

# Statistics in focus

## SCIENCE AND TECHNOLOGY

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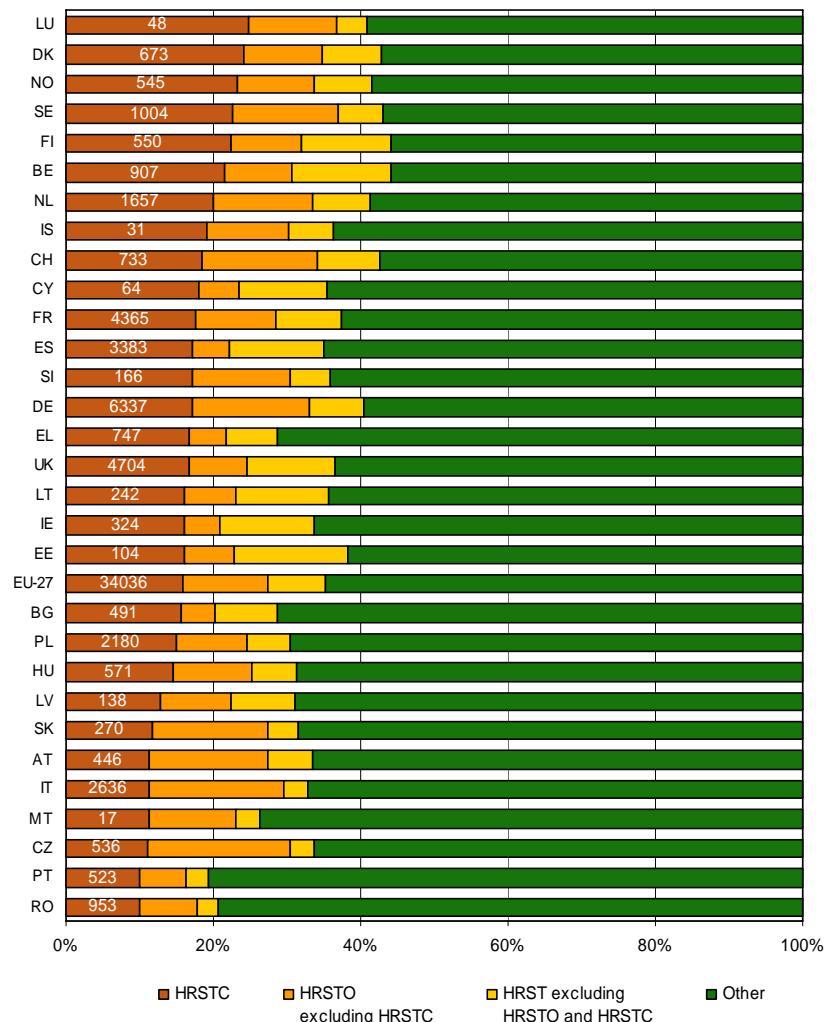
# Highly qualified workers in science and technology

## National employment characteristics

Highly qualified workers in science and technology (HRSTC) are active stakeholders in the development of knowledge and technical innovation. Across the EU, there has been dynamic growth in HRSTC employment in the last five years. In 2006, 34 million tertiary educated persons were employed in an S&T occupation, most of them as professionals. The highest share of HRSTC is found in the education sector. The share of young HRSTC is growing fastest in Cyprus and in Poland.

## The EU accounted for 34 million highly qualified human resources in science and technology in 2006

Figure 1: Employment distribution of human resources in science and technology (HRST) and non-HRST, aged 25-64, as a percentage and in thousands, in the EU and selected countries, 2006



Exception to the reference year: LU, IS and CH 2005. Source: Eurostat HRST database  
EU-27 aggregate estimated with 2005 data for LU.  
For HRST definitions see methodological notes on page 7.

In 2006, close to 35% of the total employed population of 214 million in the EU were human resources in science or technology, which accounts for 75 million persons. Of them, around 34 million were highly qualified workers employed in a science and technology position (HRSTC), i.e. both tertiary educated and working as professionals or technicians.



There are clear disparities at national level. The proportion of highly qualified human resources employed in S&T (HRSTC) varied between 10% and 25% in 2006. The largest proportion is found in Luxembourg, at 24.8%. This result illustrates the specificity of this small country, with the EU institutions and the financial institutions supporting the employment of highly qualified persons.

