

Human Resources employed in Science and Technology Occupations

Professionals and Technicians

Human resources employed in science and technology occupations (HRSTO) constitute a pool of employees who participate actively in the development of S&T activities and technological innovation.

In the EU, almost 59 million persons were HRSTO in 2006. This accounted for almost one third of the total employed population. Most HRSTO were technicians, and gender parity was achieved, as 51% of the human resources employed in an S&T occupation were female. In Lithuania 72% were female.

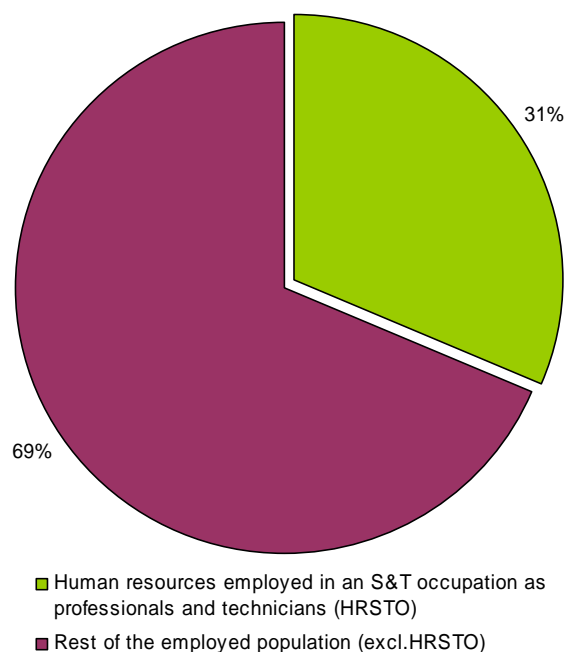
One third of the HRSTO in Sweden were found in the age group 50-64. Furthermore, HRSTO have grown most in Spain and Luxembourg in the last five years. The highest share of HRSTO was found in the education sector of economic activity, closely followed by the health and social work sector.

Almost 59 million EU professionals and technicians in 2006

Human resources employed in a science and technology occupation (HRSTO) constitute a highly skilled group of employees. The definition of this population is based on the International Standard Classification of Occupations (ISCO). HRSTO refers to persons occupied in one of the two broad ISCO classes: 2 — 'Professionals' (including, for example, mathematicians and medical doctors), and 3 — 'Technicians and associate professionals' (including, for example, computer assistants).

The specific population of HRSTO plays an important role by contributing actively to the EU's economic growth and productivity. This workforce is often considered to be a vital pool for potential innovation in the knowledge-based economy.

Figure 1: Share of human resources employed in an S&T occupation (HRSTO) as professionals and technicians among the total employed population aged 25-64 in the EU, 2006



Source: Eurostat HRST statistics

In 2006, the human resources employed in a science and technology occupation (HRSTO) accounted for 31% of the total employed population in the EU, i.e. almost 59 million persons.

But the situation was not homogeneous across the different EU Member States and clear disparities at national level can be observed.

In Lithuania, 72% of professionals and technicians were female

The Lisbon Strategy aims to make the European Union a competitive and dynamic knowledge-based economy by 2010. One way of reaching this goal is to extend the representativeness of females in S&T employment by developing more favourable conditions for women.

Figure 2 illustrates female distribution in terms of employment. It shows the national shares of females employed as professionals or technicians (HRSTO) compared to the shares of females in the rest of the employed population.

