

## II. Personnel of Research and Development

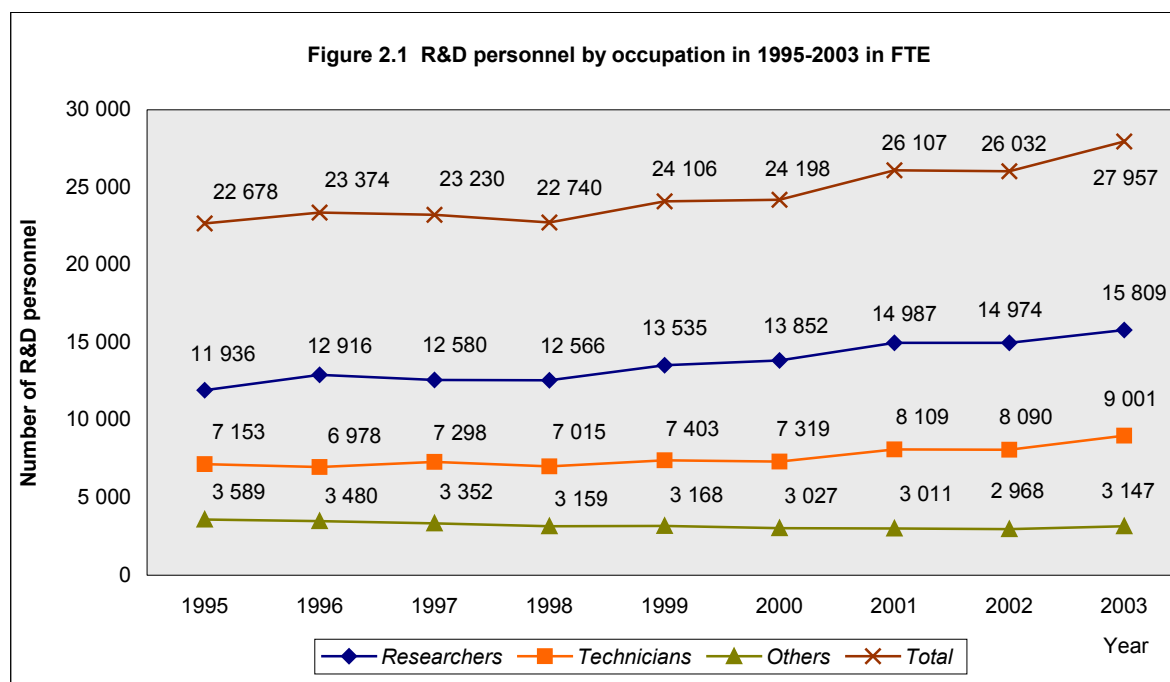
### R&D personnel by occupation

Total number of R&D personnel was 55 699 employees in the Czech Republic to 31 December 2003, of which 19 578 females. In comparison with the previous year, the number of employees engaged in R&D increased about 3,7 percentage points. The following table shows the breakdown of R&D personnel by surveyed indicators.

**R&D personnel by surveyed indicators in 2002 a 2003**

R&D personnel	2002		2003		Index 2003/2002	
	Total	Females	Total	Females	Total	Females
Headcount (31 December)	53 695	19 451	55 699	19 578	1,037	1,006
Average number	50 043	17 670	53 279	18 222	1,065	1,031
Full-Time Equivalent (FTE)	26 032	8 484	27 957	8 871	1,074	1,046

According to the FTE indicator (see Methodology), which is used for an international comparison, 27 957 personnel were engaged in R&D in the Czech Republic in the year 2003, which 8 871 were females. The number of researchers was 15 809 persons (56,5 %), from which 4 121 were females. Interannual comparison between years 2002 and 2003 shows the growth of total numbers of R&D personnel and also researchers. *Indicator of FTE is the most important indicator for the comparison,* tables and figures are presented here in this chapter in FTE. The development of the number of R&D employees during the 1995 – 2003 period is illustrated in figure 2.1.