The second largest proportion is scored by Denmark (24.1%). Although the smallest of the Scandinavian countries, it measures up to the best countries in terms of research, education, innovation and IT development.

Despite being the EU country with the highest share of human resources in S&T (44% of the total employed population), Belgium ranks fifth in terms of HRSTC in 2006.

### Cyprus and Poland have the fastest growing young HRSTC population

Figure 2 illustrates to some extent the dynamism of highly qualified human resources employed in science and technology, focusing on those at the beginning of their careers. It compares the share of HRSTC who were aged 25-34 in 2006 and the annual average growth rate (AAGR) between 2001 and 2006 of this younger part of employees.

The EU-27 average for highly qualified employees in science and technology aged 25-34 was 30.6%. This area of employment remained stable between 2001 and 2006, the AAGR being only 0.1%.

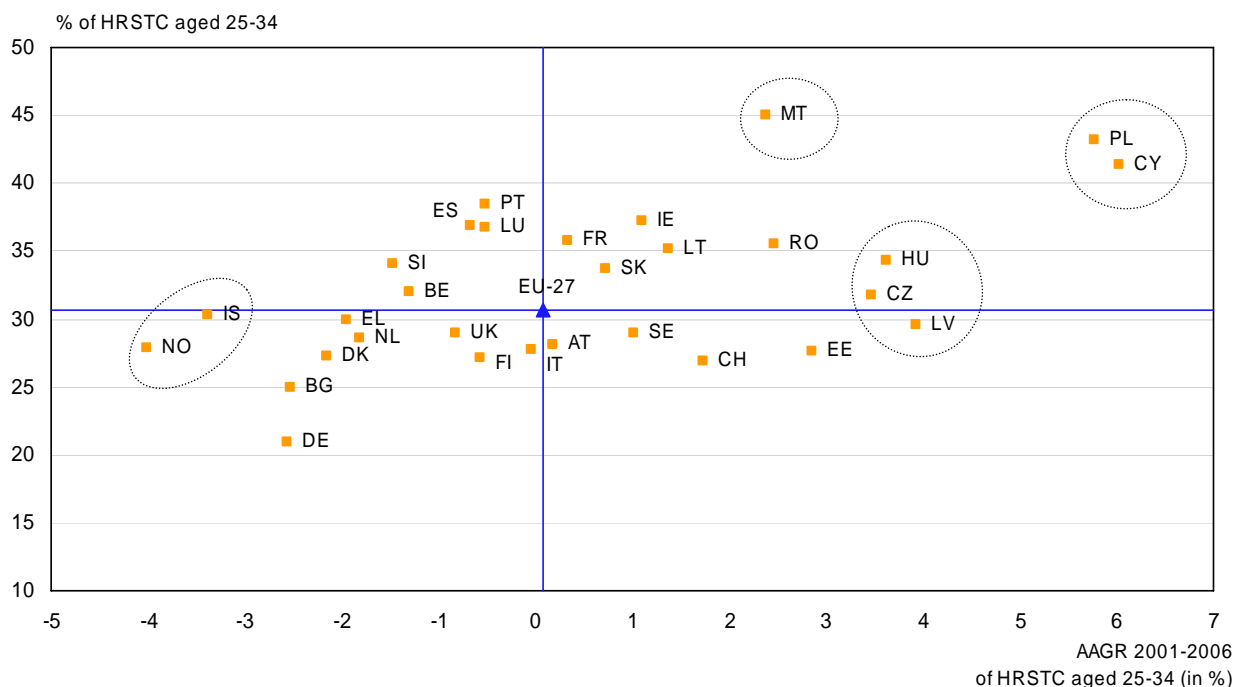
Nevertheless, the situation varies from one country to another. Cyprus and Poland both have a large share of HRSTC aged 25-34 (more than 40%), with the highest annual average growth rates in this age group of around 6%. The dynamism in Cyprus could be the result of the promotion of several activities to

increase the involvement of young people in science and technology.