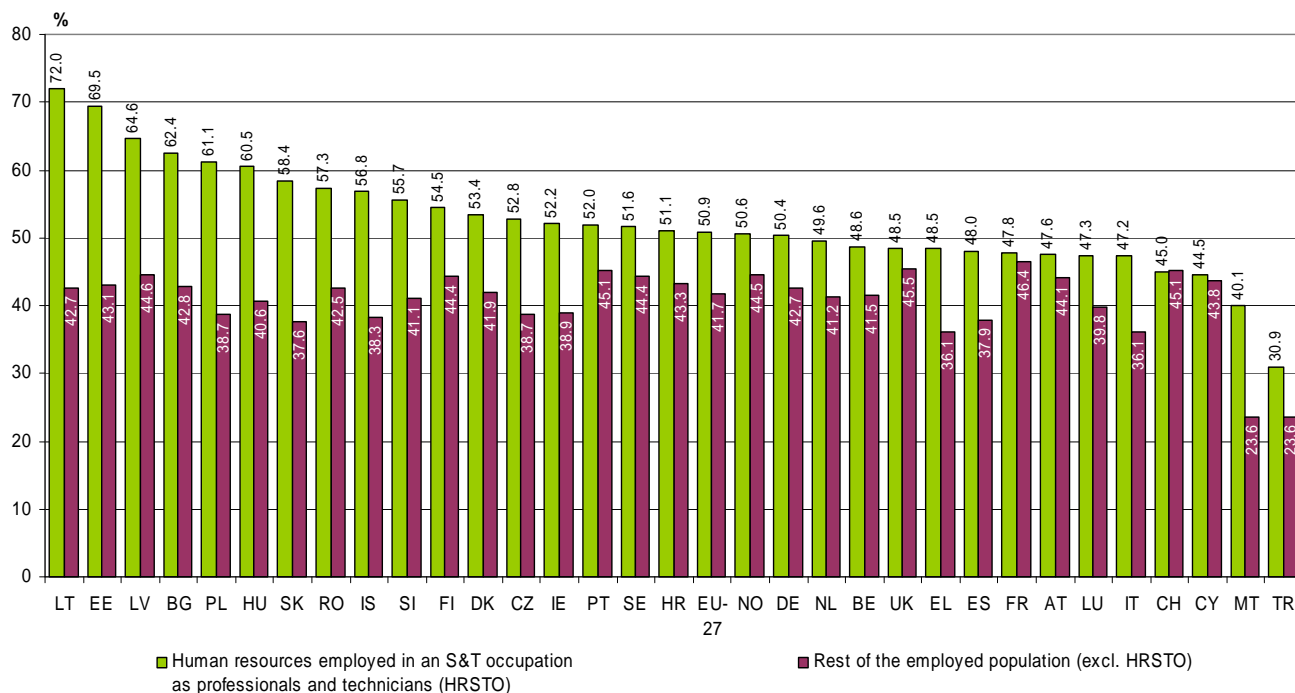
In 2006, females were clearly more represented in HRSTO than in the rest of the employed population. On an EU average, close to 51% of the human resources employed in an S&T occupation were female. At the same time, the share of females in the rest of the employed population was under parity, i.e. 42%. None of the countries covered (consisting of the EU Member States plus Iceland, Norway, Switzerland, Croatia and Turkey) achieved parity in occupations other than those of professionals or technicians. Conversely, 19 countries out of 32 had a share of female HRSTO over 50%.

In this figure, only one country, Switzerland, had a lower proportion of female HRSTO compared to the rest of the employed population. In addition, two other countries, Cyprus and France, demonstrated in 2006 a small difference between their female shares of HRSTO as compared with the rest of the employed population.

Of the EU Member States, Lithuania is found at the top of the scale in terms of proportion of female HRSTO. Indeed, of the 353 000 HRSTO employed there, 72% were female. Nevertheless, the gap between the female share of HRSTO and the female share in the rest of the employed population was the largest registered in 2006, at 29 percentage points.

The two other Baltic countries, Estonia and Latvia, also had large shares of female HRSTO, 70% and 65% respectively. At the other end of the scale, Malta — with only 40% women among HRSTO and 24% in the rest of the employed population — had the two smallest proportions of females in the EU. The Candidate Country Turkey showed an even lower proportion of women among the HRSTO labour force, at 31%.