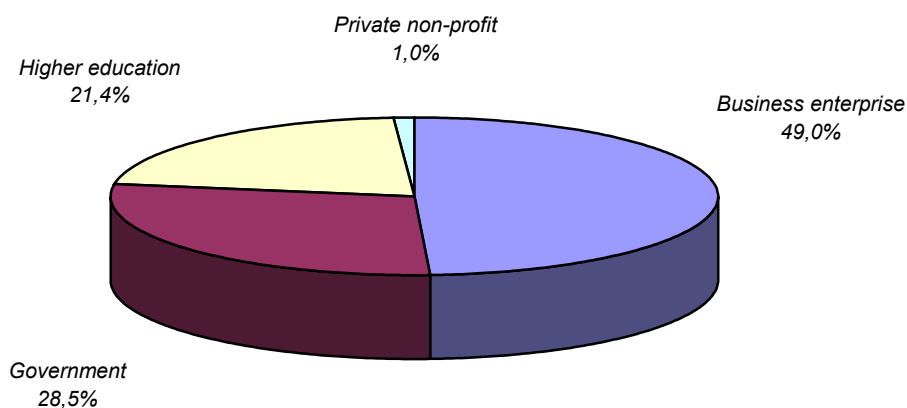
In 2001, EU-15 reported on average 10,3 R&D personnel per thousand labour force, 5,7 researchers per thousand labour force. In the Czech Republic, it was 5,4 R&D personnel per thousand labour force and it was 3,1 researchers per thousand labour force in 2003.

In comparison, for example Finland, which has the highest ratio within EU-15, reported 20,9 personnel per thousand labour force in the year 2002, above this average EU-15 there are Denmark, Netherlands and France. Finland has the highest number of researchers per thousand labour force (14,7 in the year 2002), the important shares of researchers per thousand labour force are in Japan (9,7 in the year 2002) and United States (9,1 in the year 2000).

### R&D employees by sector

In 2003, the largest number of R&D employees worked in the business enterprise sector, in total there were 13 711 employees, of which were 3 010 females. Figures illustrated, that males have the share 78,0 % and females have the share 22,0 %. The highest share of females engaged in R&D was recorded in the government sector (43,2 %) in the year 2003. A similar share of females engaged in R&D was recorded in the higher education sector (38,7 %). Figure 2.2 illustrates the percentage of R&D employees by sector in relation to the total number of R&D employees in the Czech Republic in the year 2003.

**Figure 2.2 The share of R&D employees in FTE by sector in 2003**



In comparison with the EU-15 average, the Czech Republic has different proportions in the higher education sector and the government sector. In 2001, the EU-15 average reached 29,2 % in the higher education sector and 14,4 % in the government sector.<sup>1</sup> The lower proportion of R&D employees surveyed in the higher education sector reflects the smaller amount of R&D expenditure devoted to research and development, which is carried out at universities in the Czech Republic. It is necessary to point out that the Academy of Science of Czech Republic and its' research centres belongs to the government sector. This fact is reflected in the reported percentage shares. The level of the amount depends on the applied supporting system of research and development, which varies in particular countries.

