Measuring gender differences among Europe's knowledge workers

Statistics in focus

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Contents

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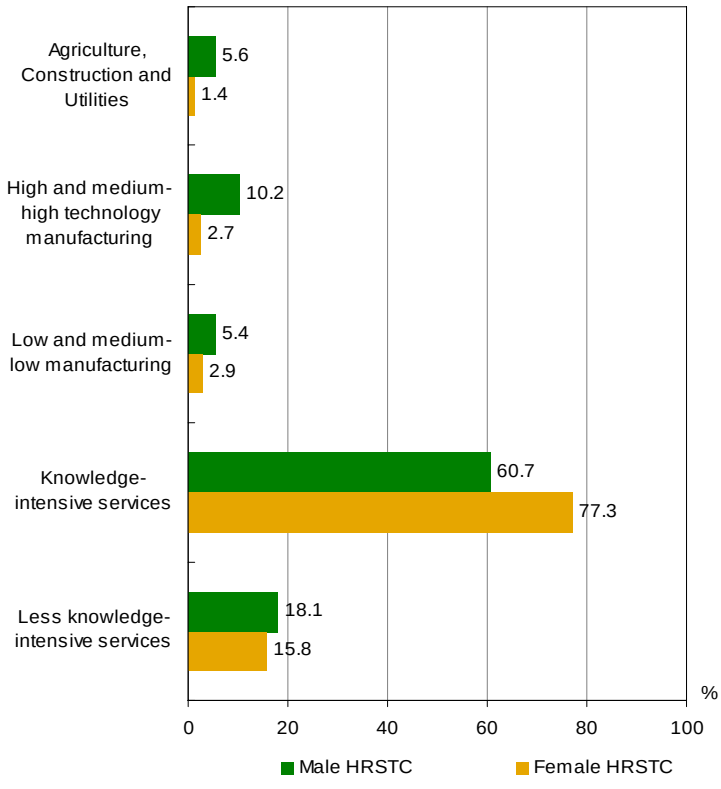
MAIN FINDINGS

- In 2004, 50.4% of human resources in science and technology core (HRSTC) in Europe were female: for comparison the female share in total employment of the 25-64 age group was only 44.1%.
- A large majority, 69.1%, of European HRSTC were working in *knowledge-intensive services.* This specialization is even more marked for female HRSTC with a share of 77.3% in 2004.
- The proportion of males working in *services* tends to be smaller for the group of Scientists and Engineers (SE), at 66.9%. At the same time, 22.9% of male SE were employed in *manufacturing* and 10.2% in *agriculture, construction and utilities*.
- At regional level, Poland had three of its regions with a share of female HRSTC higher than 60%. The other three Polish regions scored female HRSTC proportions between 50-60%.
- Scientists and Engineers are predominantly males. In Europe, only 29.0% of the Scientists and Engineers were female in 2004.
- Females, both human resources in science and technology (HRST) and non-HRST, are more likely to be unemployed than males; however this gender difference tends to decrease over the years.

Figure 1: Shares in % of male and female employed in S&T with S&T education (HRSTC), aged 25-64 years old, by broad sectors of economic activity in EU-25, 2004



Source: Eurostat HRST data base

Eurostat estimation: EU-25.