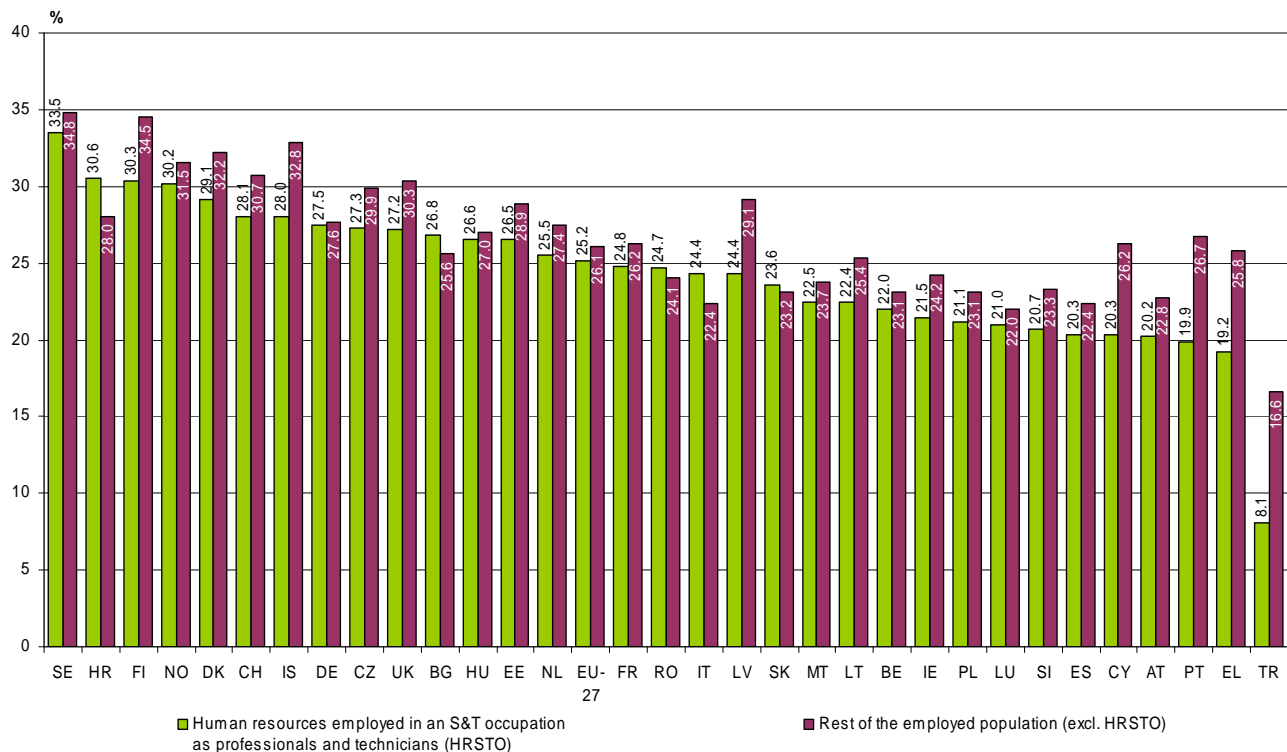
Figure 2: Share of females among the human resources employed in an S&T occupation as professionals and technicians (HRSTO) and in the rest of the employed population, aged 25-64, in the EU and selected countries, 2006



Source: Eurostat Employment & Unemployment (LFS) statistics, table lfsa_egais

The share of senior HRSTO fluctuated between 34% and 19% in the EU

Figure 3: Share of seniors aged 50-64 among the human resources employed in an S&T occupation as professionals and technicians (HRSTO) and in the rest of the employed population aged 25-64, in the EU and selected countries, 2006



Source: Eurostat Employment & Unemployment (LFS) statistics, table lfesa_egais

Stimulating young people's taste for science- and-technology careers is also a key objective for the EU in order to maintain today's volume of highly educated human capital and to achieve the Lisbon Strategy targets. For sustainable development in this area, there need to be enough young professionals and technicians to take over the tasks of the senior workforce of today when the latter retire.

From this point of view, Figure 3 shows the ageing of the employed workforce by studying the share of senior employees aged 50-64 among employees aged 25-64 by occupation. It clearly illustrates national disparities between the proportion of seniors among the HRSTO population and the rest of the employed population.

Firstly, in most of the countries, seniors aged 50-64 were more represented among non-HRSTO employees in 2006. Exceptions to this were found in only five countries out of the 32: Croatia, Bulgaria, Romania, Italy and Slovakia. But even in these countries the differences were minor, with Croatia having the largest gap between the share of senior HRSTO (31%) and senior non-HRSTO (28%).

Secondly it can be noted that in 2006, the share of senior HRSTO aged 50-64 fluctuated from one EU Member State to another, with shares of between 34% and 19%. On average across the EU, 25% of employed professionals or technicians were found in the age group 50-64, which compares to 26% for non-HRSTO.