### R&D employees by sector in 2002 and 2003

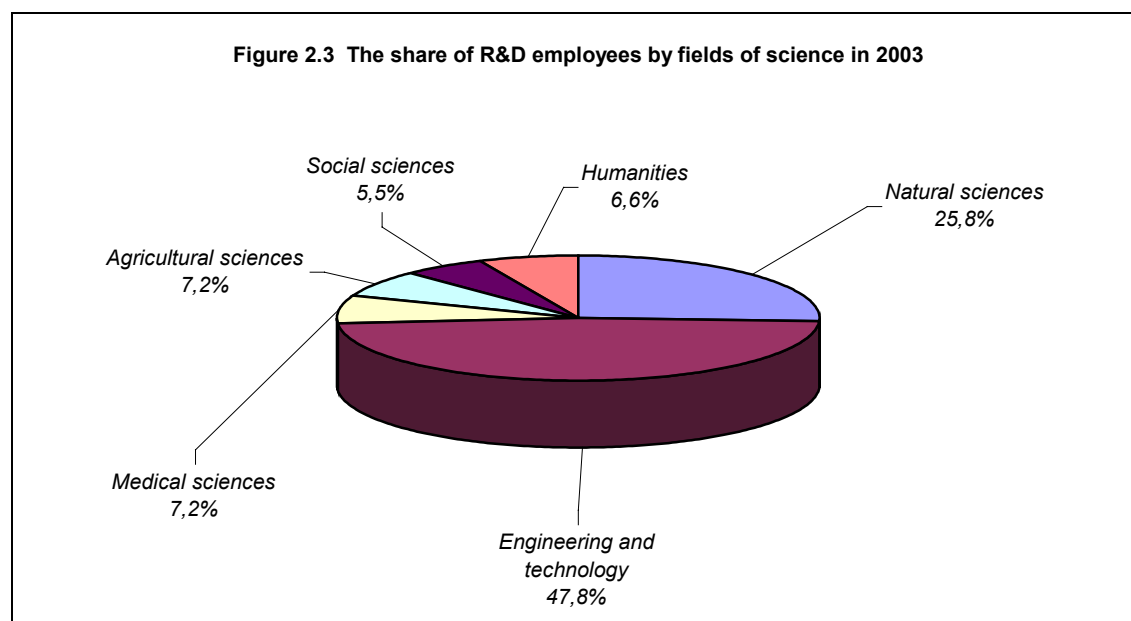
SECTOR	2002		2003		Index 2003/2002	
	Total	Females	Total	Females	Total	Females
Business enterprise	12 658	2 978	13 711	3 010	1,083	1,011
Government	7 351	3 137	7 977	3 448	1,085	1,099
Higher education	5 847	2 297	5 987	2 316	1,024	1,008
Private non-profit	176	72	282	97	1,602	1,347
<b>Total</b>	<b>26 032</b>	<b>8 484</b>	<b>27 957</b>	<b>8 871</b>	<b>1,074</b>	<b>1,046</b>

Numbers of employees in FTE are higher in all sectors in the year 2003 than in the year 2002, the highest increase was recorded in the private non-profit sector.

<sup>1</sup> In the business enterprise sector was this share equal to 55,2 %. This structure is not stable in time, but shares of particular sectors are floating. For example in 1999, the EU-15 reported following average shares: business enterprise sector (50,0 %), higher education sector (34,3 %), government sector (14,2 %) a private non-profit sector (1,6 %).

## R&D employees by field of science

In 2003, the largest number of R&D employees was recorded in engineering and technology. In this field of science, 13 366 employees worked on R&D projects, of which 2 508 were females. The figures are in line with the breakdown of R&D expenditure by fields of science. Currently, a major part of research and development activities is realized in engineering and technology. That is why 47,8 % of total number of R&D employees worked in this field of science. Natural sciences have the significant share with 25,8 %. The lowest number of R&D employees is in social sciences: 5,5 %, females have the share 48,1 % from total.



In comparison between years 2002 and 2003, there is an increase of percentage of employees in FTE in humanities, in total and by number of females. Assuming a detailed view of a breakdown by fields of science and by gender, the lowest share of women was recorded in engineering and technology (18,8 %), followed by natural sciences (35,5 %) in FTE in 2003. On the contrary, in medical sciences and agricultural sciences, the share of females slightly prevailed. The share of medical sciences made up 55,9 % and in agricultural sciences 53,6 %. The following table shows absolute numbers of R&D employees by field of science.

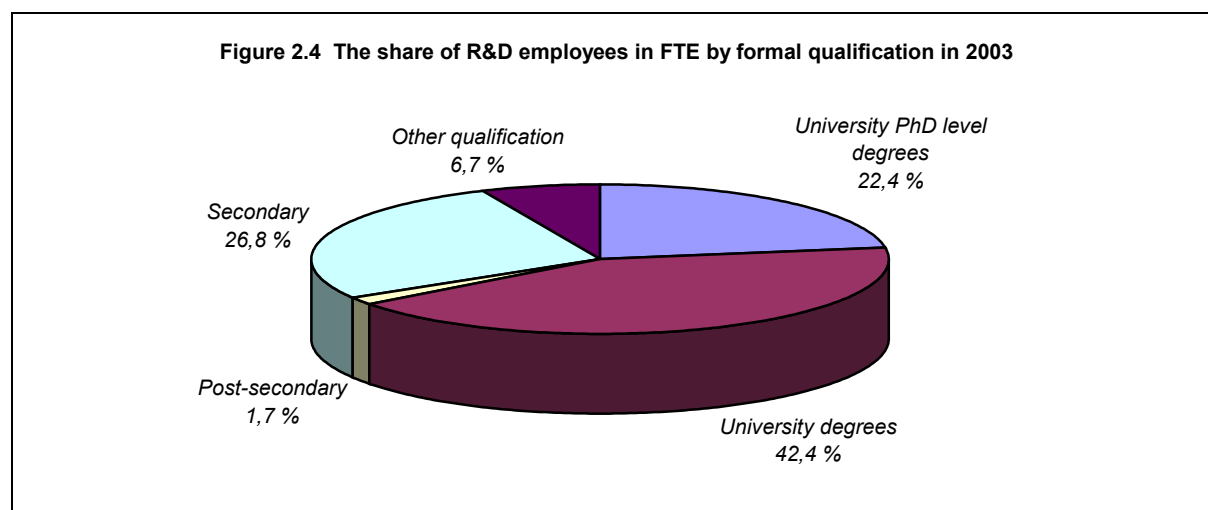
**R&D employees by field of science in 2002 a 2003 in FTE**