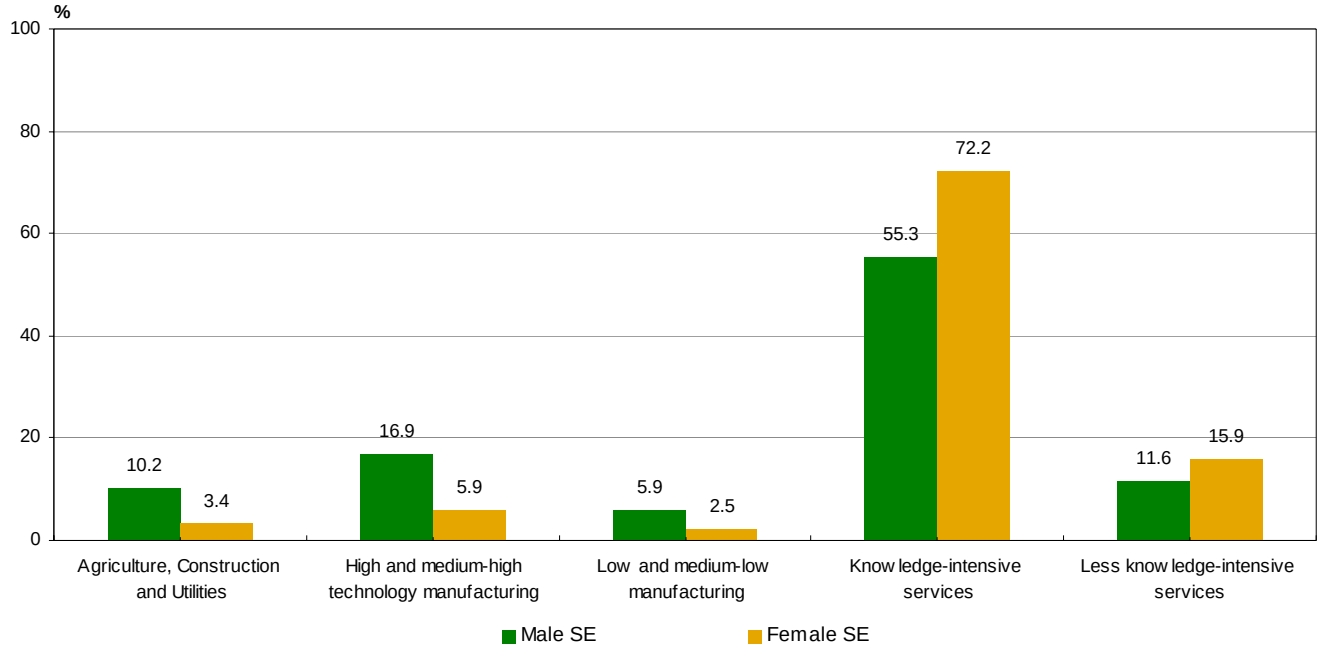
The number of human resources in science and technology — HRST — in Europe in the age group 25-64 was over 76 million in 2004. Of this population, close to 30 million (or 38.8%) were classified as core human resources in S&T — HRSTC — since they all share the characteristic of being employed as professionals or technicians and having successfully completed a tertiary education.

In 2004, the majority of European HRSTC were working in knowledge-intensive services (KIS) e.g. financial intermediation, education or health. Indeed, 69.1% of total HRSTC were working in this sector; only 10.6% declared that they were employed in manufacturing and 3.5% in agriculture, construction and utilities. As shown in Figure 1, gender differences appear in the distribution of female and male HRSTC according to sector of economic activity. Low and medium-low manufacturing, at 5.4%, employed the fewest of all male HRSTC. Agriculture, construction and utilities at 5.6% employed a slightly higher proportion of the male HRSTC. The largest part by far of male HRSTC were working in knowledge-intensive services.

Even if a majority of female HRSTC also worked in KIS, the share of female HRSTC employed in this sector (77.3%) was much higher than for males. The other four broad sectors of economic activity seem to attract a smaller proportion of female HRSTC than male HRSTC. Female HRSTC were least likely to work in agriculture, construction and utilities (1.4%) followed by manufacturing (5.6%).

European Scientists and Engineers mainly worked in the *knowledge-intensive services* sector

Figure 2: Shares in % of male and female employed in S&T as Scientists and Engineers (SE), aged 25-64 years old, by broad sectors of economic activity in EU-25, 2004



Source: Eurostat HRST data base

Eurostat estimation: EU-25.

A particular HRST group of interest is Scientists and Engineers (SE) who are more likely to be involved in leading-edge technology in *physical, mathematical and engineering* occupations and *life science and health occupations*. More than 8.7 million SE were employed in Europe in 2004. Of these 29% were female (see Table 3).

Specific gender differences of the SE distributed according to sector of economic activity are detailed in Figure 2. The proportion of male SE working in services tends to be much smaller than the proportion of male HRSTC employed in the same sector described in Figure 1.

Even if *services* employed most of the male SE (55.3% were employed in *KIS* and 11.6% in *less knowledge-intensive services*, *LKIS*), 22.9% of the male SE were employed in *manufacturing* and 10.2% in *agriculture, construction and utilities*. Thus, the proportion of male SE working in *services* is 11.9 percentage points lower than the share of male HRSTC employed in the same sector.

The shares of female SE employed in *KIS* (72.2%) and in *LKIS (*15.9%) were almost as high as the proportion of female HRSTC employed in the two service sectors. As previously, Figure 2 illustrates the specialization of females in *services* while male Scientists and Engineers are a little bit more equally distributed between the different selected sectors of economic activity.