In national terms, Sweden had the largest share of senior HRSTO, with one third of its professionals or technicians aged 50-64 in 2006. Croatia, Finland and Norway followed, with proportions of senior HRSTO around 30%. With the exception of Croatia, as previously mentioned, and alongside the remaining two Scandinavian countries Denmark and Iceland, these were also the countries with the largest shares of seniors in the rest of employment. The generation of baby boomers growing older could explain the ageing in these countries.

Finally, at the other end of the scale, Turkey had both the lowest proportions of senior HRSTO and non-HRSTO compared to the other countries, with 8% and 17% respectively.

Of the HRSTO in the EU, almost 18% were scientists or engineers

Figure 4 analyses the distribution of human resources occupied in science and technology (HRSTO) according to their type of occupation. As seen before, this specific group are either employed as professionals or technicians. 'Scientists and Engineers' (SE) is a sub-group of special interest of professionals, grouping persons employed in 'Physical, mathematical and engineering' (ISCO code 21) and in 'Life science and health' occupations (ISCO code 22).

In absolute terms, four Member States (Germany, France, Italy and the United Kingdom) accounted for more than 50% of the highly qualified population in science and technology occupied as professionals, and for 60% of those employed as technicians.

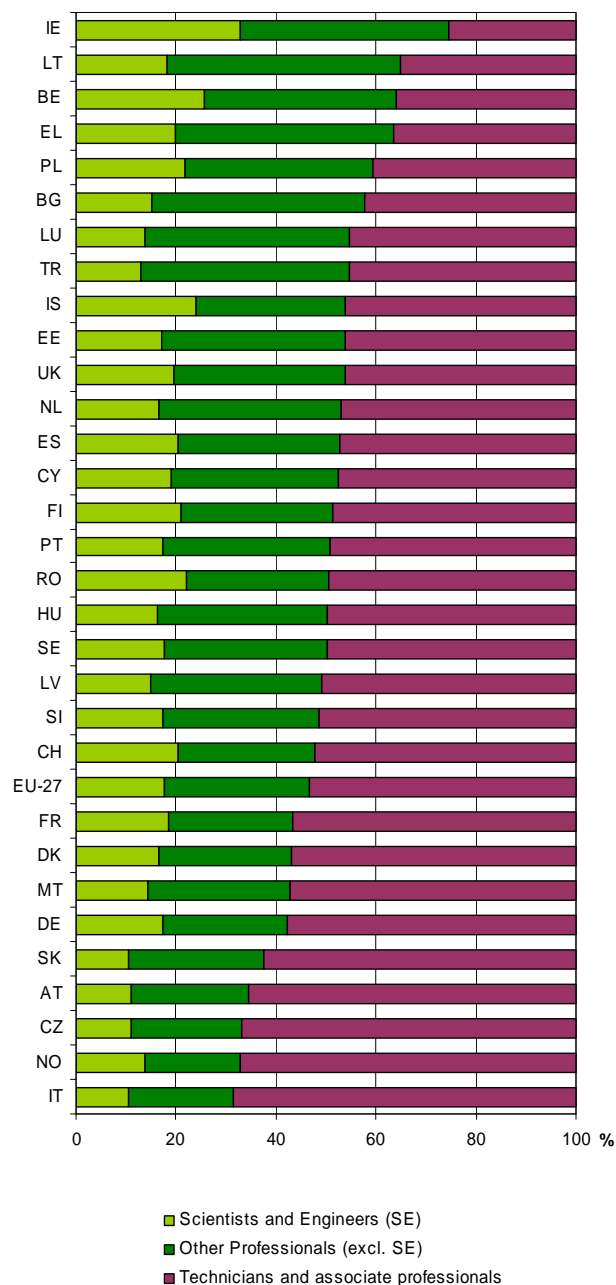
In relative terms and on average across the EU, HRSTO were more or less equally distributed between the occupations of technicians (53%) and of professionals (47%). Nevertheless, national disparities exist.

Ireland is at the top of the scale, with 74% of its HRSTO employed as professionals. Three other countries also had a proportion of HRSTO professionals of over 60%: Lithuania, Belgium and Greece.