Field of science	2002		2003		Index 2003/2002	
	Total	Females	Total	Females	Total	Females
Natural sciences	6 982	2 573	7 202	2 555	1,032	0,993
Engineering and technology	12 748	2 595	13 366	2 508	1,048	0,966
Medical sciences	1 733	984	2 001	1 119	1,155	1,137
Agricultural sciences	1 806	978	2 005	1 074	1,110	1,098
Social sciences	1 453	709	1 533	737	1,055	1,039
Humanities	1 310	645	1 850	878	1,412	1,361
<b>Total</b>	<b>26 032</b>	<b>8 484</b>	<b>27 957</b>	<b>8 871</b>	<b>1,074</b>	<b>1,046</b>

The indexes for 2003/2002 showed that humanities recorded an increase of R&D employees. Increases were recorded in all fields of science in total. Shares of women decreased in engineering and natural sciences. On the contrary, humanities and medical sciences recorded increases of number of women engaged in R&D.

### R&D employees by formal qualification

Based on data concerning the structure of employees by level of formal qualification in 2003, the largest share from total number of R&D employees, was found to be personnel with basic university degrees with a 42,4 % share. The number of employees with university degrees at PhD level made up the 22,4 % share in 2003, the same as in 2002. The complete structure of R&D employees by formal qualification is illustrated in Figure 2.4.



In 2003, the highest share of R&D employees with university degrees at PhD level was reported in social sciences (35,2 %) and in medical sciences (32,3 %). The lowest share was recorded in engineering and technology (14,3 %). The highest share with secondary education was recorded in agriculture sciences (34,1 %). Total number of PhD was 6 256 employees R&D, of which was 1 467 females, it is 23,4 %.

Accordingly, the highest share of R&D employees with university degrees at PhD level (6 256 employees R&D) was recorded in the higher education sector (2 836 employees R&D) in 2003, it is 45,3 %. The number of 2 363 R&D employees with PhD was recorded in government, it is 37,8 %. The number of 993 R&D employees with PhD was recorded in business enterprise sector, it is 15,9 %.