In Europe, only 29% of the Scientists and Engineers were female in 2004

Table 3: Employment in 2004 of the 25-64 years old population, as a total, as core Human Resources in S&T, and as Scientists and Engineers. Figures are given by gender, in thousand, as % of respective labour force, and as annual average growth rates (AAGR) 1999-2004

	Total employment		Human resources in science and technology core - HRSTC -						Scientists and Engineers - SE -			
					AAGR (%) 1999-2004		as % of the respective labour force				AAGR (%) 1999-2004	
	in thousand	share of female (%)	in thousand	share of female (%)	Female	Male	Female	Male	in thousand	share of female (%)	Female	Male
EU-25	193 480 s	44.1 s	29 527 s	50.4 s	3.9 s	1.8 s	18.1 s	14.2 s	8 731 s	29.0 s	-1.7 s	1.4 s
EU-15	164 591 s	43.8 s	25 817 s	49.4 s	3.9 s	1.7 s	18.5 s	15.0 s	7 751 s	28.1 s	-1.5 s	1.3 s
BE	4 139	43.1	868	51.9	2.0	1.0	25.5	18.3	311	48.5	1.3	1.1
CZ	4 682	43.7	475	44.7	3.4	4.3	10.4	10.3	151	33.4	1.8	-0.6
DK	2 742	46.5	627	55.9	4.7	2.4	30.4	21.0	147	32.0	6.2	-0.7
DE	35 463	45.0	6 028	43.3	2.8	0.7	16.8	17.7	1 974	21.8	1.8	0.8
EE	595	49.9	84	69.2	-0.5	2.1	20.4	9.3	17	51.0	-6.2	-2.2
EL	4 331	38.1	703	47.7	5.7	5.1	19.4	14.5	178	31.6	6.8	4.3
ES	17 866	39.1	3 046	49.7	9.5	6.7	21.2	14.7	857	38.8	9.9	7.7
FR	24 161	46.3	4 073	52.0	2.9	1.6	19.2	15.5	1 181	21.6	1.8	3.7
IE	1 836	42.0	287	51.9	8.8	7.4	22.9	15.0	130	49.1	7.2	8.2
IT	22 438	39.1	2 429	49.9	7.9	4.0	13.9	9.3	765	34.0	9.3	4.9
CY	336	43.8	60	45.7	11.0	6.7	20.4	19.2	14	40.8	11.9	5.2
LV	1 021	47.9	117	65.7	1.2	0.8	16.2	8.2	35	51.4	-2.5	-0.1
LT	1 437	48.8	219	65.6	-5.1	-1.2	19.6	10.3	65	55.5	-0.1	-1.2
LU	186	40.7	41	39.7	6.7	6.1	21.5	22.9	10	17.7	-0.8	1.7
HU	3 894	45.6	541	57.1	5.1	4.4	17.9	11.4	161	33.1	4.1	9.7
MT	146	29.5	15	45.8	17.0	7.3	22.3	9.1	3	:	:	:
NL	8 028	44.4	1 483	45.9	5.3	3.3	22.7	20.5	431	28.6	-0.6	0.9
AT	3 654	45.4	431	43.9	6.8	8.6	12.7	13.4	103	29.4	5.8	5.2
PL	13 682	45.2	1 838	59.5	6.0	5.3	16.4	9.5	436	33.7	-2.1	4.4
PT	5 125	45.6	498	61.3	9.2	7.0	14.3	7.9	144	49.0	10.2	6.5
SI	946	45.9	137	60.4	6.4	4.6	20.4	11.6	40	39.9	11.2	10.1
SK	2 149	45.1	223	55.4	6.2	2.2	11.8	8.0	57	31.1	-3.2	0.0
FI	2 384	48.1	528	56.9	3.2	1.8	27.5	19.3	165	26.5	-15.0	5.9
SE	4 311	47.9	923	59.9	2.6	-1.5	28.8	17.6	264	39.3	4.1	5.2
UK	27 929	46.3	4 482	50.2	3.2	1.2	20.1	17.0	1 269	20.1	-18.6	-2.9
IS	156	47.2	28	55.6	5.7	4.3	25.7	18.1	8	49.1	5.1	-4.0
NO	2 273	47.5	508	54.3	3.4	2.8	29.4	21.8	114	36.7	4.4	3.7
EEA	195 910 s	44.1 s	30 062 s	50.5 s	3.9 s	1.8 s	18.2 s	14.3 s	8 853 s	29.1 s	-1.6 s	1.4 s
CH	3 959	45.1	697	34.9	8.9	2.1	15.6	23.9	260	14.9	8.9	1.4
BG	2 970	47.0	466	64.9	1.7	2.0	21.2	10.3	84	43.2	-9.4	-4.7
HR	1 583	44.5	:	:	:	:	:	:	:	:	:	:
RO	9 283	46.2	800	51.7	4.4	1.5	10.9	8.5	:	:	:	:

Source: Eurostat HRST data base

Exception to the reference year 2004: NL 2003.
Exception to the reference period 1999-2004: IE, IS, BG, EEA and EU-25 2000-2004, MT 2002-2004, NL 1999-2003.
Break in series: PT 2004, FI 2002, UK 2001 and BE 1999.
Provisional data: AT 2004, RO and SE 1999.

As seen in Table 3, in total 193 million persons between 25 and 64 years old were employed in the EU in 2004. The proportion of females in this population was 44.1%. In none of the countries shown is this proportion higher than 50%.

The highest proportion of female employment was found in Estonia (49.9%), followed by Latvia (48.8%). Malta shows the smallest proportion with 29.5%.

In the third and fourth column of Table 3 the total number of HRSTC and the share of females in this group of knowledge workers are shown. In all of the countries shown, except in Germany, Luxembourg Austria and Switzerland, the share of female HRSTC is much larger than the share of females in total employment.

Parity between male and female HRSTC was nearly achieved in the EU as a total, with a share of females of 50.4%. In the majority of the EU countries (15 out of 25), a larger number of HRSTC were female than male.

Despite its high share of female HRSTC, Lithuania shows declining figures for this group between 1999 and 2004 with an annual average growth rate (AAGR) of -5.1%. Also the number of male HRSTC decreased in Lithuania during the same period, but to a lesser extent, (-1.2%). For the period 1999-2004 the number of female HRSTC decreased also in Estonia (-0.5%), and the number of male HRSTC decreased in Sweden (-1.5%).

On the contrary, countries which had a share of female HRSTC below 50%, registered some of the highest growth rates for this group. This is the case for Malta and Cyprus which during the time period 1999-2004 had the highest AAGR of female HRSTC of all countries shown, 17.0% and 11.0% respectively.

When looking at the share of HRSTC in the female and male part of the labour force 25-64 years old, column 7 and 8 in Table 3, females are more likely to be HRSTC than males for almost all of the European countries. In the EU-25, where the proportion of male HRSTC as a percentage of the male labour force was 14.2%, the proportion of HRSTC in the female labour force reached 18.1%. Denmark had the highest proportion of HRSTC in the female labour force (30.4%), and Luxembourg registered the highest share of HRSTC in the male labour force (22.9%). At the other end of the scale, we find the Czech Republic with 10.4% of their female labour force in the age group 25-64 classified as HRSTC and Portugal with 7.9% of their male labour force in the same age group classified as HRSTC.

The analysis is however different when looking at Scientists and Engineers (SE), column 9-12 in Table 3. Indeed, strong disparities appear between males and females. In the EU, only 29.0% of SE were female in 2004 against, as previously seen, a proportion of 50.4% for the HRSTC. Only the three Baltic member states had more than half of their SE population female. Lithuania had the highest rate of female SE with 55.5%, followed by Latvia (51.4%) and Estonia (51.0%). As previously seen, these same three countries also registered the highest proportions of female HRSTC. The lowest proportion of female Scientists and Engineers, in 2004, was measured in Luxembourg (17.7%).

Between 1999 and 2004, the number of female SE decreased in Europe by an AAGR of -1.7%. During the same time, the number of male SE increased with an AAGR of 1.4%. This trend is however not the same in all countries. The highest growth in female SE is found in Cyprus, Slovenia and Portugal which all show an AAGR above 10% during the same period.