Countries do not display the same results when one looks at the share of scientists and engineers. On average across the EU, 18% of the total HRSTO population were scientists and engineers in 2006. The highest shares were found in Ireland (33%) and in Belgium (26%).

If looking at the distribution within the professionals, in Ireland, Romania and Iceland, 44% of HRSTO occupied as professionals were scientists and engineers. For Ireland, this can partly be explained by the national efforts to attract foreign scientists and engineers. At the other end of the scale, Turkey, Luxembourg, Bulgaria, Slovakia and Lithuania all scored a share of SE among professionals of below 30%.

Figure 4: Distribution of human resources employed in an S&T occupation (HRSTO) by type of occupation, aged 25-64, in the EU and selected countries, 2006



Source: Eurostat HRST statistics

"According to UNESCO, personnel should be classified in the category of scientists and engineers if they have either: (i) completed education at the third level leading to an academic degree; or (ii) received third-level non-university education (or training) not leading to an academic degree but nationally recognised as qualifying for a professional career, or (iii) received training, or acquired professional experience, that is nationally recognised as being equivalent to one of the two preceding types of training (e.g. membership of a professional association or the holding of a professional certificate or licence)."

Source: Manual on the measurement of human resources devoted to S&T – Canberra Manual, the OECD, Paris, 1995, p. 69

Highest share of European HRSTO in the education sector

Table 5 shows the representativeness of the human resources employed in science and technology as professionals or technicians (HRSTO) in specific sectors of economic activity. It compares three sectors, known for having high shares of HRSTO, with the total for all sectors¹.

In 2006, the employed population of HRSTO in the EU accounted for almost 59 million persons in the 25-64 age group. Of this population, 45% was working either in *education* or in *health and social work* or in *public administration, extra-territorial organisation and bodies* sectors.

The average percentage of HRSTO employed in education for the EU was 74%. Among the twelve Member States which joined the

¹ Other sectors of economic activities with high shares of HRSTO but not shown in this publication are 'financial intermediation' and 'real estate, renting and business activities'.

European Union in 2004 and 2007, only four had a higher score than the EU average, with Slovenia displaying the highest (80%). Moreover, Luxembourg held first place with 93% of people employed in the education sector being HRSTO.

In the health and social work sector the majority of the EU Member States had shares of HRSTO between 45% and 65%. However, the highest score (71%) was registered in Poland and the lowest (34%) in Portugal. Latvia and Lithuania were the only countries with higher shares of HRSTO here than in the education sector.

HRSTO were less employed in the public administration, extra-territorial organisation and bodies sector than in the other two mentioned sectors in all countries, except Denmark, Germany, Luxembourg, Portugal, Finland, Sweden and Norway. In Sweden 64% were HRSTO compared to 20% in Ireland.