The largest share of HRSTC aged 25-34, at 45%, is recorded in Malta but the annual growth was lower, at 2.4%. Despite a low proportion of HRSTC in 2006 (Figure 1), Latvia, Hungary and the Czech Republic demonstrated a certain dynamism with a significant increase in HRSTC aged 25-34 during the period 2001-2006. The growth rates were between 3.5% and 3.9%.

Norway and Iceland contrast strongly, with a notable fall in the share of HRSTC aged 25-34 between 2001 and 2006. In addition, Germany, which is the EU country with the largest HRSTC employment level in absolute terms, showed an ageing of its highly qualified employees in science and technology. Its proportion of HRSTC aged 25-34 registered a marked drop of -2.6% between 2001-2006.

**Figure 2: Annual average growth rates in 2001-2006 of highly qualified human resources employed in science and technology (HRSTC) aged 25-34 and proportion of HRSTC aged 25-34 of all age groups, in the EU and selected countries, 2006**

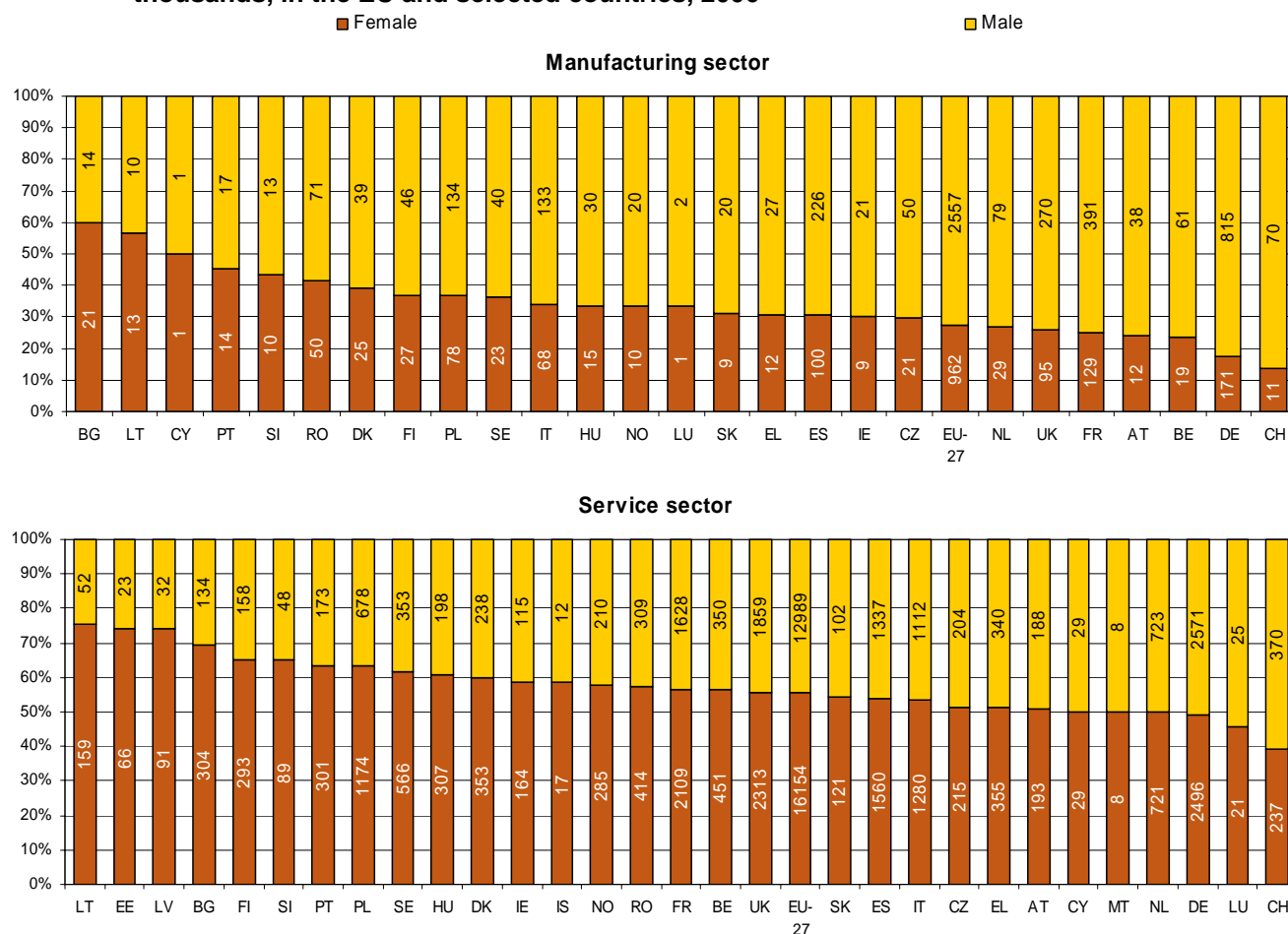


Exceptions to the reference year: LU, IS and CH 2005.  
 EU-27 aggregate estimated with 2005 data for LU.  
 AAGR is calculated on HRSTC aged 25-34 expressed as a percentage of all age groups.

Source: Eurostat HRST database

## 27% of the HRSTC employed in manufacturing in the EU were female

Figure 3: Gender distribution of highly qualified human resources employed in science and technology (HRSTC), aged 25-64, in the manufacturing and service sectors, as a percentage and in thousands, in the EU and selected countries, 2006



Exceptions to the reference year: LU, IS and CH 2005.  
EU-27 aggregate estimated with 2005 data for LU.

Source: Eurostat HRST database

Figure 3 shows the specificities of HRSTC across their sectors of economic activity and gender. As expected, females were more represented in services than in manufacturing. On average, in 2006 only 27% of the HRSTC employed in manufacturing in the EU were female. At the same time, the share of female HRSTC in services exceeded parity, at 55%. In this sector, only four countries had a proportion of highly qualified male employed in science and technology higher than the proportion of female: the Netherlands, Germany, Luxembourg and Switzerland.

Conversely, in manufacturing, Bulgaria had the highest proportion of highly qualified female employed in S&T, at 60%. These persons are predominantly employed in textiles and in the food industry sectors. Lithuania and Cyprus were the two other countries where the female HRSTC proportion was at least 50% in the manufacturing sector.