Three out of six Polish regions had a share of female HRSTC greater than 60%

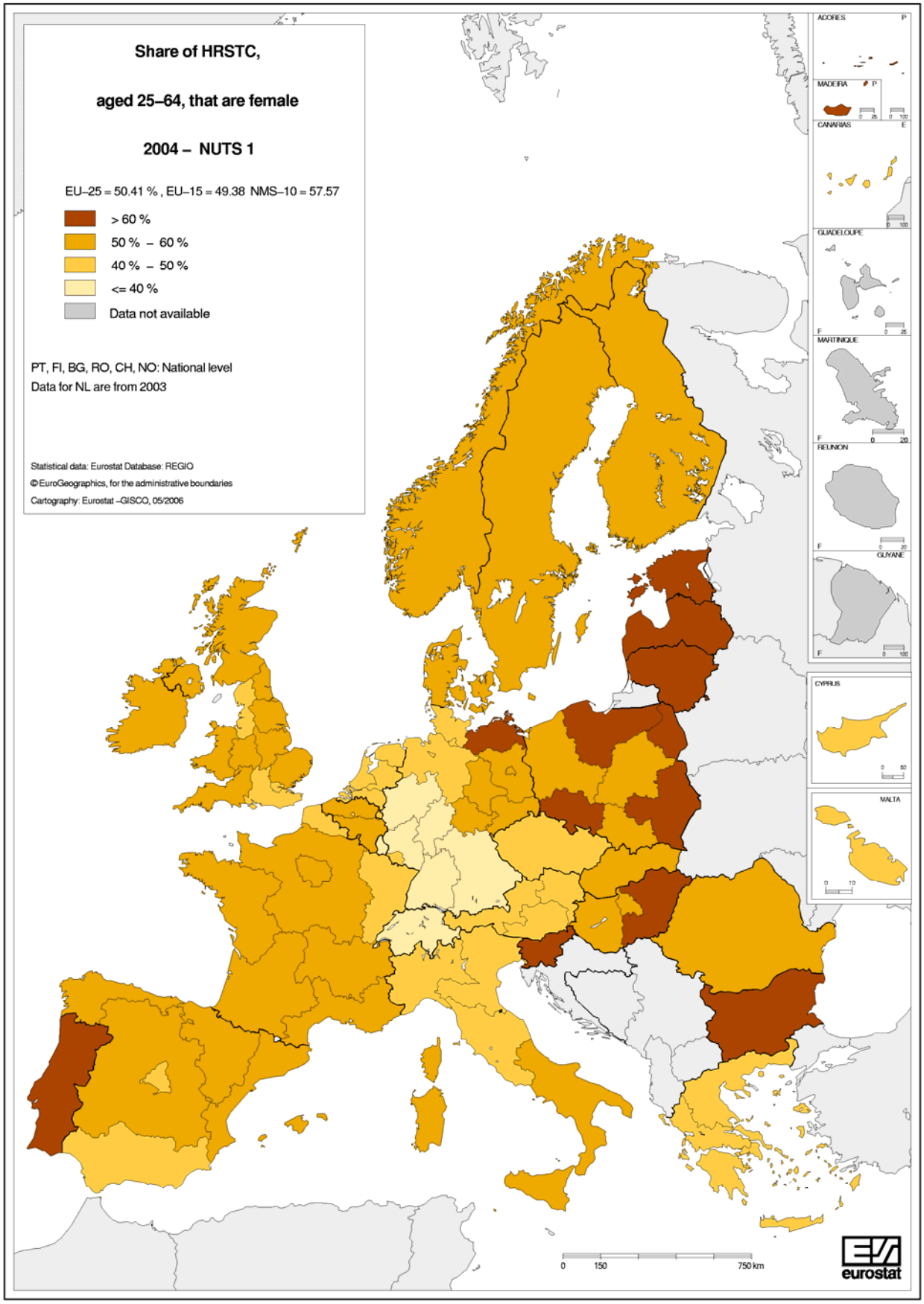
Map 4 shows the share of females in the population of HRSTC aged 25-64 by region. The majority of the regions, at NUTS 1 level, had a share of female HRSTC between 40% and 60% in 2004.

However, shares of female HRSTC higher than 60% are found in several regions and countries. Estonia, Latvia and Lithuania, where the country corresponds to the regional level, had the highest share of female HRSTC with 69.2%, 65.7% and 65.6%, respectively. Bulgaria for which data is not available at NUTS 1 level comes in fourth place with a share of female HRSTC of 64.9%. Three Polish regions also had a proportion of female HRSTC greater than 60%: Wschodni (61.2%), Poludniowo-Zachodni (61.1%) and Polnocny (60.1%). The other three Polish regions (Centralny, Poludniowy and Polnocno-Zachodni), are in the 50%-60% band, but with a proportion of female HRSTC close to the upper limit of 60%. Portugal and Slovenia also had a high share of female HRSTC, 61.3% and 60.4% respectively.