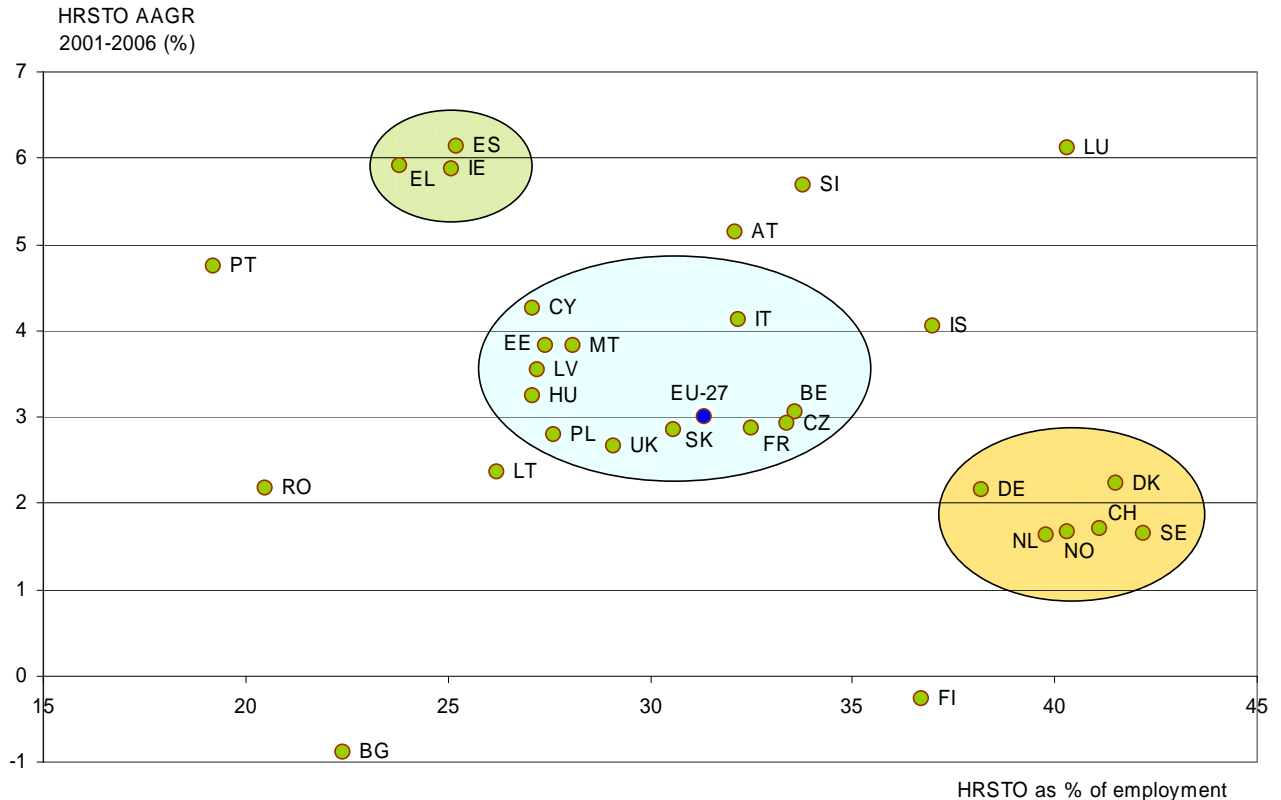
Table 5: Human resources employed in an S&T occupation as professionals and technicians (HRSTO) by type of economic activity, aged 25-64, in thousands and as percentage of employment, in the EU and selected countries, 2006

Human resources employed in an S&T occupation as professionals and technicians - HRSTO								
	All sectors		Education		Health and Social work		Public administration, extra-territorial organization and bodies	
	in 1 000s	as % of employment	in 1 000s	as % of employment	in 1 000s	as % of employment	in 1 000s	as % of employment
EU-27	58 856	31.3	10 492	74.0	10 010	53.6	6 024	41.8
BE	1 303	33.6	280	80.2	298	61.3	100	23.3
BG	635	22.4	142	67.6	97	61.3	79	36.8
CZ	1 467	33.4	194	71.4	199	65.4	148	48.1
DK	983	41.5	159	79.4	214	49.0	81	50.3
DE	12 474	38.2	1 609	82.3	2 243	61.8	1 651	62.6
EE	152	27.4	34	66.8	18	54.7	17	49.0
IE	419	25.1	92	73.5	93	51.5	22	19.9
EL	970	23.8	281	87.8	148	67.6	93	25.3
ES	4 435	25.2	927	83.5	583	51.3	409	36.4
FR	7 299	32.5	1 247	74.5	1 199	42.5	744	32.2
IT	6 785	32.2	1 257	80.6	1 018	67.2	433	31.0
CY	85	27.1	17	78.5	8	61.3	9	30.3
LV	250	27.2	47	58.8	28	62.0	38	49.5
LT	353	26.2	77	62.5	67	65.1	32	44.8
LU	74	40.3	14	92.7	10	53.1	16	53.1
HU	987	27.1	214	68.9	156	59.6	107	39.7
MT	35	28.1	9	79.7	5	49.2	4	28.1
NL	2 719	39.8	429	82.9	683	60.8	271	52.6
AT	1 075	32.1	162	77.8	169	53.3	83	34.7
PL	3 577	27.6	762	70.9	580	70.6	481	57.7
PT	842	19.2	195	63.6	102	33.6	120	36.4
RO	1 652	20.5	303	77.0	236	64.5	192	40.9
SI	286	33.8	58	80.2	33	62.6	29	53.9
SK	634	30.6	114	71.1	85	58.6	79	52.3
FI	789	36.7	117	74.2	153	44.3	58	52.7
SE	1 641	42.2	321	70.1	251	39.2	152	63.6
UK	6 935	29.1	1 429	58.7	1 333	41.9	578	30.8
IS	50	37.0	9	78.0	12	58.7	4	48.9
NO	809	40.3	155	79.9	169	41.5	79	61.8
CH	1 396	41.1	247	84.9	250	58.9	99	49.0
TR	2 422	13.4	604	73.5	314	61.3	325	27.5