### R&D employees by field of science and formal qualification in FTE in 2003

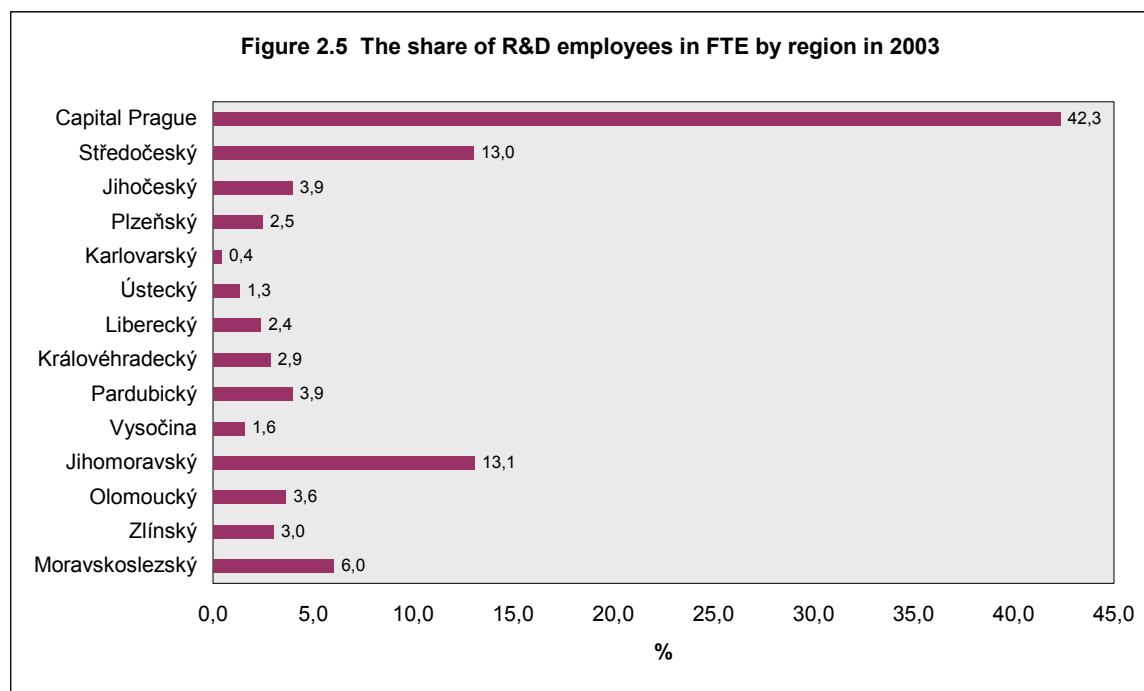
Field of science	Total	of which with education									
		university PhD		university		post-secondary		secondary		other	
		Total	Females	Total	Females	Total	Females	Total	Females	Total	Females
Natural sciences	7 202	2 180	464	2 744	892	70	27	1 804	1 035	404	137
Engineering and technology	13 366	1 907	257	6 252	838	316	58	3 927	1 186	965	167
Medical sciences	2 001	647	221	791	450	15	11	519	416	30	21
Agricultural sciences	2 005	418	142	690	333	24	18	684	465	190	117
Social sciences	1 533	539	186	731	369	35	19	195	147	33	16
Humanities	1 850	564	197	643	320	28	15	357	233	257	113
<b>Total</b>	<b>27 957</b>	<b>6 256</b>	<b>1 467</b>	<b>11 850</b>	<b>3 201</b>	<b>487</b>	<b>148</b>	<b>7 485</b>	<b>3 483</b>	<b>1 878</b>	<b>572</b>

In comparison between years 2002 and 2003, there are the same share of R&D employees with PhD, it was 22,4 %. The number of R&D employees with university degrees increased interannually by 1,5 percentage point from 40,9 % to 42,4 %. The number of R&D females with PhD decreased interannually by 0,8 percentage point from 24,2 % to 23,4 %. The number of R&D females with university degrees decreased by 0,3 percentage point from 27,3 % to 27,0 %.

### R&D employees by region

The largest number of R&D employees was recorded in Capital Prague according regional level (NUTS 3), it was 42,3 % of the total R&D employees. The smallest number of R&D employees was reported in Karlovarský region with a 0,4 % share.

The major portion of research and development activities is concentrated in Prague, which recorded the highest number of units performing R&D and it corresponds with the number of R&D personnel. Data are collected by the annual questionnaire VTR 5-01.



### Researchers in R&D

Researchers are the most important category of R&D personnel carrying out research and development. Researchers are scientists or scientific workers engaged directly in the creation of new knowledge of products, processes, methods and systems and to management of research and development activities.

In 2003, the share of researchers to total number of R&D employees made up 56,5 % (15 809 employees in FTE), which the share of females was 26,1 % (4 121 employees in FTE). The number of researchers increased since the year 1995 (11 936 researchers in FTE) to the 15 809 researchers in the year 2003.

### Researchers by sector

In 2003, the largest number of researchers - 41,5 % - was employed in research and development projects in the business enterprise sector. The second most important sector, with regard to researchers, was the government sector with 30,6 %. These figures reflect the fact that Academy of Science of the Czech Republic and its' research centres belongs to the government sector. The share 27,3 % of the researchers from the total number of researchers was employed in the higher education sector. And finally, in the private non-profit sector, the share of researchers to researchers made up only 0,6 %.

The average of EU-25 was recorded for the surveyed year 2001 – researchers in FTE: business enterprise - 47,3 %, government - 14,5 % and higher education sector - 36,0 %.