At the other end of the scale Switzerland, with a share of 34.8%, had the lowest proportion of female HRSTC. Following, Luxembourg scored a slightly higher proportion with 39.6% female HRSTC. Finally, five German regions out of 16 had a proportion of female HRSTC lower than 40%: Baden-Württemberg, Bayern, Hessen, Nordrhein-Westfalen and Rheinland-Pfalz. Only Mecklenburg-Vorpommern scored over 60% for 2004.

To a lower extent, regional disparities appear also in France. A majority of the French regions had a proportion of female HRSTC greater than 50% (six regions out of eight) in 2004. The regions Nord-Pas-de-Calais and Est are the exceptions as their share of female HRSTC was below 50%.

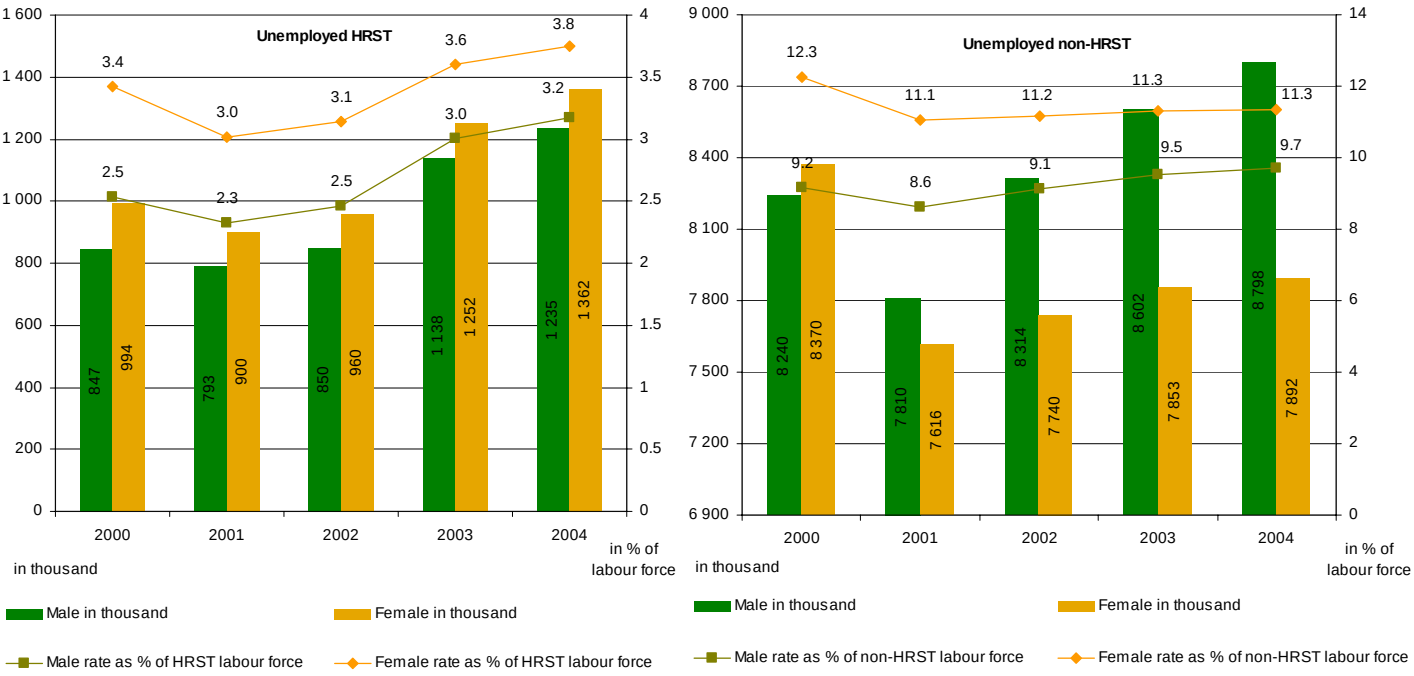
Map 4: Share of female human resources in science and technology core (HRSTC), by region (NUTS 1), 2004



Source: Eurostat HRST data base

Differences between female and male unemployment are decreasing over the years

Figure 5: Unemployed HRST and unemployed non-HRST, by gender, in thousand and as % of respective labour force, in EU-25



Source: Eurostat HRST data base

Eurostat estimation: EU-25.