Source: Eurostat HRST statistics

Luxembourg and Spain had the fastest growing HRSTO populations between 2001 and 2006

Figure 6: Annual average growth rates of human resources employed in an S&T occupation as professionals and technicians (HRSTO), 2001 to 2006, and their proportion in the total employed population, in the EU and selected countries, 2006



Break in series for all countries except BE and LU in 2006.

Source: Eurostat HRST statistics

Figure 6 illustrates the dynamism of human resources employed in S&T as professionals and technicians (HRSTO). For this, it compares the annual average growth rate of HRSTO with their share of total employment.

Over the period 2001 to 2006 the number of human resources employed in S&T increased at an annual average growth rate of 3% at EU level. In parallel, more than 31% of the employed population formed part of the HRSTO in 2006.

But national disparities are clearly shown in this figure. Two countries, Finland and Bulgaria, saw a decrease in their number of HRSTO between 2001 and 2006 (-0.3% and -0.9% respectively). Bulgaria also combined this decrease with one of the lowest proportions of HRSTO among total employment (22%). Romania and Portugal also had low shares of HRSTO.

In the same period, Luxembourg and Spain had the highest annual average growth in HRSTO, with 6.1%. In addition, the share of Luxembourg HRSTO among total employment was one of the highest in 2006, at 40%. This result illustrates the specificity of this small Member State, with the EU institutions and the financial institutions contributing to employment in S&T occupations.

Conversely in Spain, the share of HRSTO among the employed population was much smaller (25%). Ireland and Greece were in the same position, but, as all these three Member States have high growth rates, they might soon have shares of HRSTO equal to the EU average.

In Sweden and Denmark, and in four other countries, HRSTO accounted for a high share of total employment (around 40%), combined with a moderate growth rate (more or less 2%).

ESSENTIAL INFORMATION — METHODOLOGICAL NOTES

1. Human resources in science and technology

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

This publication shows results for the following specific HRST sub-population:

- **Human Resources in Science and Technology in terms of Occupation — HRSTO**

- Individuals who are employed in an S&T occupation as ‘professionals’ or ‘technicians and associate professionals’ (ISCO 88 COM codes 2 or 3).

This population features further the following sub-group of HRSTO:

- **Scientists and Engineers — SE**

- Employed in ‘physical, mathematical and engineering’ occupations (ISCO 88 COM code 21); or ‘life sciences and health’ occupations (ISCO 88 COM code 22).

Reference manual

Manual on the measurement of human resources devoted to S&T — Canberra Manual, the OECD, Paris, 1995.

2. Data sources

The indicators presented are derived from the **European Union Labour Force Survey (EU LFS)** and were compiled in January 2008. A break in series for HRST stocks exists for all countries except BE and LU in 2006. This is due to a change in the methodology of the LFS data collection modifying the periodicity of certain variables.

Quality of the data

The guidelines on the sample size reliability of the data, established by the EU LFS, are applied to the HRST statistics. Therefore, breakdowns where data lack reliability due to small sample size are flagged.

3. 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 COM 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 COM 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.

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. The following sectors are shown in this publication:

- **Education** (code 80)
- **Health and social work** (code 85)
- **Public administration, extra-territorial organisation and bodies** (codes 75 and 99)

(Two-digit codes refer to NACE divisions)

5. Statistical abbreviations and Symbols

- u Lack reliability due to small sample size
- : Not available

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

Further information

Data: [Eurostat Website: http://ec.europa.eu/eurostat](http://ec.europa.eu/eurostat)

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Science and technology

Human Resources in Science & Technology

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