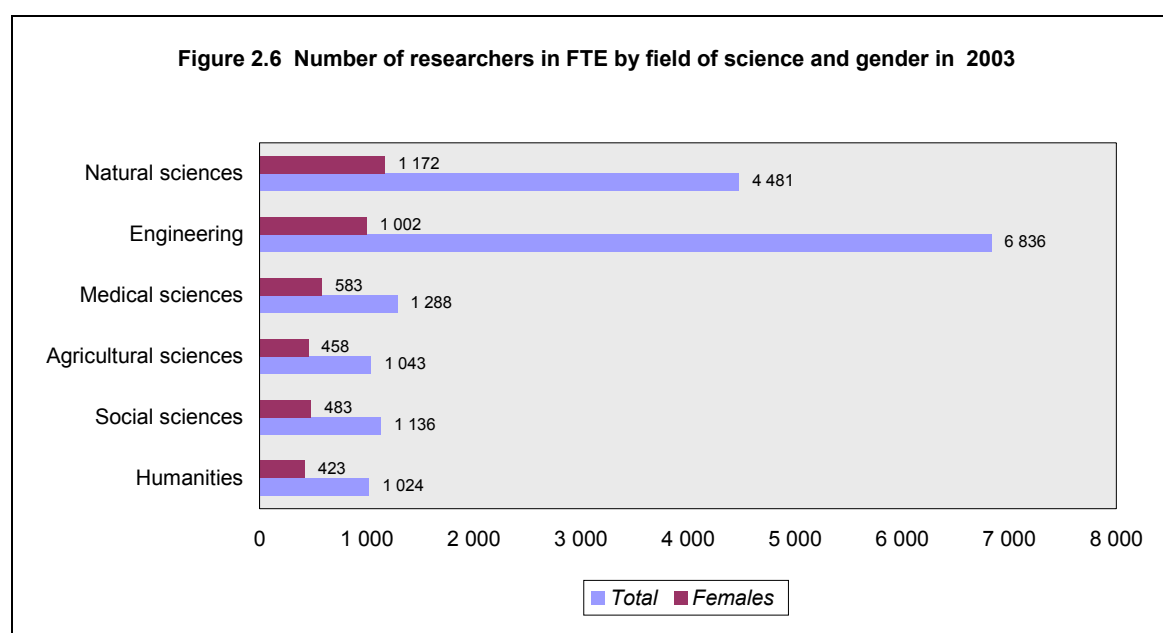
Data for the Czech Republic are in the following table.

### Researchers in FTE employed in R&D by sector in 2002 and 2003

SECTOR	2002		2003		Index 2003/2002	
	Total	Females	Total	Females	Total	Females
Business enterprise	6 191	1 001	6 558	1 051	1,059	1,050
Government	4 429	1 427	4 833	1 633	1,091	1,144
Higher education	4 283	1 473	4 318	1 412	1,008	0,958
Private non-profit	71	16	100	25	1,408	1,562
<b>Total</b>	<b>14 974</b>	<b>3 917</b>	<b>15 809</b>	<b>4 121</b>	<b>1,056</b>	<b>1,052</b>

### Researchers by field of science

In 2003, the largest number of researchers engaged in R&D projects worked in engineering and technology, which was dominant in the business enterprise sector having the highest share of researchers. Due to this fact, the share of 43,2 % researchers was recorded in engineering and technology. The lowest share of researchers was reported in humanities; only 6,5 % researchers. Numbers of researchers are in the following figure 2.6.



In 2003, the largest number of female researchers was recorded in medical sciences (45,3 %). The highest share of female researchers was registered in agricultural sciences (43,9 %). The lowest share of female researchers was recorded in engineering and technology (14,6 %).