Of the EU countries, Germany is found at the end of the scale in terms of proportion of female HRSTC in both sectors, services and manufacturing. Indeed, of the almost one million HRSTC employed in manufacturing, close to 83% were male. Switzerland is the only country with a higher rate (86%).

Even if gender segregation is less clear, the same observation can be made for services. Germany (even if parity was almost achieved) scored the third smallest proportion of female HRSTC in this sector, at 49%. Again, Switzerland is found at the absolute end of the scale. Among the relatively large HRSTC population (607 thousand persons) employed in services in Switzerland in 2006, only 39% were female.

## Highest share of HRSTC in the education sector

Table 1 gives an idea of the representativeness of highly qualified human resources in science and technology (HRSTC) in specific sectors of economic activity. It compares the three sectors with the highest shares of HRSTC with the total for all sectors.

In 2006, the employed population of HRSTC in the EU accounted for more than 34 million persons in the 25-64 age group. Of this population, a quarter was working in *Education*. The *Health and social work* and *Real estate, renting and business activities* sectors had lower HRSTC shares of 18% and 17% respectively.

A look at the national distribution of highly qualified human resources employed in science and technology by selected sector of economic activity shows a number of disparities. In Malta, two HRSTC out of five were employed in *Education*. The second highest share of this type of employment in education was registered in Greece, which also had the highest

proportion of HRSTC among total employment in this sector (80.9%). Spain was second in HRSTC predominance among total employment in *Education* (79.6%).

In three Scandinavian countries (Denmark, Finland and Norway), HRSTC were employed primarily in the *Health and social work* sector. Almost 30% of Danish HRSTC were working in this sector. Italy had the largest proportion of HRSTC in *Real estate, renting and business activities*.

Finally, in the *Health and social work* and *Real estate, renting and business activities* sectors, the proportion of HRSTC was lower for all countries than in *Education*. The highest shares were found, respectively, in Bulgaria (57.8%) in the former and in Greece (54.8%) in the latter. In addition, Greece is the only country to place high in all three selected sectors in terms of share of HRSTC among the respective sectors of employment.

