sources is not assured. The most recent data were extracted in April 2007.

Quality of the data

The guidelines on the sample size reliability of the data, established by the EU LFS, are applied to the HRST database. Therefore, breakdowns for which quality levels are considered insufficient are flagged either as not available or unreliable.

3. Nomenclature of territorial units for statistics — NUTS

The Nomenclature of Territorial Units for Statistics — NUTS — was established to provide a single, uniform breakdown of territorial units for the production of regional statistics for the European Union. NUTS is a five-level hierarchical classification comprising three regional and two local levels. In this way, NUTS subdivides Member States into NUTS 1 regions,

each of which is in turn subdivided into a whole number of NUTS 2 regions, and so on.

In the present edition of Statistics in Focus, data are presented at NUTS 1 or NUTS 2 level.

Cyprus, Denmark, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovenia and Iceland are classified as regions at NUTS 2 level. At NUTS level 1 also the Czech Republic, Ireland, Slovakia, Sweden, Norway and Switzerland are classified as regions.

4. NACE

Data presented by sector of economic activity are based on the statistical classification of economic activities in the European Community, NACE Rev.1.1., with the following details:

Manufacturing (15 to 37)

High and medium-high technology manufacturing

24 Manufacture of chemicals and chemical products; **29 to 35** Manufacture of machinery and equipment n.e.c.; man. of electrical and optical equipment; man. of motor vehicles, trailers and semi-trailers; man. of other transport equipment

Low and medium-low technology manufacturing

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; **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; **36 to 37** Manufacturing n.e.c.

Services (50 to 99)

Knowledge-intensive services

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

Less knowledge-intensive services

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 organisations and bodies

(Two-digit codes refer to NACE divisions)

Further information:

Data: [EUROSTAT Website/Home page/Science and technology/Data](#)

Science and technology

Human Resources in Science & Technology

Stocks of HRST at the national and regional levels; unemployment for HRST and non-HRST

Annual data on HRST and sub-groups of HRST at the national level

 Annual data on HRST with tertiary education, by field of education and gender

 Annual data on HRST with tertiary education, by field of education and age

 Annual data on HRST with tertiary education, employed, by field of education and occupation

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