### Researchers employed in R&D in FTE by field of science and gender in 2002 a 2003

Field of science	2002		2003		Index 2003/2002	
	Total	Females	Total	Females	Total	Females
Natural sciences	4 267	1 160	4 481	1 172	1,050	1,010
Engineering and technology	6 743	971	6 836	1 002	1,014	1,032
Medical sciences	1 095	546	1 288	583	1,176	1,068
Agricultural sciences	972	446	1 043	458	1,073	1,027
Social sciences	1 059	458	1 136	483	1,073	1,054
Humanities	838	336	1 024	423	1,222	1,259
<b>Total</b>	<b>14 974</b>	<b>3 917</b>	<b>15 809</b>	<b>4 121</b>	<b>1,056</b>	<b>1,052</b>

## Qualification of researchers – statistical survey of new research and development indicators in the surveyed year 2003

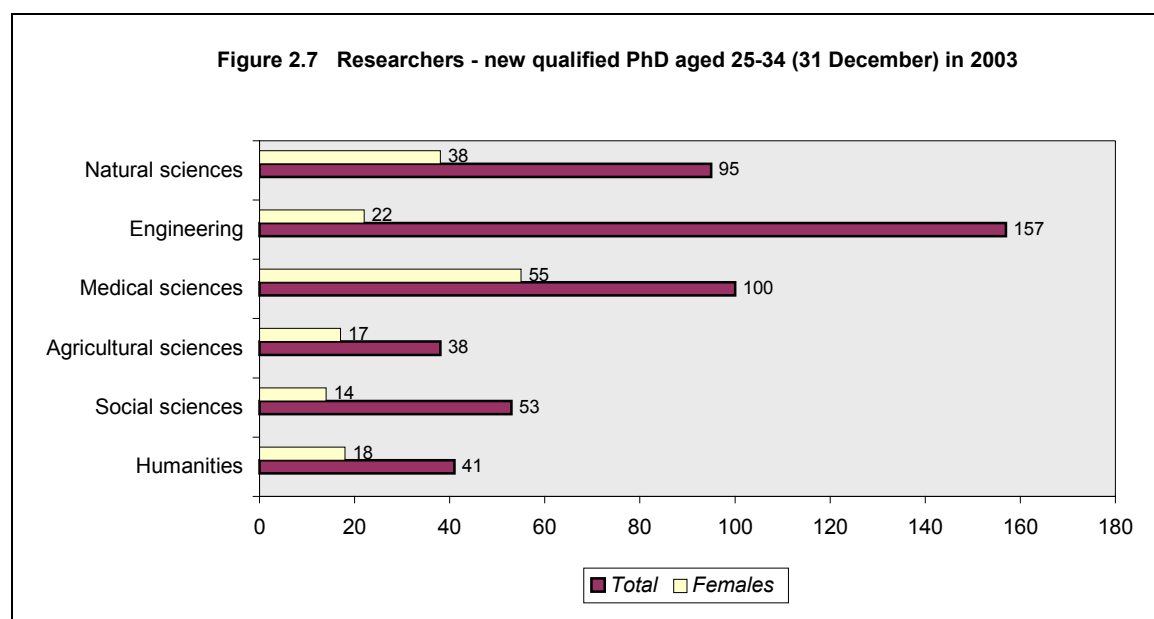
Three new indicators for researchers in the annual questionnaire VTR 5-01:

- researchers with PhD
- researchers with PhD aged 25-34
- researchers with PhD aged 25-34 newly qualified during the year 2003

### Researchers with PhD by sector in headcount - 31 December 2003

SECTOR	Researchers with PhD		of which aged 25-34		of which newly qualified in 2003	
	Total	Females	Total	Females	Total	Females
Business enterprise	1 632	367	283	91	77	30
Government	3 550	779	608	179	135	51
Higher education	7 387	1 942	1 127	325	272	83
Private non-profit	59	11	5	0	1	0
<b>Total</b>	<b>12 627</b>	<b>3 099</b>	<b>2 024</b>	<b>595</b>	<b>485</b>	<b>164</b>

The highest share of researchers with PhD was recorded in the higher education sector (58,5 %), the government sector followed with the share 28,1 %. The share of the business enterprise sector was 12,9 % on total researchers with PhD, the share of the private non-profit sector was 0,5 %.



The number of researchers with PhD in FTE was recorded 5 165 from total 15 809 researchers, it is 32,7 %, 1 225 researchers-females with PhD in FTE engaged in R&D from total 4 121 researchers-females, it is 29,7 %. The highest share of researchers with PhD was recorded in natural sciences – the number 1 888 in FTE (36,6 %), of which were females 413 in FTE, engineering and technology was following: 1 492 in FTE (28,9 %), of which were females 203 in FTE. The lowest share of researchers with PhD in FTE was recorded in agricultural sciences: 373 (7,2 %), of which were females 122 in FTE.