**Table 1: Highly qualified human resources employed in science and technology (HRSTC) aged 25-64, in thousands and as a percentage of respective employment, in all sectors and in selected sectors of economic activities, in the EU and selected countries, 2006**

	All sectors		Education		Health and Social work		Real estate, renting and business activities	
	in 1000s	as % of total employment	in 1000s	as % of respective employment	in 1000s	as % of respective employment	in 1000s	as % of respective employment
EU-27	34 036 s	18.1 s	8 511 s	60.1 s	6 187 s	33.3 s	5 737 s	32.6 s
BE	907	23.6	255	71.4	218	45.1	144	40.8
BG	491	17.1	139	65.8	90	57.8	53	40.3
CZ	536	12.2	125	46.5	63	20.6	93	32.6
DK	673	28.5	136	73.1	195	44.5	104	40.3
DE	6 337	19.5	1 240	61.9	1 105	30.6	1 040	31.3
EE	104	18.6	29	54.8	11 u	40.2 u	13 u	39.2 u
IE	324	19.4	85	67.6	74	41.0	57	36.7
EL	747	18.4	260	80.9	116	52.9	145	54.8
ES	3 383	19.3	839	79.6	501	46.0	619	37.4
FR	4 365	19.4	997	60.2	890	31.6	729	31.1
IT	2 636	12.4	722	45.8	517	34.5	612	27.6
CY	64	20.6	17	76.3	7	55.8	10	42.6
LV	138	15.1	38	52.4	15	34.1	12	25.6
LT	242	17.9	64	54.0	38	39.1	27 u	36.4 u
LU	48	26.7	11	79.1	4	23.9	7	42.1
HU	571	15.7	188	59.7	63	24.1	83	31.6
MT	17	13.6	7	59.5	3	28.0	2 u	28.6 u
NL	1 657	24.2	380	72.9	355	31.2	312	37.1
AT	446	13.3	127	61.3	81	25.2	67	21.9
PL	2 180	17.0	696	64.9	236	29.2	271	36.4
PT	523	11.9	185	60.2	84	27.6	72	27.0
RO	953	11.7	212	52.6	95	24.5	88	37.8
SI	166	19.5	45	61.5	21	37.8	20	34.0
SK	270	13.1	82	50.5	30	21.0	41	35.1
FI	550	25.6	101	63.5	130	37.5	89	36.2
SE	1 004	25.8	277	61.2	214	33.4	197	35.7
UK	4 704	19.8	1 254	51.5	1 031	32.4	830	29.7
IS	31	24.3	8	67.9	7	34.8	6	49.2
NO	545	27.1	128	71.4	154	36.5	95	44.2
CH	733	21.8	137	48.8	118	27.9	142	38.2

Exceptions to the reference year: LU, IS and CH 2005.

EU-27 aggregate estimated with 2005 data for LU.

All sectors cover all sectors of economic activities in accordance with NACE rev 1.1.

Source: Eurostat HRST database

## Steady growth of HRSTC in the EU

Focus on *Education* is extended in Figure 4 by comparing the annual average growth rate of highly qualified human resources in science and technology (HRSTC) between 2001 and 2006 in this specific sector and in all sectors taken together.

### Education (code 80 NACE Rev. 1.1):

This sector includes both public and private education at any level or for any profession, oral or written and by radio and television.

It includes both education by the different institutions in the regular school system at the different levels as well as adult education, literacy programmes, etc. For each level of initial education the classes include special education for physically or mentally handicapped pupils. Adult education which is similar in content to the education given at specific levels is included in that level. This division also includes other education, such as driving schools.