Figure 5 illustrates the trends of unemployed human resources in science and technology (HRST) and unemployed non-HRST, by gender.

After a small period of decrease in 2000-2001, the number of unemployed people in both the S&T labour force and non-S&T labour force start to increase again. Differences between female and male distribution are found. For unemployed HRST, the number of females, 1.4 million, was higher than that for males, 1.2 million, in 2004. A similar relationship in unemployment figures between the genders can be observed for HRST for all the years shown. On the contrary, for non-HRST, a shift occurs in 2001 when the number of unemployed males (7.8 million) becomes larger than the number of unemployed females (7.6 million).

Female unemployment rates, also shown in figure 5, are higher than male unemployment rates for both HRST and non-HRST. In 2004, the unemployment rate in the group of female HRST was 3.8%, whilst the unemployment rate among their male counterpart was 3.2%. For the EU non-HRST population the female unemployment rate in 2004 reached 11.3% against 9.7% for males.

One interesting fact that can be concluded from the graphs is that the gender differences in unemployment rates seem to decrease over the years. Indeed, for the HRST population, the difference between the male and female unemployment rates are much smaller in 2004 than it was in 2000 (the difference equals 0.6 percentage points in 2004 against 0.9 percentage points in 2000). The same trend can be observed in the unemployment rates for the non-HRST population with a difference of 1.6 percentage points in 2004.

➢ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

1. Human resources in science and technology — HRST

HRST (S&T labour force) and their sub-groups are measured using characteristics 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 on of the following conditions:

- having successfully completed education at the third level 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 and 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).

• 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).

• Unemployed HRST
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) and are unemployed.

• Unemployed non-HRST
Individuals who have not successfully completed tertiary education in an S&T field of study and are unemployed.

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.

Remark: The term "unemployed HRST rate", used in the Figure 5, expresses the number of unemployed HRST on the number of people which compose the total HRST labour force. In parallel, the "unemployed non-HRST rate" is based on the number of unemployed people who are not HRST on the total non-HRST labour force.

2. Data source

The indicators presented are derived from Eurostat's Education database or from the European Union Labour Force Survey (EU LFS). The most recent data were compiled in November 2005 and refer to the spring quarter of 2004.

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.
In the present Statistics in Focus all data are presented at NUTS 1 on the basis of the NUTS 2003 version.

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:

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.

Knowledge-intensive services (KIS)

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 (LKIS)

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 organization n.e.c.; 93 Other service activities; 95 Activities of households as employers of domestic staff; 99 Extra-territorial organisations and bodies

Agriculture, construction and utilities

01-14 and 40, 41, 45

5. Statistical abbreviations and Symbols

: not available s Eurostat estimate

<table>
<tr><td></td><td></td><td></td><td colspan="3">HRSTE
— Education —</td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="3">Tertiary education</td><td>Lower than tertiary education</td></tr>
<tr><td></td><td></td><td></td><td>ISCED 6</td><td>ISCED 5a</td><td>ISCED 5b</td><td>ISCED < 5</td></tr>
<tr><td rowspan="2">HRSTO
— Occupation —</td><td>ISCO 2</td><td>Professionals</td><td colspan="3" rowspan="2">HRST core — HRSTC</td><td rowspan="2">HRST without tertiary education</td></tr>
<tr><td>ISCO 3</td><td>Technicians</td></tr>
<tr><td>ISCO 1</td><td>Managers</td><td colspan="3" rowspan="2">HRST non-core</td><td rowspan="2">Non-HRST employed</td></tr>
<tr><td>ISCO 0, 4-9</td><td>All other occupations</td></tr>
<tr><td rowspan="2"></td><td>Unemployed</td><td colspan="3">HRST unemployed — HRSTU</td><td>Non-HRST unemployed — NON_HRSTU</td></tr>
<tr><td>Inactive</td><td colspan="3">HRST inactive</td><td>Non-HRST inactive</td></tr>
</table>

Further information:

Data: EUROSTAT Website/Home page/Science and technology/Data

- **Science and technology**
  - Research and development
  - Survey on innovation in EU enterprises
  - High-tech industry and knowledge-intensive services
  - Patent statistics
  - ***Human Resources in Science & Technology***

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