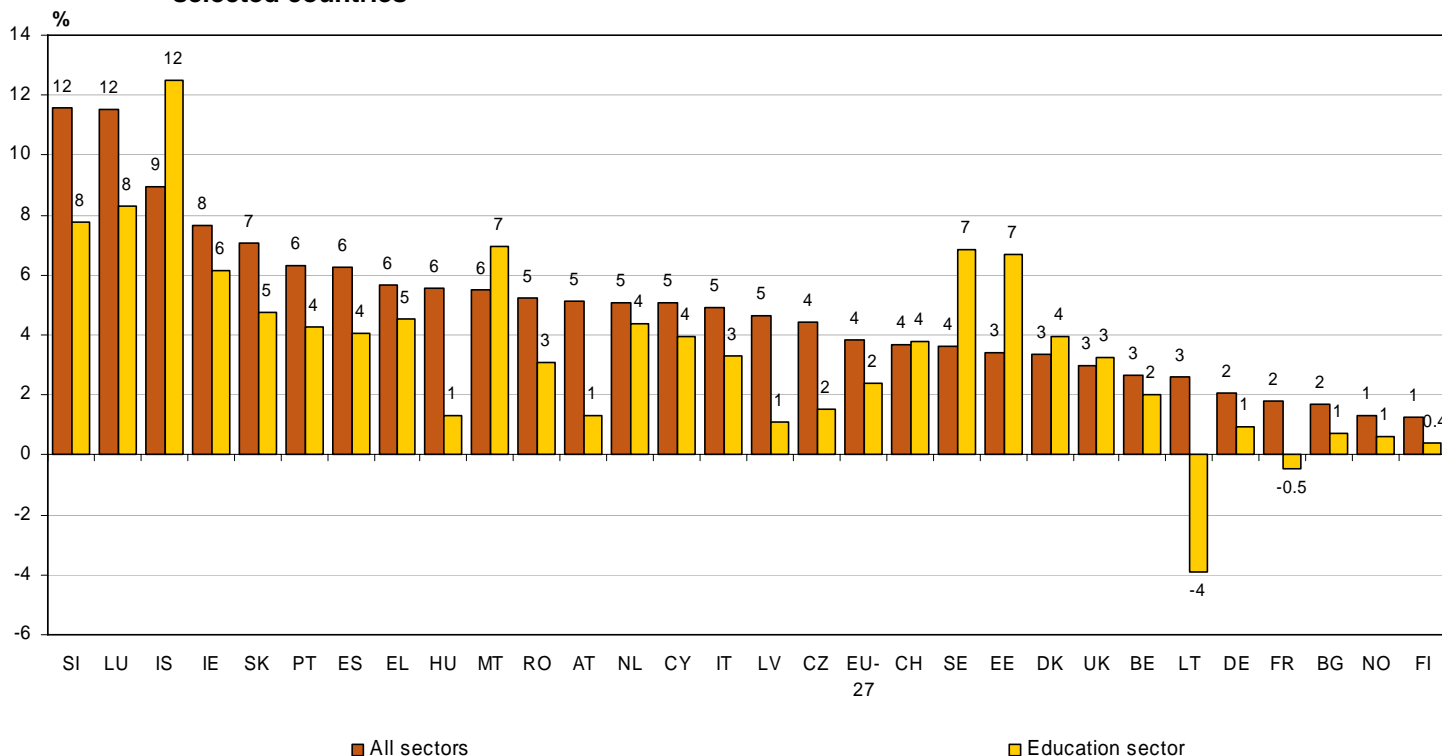
For most countries, growth in HRSTC was higher in the economy as a whole than in the specific sector of *Education*. Slovenia and Luxembourg had an annual growth of 8% in *Education* whereas in all sectors average growth was up to 12%. However, seven countries do not follow this trend. For example, Iceland, which is in third position in terms of AAGR in

all sectors (9%), had the highest growth of HRSTC working in *Education*, at 12%. In Estonia and Sweden, the difference between the two AAGRs was also significant and clearly shows the dynamism in this specific sector. Estonia's stock of HRSTC employed in *Education* grew by 7% between 2001 and 2006, whereas over the same period average growth in all sectors of economic activity was only 3%.

Two countries, Lithuania and France, registered a decrease in their number of highly qualified human resources employed in *Education* between 2001 and 2006. The largest decrease in stock of HRSTC employed in this sector was registered in Lithuania (-4%). This may be due in part to the current reorganisation of the Lithuanian economy, which is mainly creating rises in employment in industry.

Despite Lithuania's marked decline in this important sector, it is worth noting that the total stock of HRSTC in this country has been growing steadily in recent years. Overall, it is remarkable that not a single country shows a decline in total HRSTC stock.

**Figure 4: Annual average growth rates 2001-2006 of highly qualified human resources employed in science and technology (HRSTC) aged 25-64, in all sectors and in education sector, in the EU and selected countries**

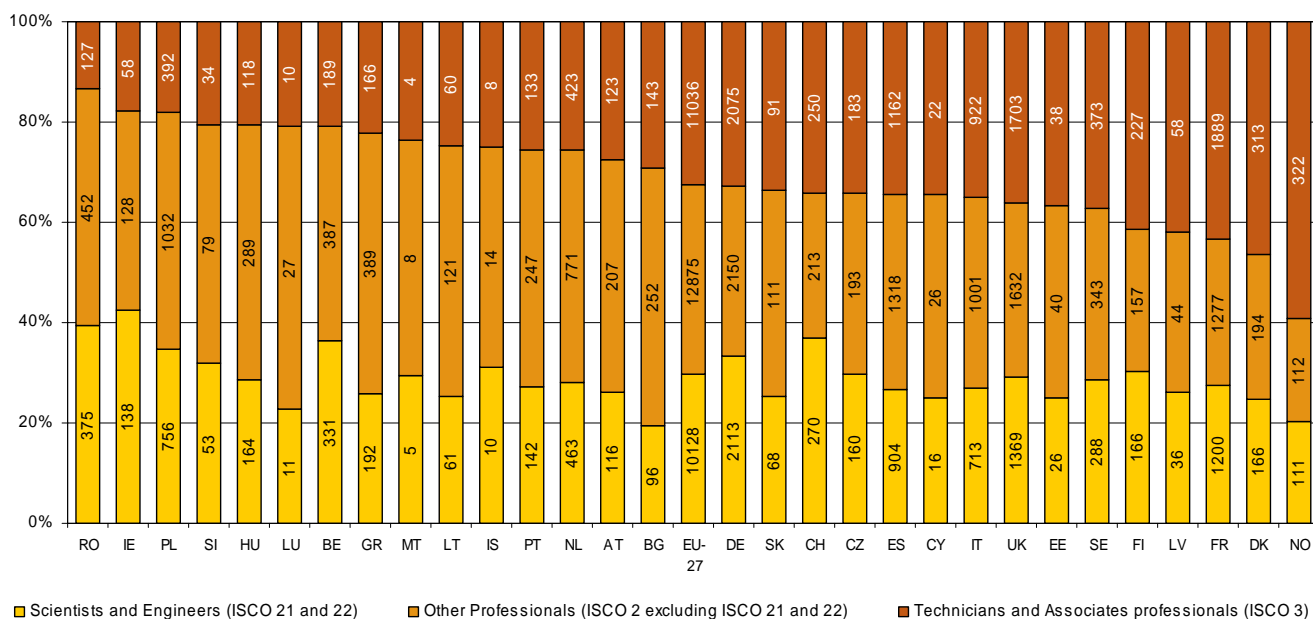


Exceptions to the reference year: LU, IS and CH 2005.  
 EU-27 aggregate estimated with 2005 data for LU and does not include PL.  
 PL missing because no NACE details available before 2004.  
 All sectors cover all sectors of economic activities in accordance with NACE rev 1.1.

Source: Eurostat HRST database

## European HRSTC are more inclined to work as professionals

**Figure 5: Distribution of highly qualified human resources employed in science and technology (HRSTC), aged 25-64, by occupation, as a percentage and in thousands, in the EU and selected countries, 2006**



Exceptions to the reference year: LU, IS and CH 2005.  
EU-27 aggregate estimated with 2005 data for LU.

Source: Eurostat HRST database

Figure 5, finally, analyses the distribution of highly qualified human resources in science and technology (HRSTC) according to their type of occupation. By definition, this specific group of human resources in science and technology can be employed as *Professionals* (ISCO88 COM code 2, including, for example, mathematicians and medical doctors) or *Technicians* (ISCO88 COM code 3, including, for example, computer assistants). *Scientists and Engineers* form a sub-set of particular interest of *Professionals*, listing persons employed in “Physical, mathematical and engineering” (ISCO88 COM 21) and in “Life science and health” occupations (ISCO88 COM 22).

In absolute terms, four countries (Germany, France, Spain and the United Kingdom) contained half of the highly qualified population in science and technology occupied as *professionals* and almost 60% of those employed as *technicians*.

HRSTC in Europe were more inclined to work as *professionals* than as *technicians*. This type of occupation requires a high level of knowledge and experience, generally provided by an education in science and technology. In 2006, more than 23 million HRSTC in EU-27 were employed as *professionals*. This gave a proportion of close to 70% of the total highly qualified S&T population. This holds true for the majority of countries studied, as the

share of HRSTC working as *professionals* was higher than the number employed as *technicians and associate professionals*. The only exception is found in Norway. In 2006, close to 60% of Norwegian HRSTC were employed as *technicians* rather than *professionals*.

Romania, one of the recently joined EU Member States, had 827 000 HRSTC employed as *professionals* in 2006. This was almost 87% of the total. Two other countries also had a proportion of HRSTC *professionals* of more than 80%: Ireland and Poland.

Countries do not display the same trends when looking at the share of *scientists and engineers*. On average, more than 10 million persons in EU-27 were *scientists and engineers* in 2006, which was close to 30% of the total European HRSTC population.

In Ireland, Finland and Switzerland, more than half of the HRSTC occupied as *professionals* were *scientists and engineers*. For Ireland, this is partly explained by the national efforts to attract foreign *scientists and engineers*. At the other end of the scale, Bulgaria and Luxembourg scored a share of *scientists and engineers* among *professionals* of below 30%, as this distribution also depends on the structure of the economy of the country.

## ➤ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

### 1. Human Resources in Science and Technology — HRST — concepts

HRST and their sub-groups (see Figure below) are measured in terms of educational achievement and occupation and follow the guidelines of the *Canberra Manual*, OECD, Paris, 1994.

#### • HRST — Human Resources in Science and Technology

Individuals who fulfil at least one of the following conditions:

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

or/and

- working in an S&T occupation as professionals or technicians (ISCO '88 COM codes 2 or 3).

#### • HRSTC — Core of Human Resources in Science and Technology

Individuals who have both successfully completed education at the third level in an S&T field of study (ISCED '97 version levels 5a, 5b or 6) and are employed in an S&T occupation as professionals and technicians (ISCO '88 COM codes 2 or 3).

#### • HRSTO – HRST in terms of occupation

Individuals who are employed in an S&T occupation: professionals (ISCO '88 COM code 2) or technicians and associate professionals (ISCO '88 COM code 3).

#### • SE — Scientists and Engineers

Individuals employed as physical, mathematical and engineering professionals (ISCO '88 COM code 21) or life sciences and health professionals (ISCO '88 COM code 22).

### 2. Data sources

The indicators presented are derived from the **European Union Labour Force Survey (EU LFS)**. The most recent data were compiled in April 2007 and refer to the spring quarter of 2006.

### 3. 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: Section D (codes 15 to 37)

Services: Sections G to Q (codes 50 to 99)

Real estate, renting and business activities: Section K (codes 70 to 74)

Education: Section M (code 80)

Health and social work: Section N (code 85)

(Two-digit codes refer to NACE divisions)

For further details on NACE classification, please refer to the internet site:

<http://ec.europa.eu/eurostat/ramon>.

### 4. Occupation

The classification of occupations is based on the *International Standard Classification of Occupations — ISCO*.

The following occupational breakdown is used in this publication:

#### • Professionals (ISCO' 88 code 2)

Occupations whose main tasks require a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities.

#### • Technicians and associate professionals (ISCO' 88 code 3)

Occupations whose main tasks require technical knowledge and experience in one or more fields of physical and life sciences, or social sciences and humanities.

### 6. Statistical abbreviations and symbols

: Not available

s Eurostat estimate

u Unreliable value

		<b>HRSTE</b> — HRST in terms of Education —			
		Tertiary education			Lower than tertiary education
		ISCED 6	ISCED 5a	ISCED 5b	ISCED < 5
<b>HRSTO</b> — HRST in terms of Occupation —	ISCO 2	Professionals	HRST Core — HRSTC		HRST without tertiary education
	ISCO 3	Technicians			
	ISCO 1	Managers	HRST non-core		Non-HRST employed
	ISCO 0, 4-9	All other occupations			
		Unemployed	HRST unemployed — HRSTU		Non-HRST unemployed — NHRSTU
	Inactive	HRST inactive		Non-HRST inactive	

## Further information:

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

-  **Science and technology**
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  -  High-tech industry and knowledge-intensive services
  -  Patent statistics
-  **Human Resources in Science & Technology**

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