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*Seniority in
academia and R&D*

3. Seniority in academia and R&D

Seniority in academia and R&D

In the first two Chapters, it has been seen how the overall patterns of the distribution of scientists and researchers are gendered according to the sectors of performance and to the fields of science. Furthermore, it has emerged that these patterns cannot be isolated from the different national contexts of R&D organisation, of the labour force and of education outcomes. However, although this information is valuable in terms of mapping women's participation and career choices, it still does not reveal whether women and men are on equal terms in R&D employment.

This Chapter on the other hand, sets out to explore the vertical dimension. This tells us about the dissimilarity in the distributions of the sexes throughout a given hierarchical system, and can therefore be used to highlight differences in career opportunities and outcomes (Osborn et al., 2000).

Although women and men study and work within the same infrastructures, case studies at institutional level have shown that they have different experiences when it comes to the reward and recognition systems (Wennerås & Wold, 1997; Palomba, 2000). Furthermore, a US study has shown that vertical segregation is linked to gender bias in S&T productivity indicators, whereby senior men use their positions to claim

authorship (Long, 2002). Eliminating vertical differences between women and men at European level is therefore central to attracting young women into research careers.

The approach that has been taken in this Chapter is to look at levels of vertical concentration¹ in academia and at vertical dissimilarity² in each of the three R&D occupations (Researchers, Technicians and Auxiliary staff). From the European perspective, R&D and academia are the two domains where the necessary information is available and of sufficient quality. We have capitalised upon the data collected in national higher education surveys, which have several common questions. However, no formal methodology for harmonising these exists at present. The coverage of the grades presented here, and, more specifically, the identification of grade A (see Annex 5) has therefore been agreed for this publication by the Statistical Correspondents of the Helsinki Group on Women and Science. Further methodological work is necessary if more detailed analysis is to be undertaken. Here we are nevertheless able to obtain a preliminary overview of the professional advancement of women in universities and in R&D institutions, despite the differences between countries in the grading systems.

¹ The term 'concentration' here refers to the practice of comparing part(s), rather than the whole of the system.

² See Box 2 in Chapter 2.

Findings

The Feminisation Ratios (see Box 3) are even lower for senior academic staff than they are for academic staff in general, and the percentage of women in the top grades never exceeds 21%. Men are three times more likely than women to obtain professorships or their equivalents in Europe.

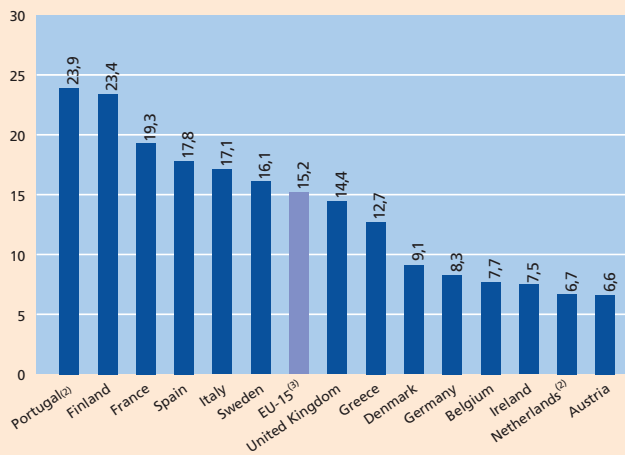
There are also high levels of vertical dissimilarity among R&D personnel in many countries, but the pattern varies across the sectors. The relationship between occupations seems to depend on the institutional sector and the group of countries. This is mostly due to low proportions of women as researchers and high proportions of women as auxiliary staff. It is not at present possible to examine whether this is due to gender differences in qualification in R&D, although, based upon the evidence from the HRST results, this is unlikely.

The Feminisation Ratios of researchers and technicians are strongly and positively correlated ($r=74\%$) in the HES and the BES in the Candidate Countries. On the other hand the same correlation in the HES for the Member States and Iceland is negative, although weaker ($r=-36\%$). The findings in this Chapter support the conclusion in the chapter on differences across scientific fields (Chapter 2), that it is important to examine the summary data on R&D personnel and academic staff both horizontally and vertically in order to obtain a truly accurate analysis.

¹ In "She Figures", the term 'senior academic staff' is synonymous with the term 'grade A'. A list of the grades that are included in grade A for each country can be found in Annex 5. In many countries, but not all, grade A is also synonymous with the title of "Full Professor".

Figure 3.1.a

Feminisation Ratio among senior academic staff (grade A) in EU Member States, HC, 2000⁽¹⁾



Source: DG Research, WiS database

Notes: ⁽¹⁾Exceptions to the reference year: DE, IT, SE: 2001; BE, ES, PT: 1999; AT: 1998

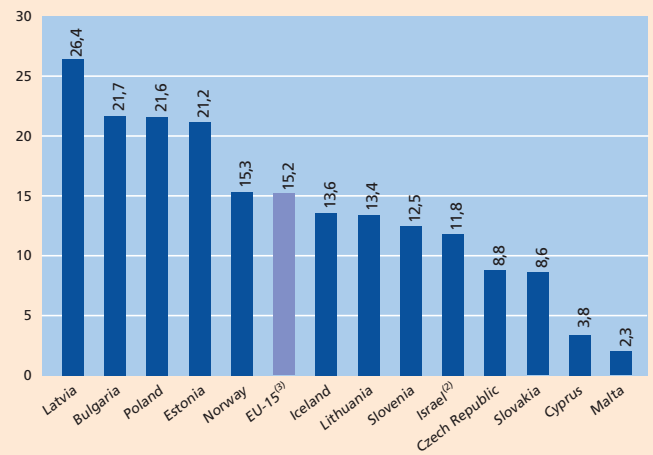
⁽²⁾FTE as exception to HC

⁽³⁾EU-15: estimate excludes LU. Above exceptions to reference year apply

Data are not yet comparable between countries due to differences in coverage & definitions

Figure 3.1.b

Feminisation Ratio among senior academic staff (grade A) in Associated Countries, HC, 2001⁽¹⁾



Source: DG Research, WiS database

Notes: ⁽¹⁾Exceptions to the reference year: CY: 2000; MT: 1999

⁽²⁾FTE as exception to HC

⁽³⁾EU-15: estimate excludes LU. Exceptions to reference year from Figure

3.1.a apply
Data are not yet comparable between countries due to differences in coverage & definitions

There are only two Member States (Portugal and Finland) in the European Union where there are more than two women for every ten men in the top echelons of academia. Portugal is a special case because its university system is relatively new and in Finland gender balance in all areas of employment has been a priority policy action for many years.

In six out of the fourteen Member States presented here (Denmark, Germany, Belgium, Ireland, the Netherlands and Austria) there is less than one woman for every ten men in the top grade of University staff. However, the EU average of grade A university staff who are women has crept up from 11.6% in 1998/1999 to 13.2% in 2000.

The feminisation ratios for Iceland and Norway do not differ remarkably from the EU average.

Box 3

Vertical Concentration

The vertical dimension is the only dimension that tells us something about inequality between the sexes. This is because vertical concentration describes the relative intensity of women and men at identified points in a given hierarchical system. The two main indicators of vertical concentration presented in this booklet are the percentage of women (%) and the Feminisation Ratio (FR_i). They each have slightly different meanings.

Percentages

A percentage tells us what we could expect if the denominator were standardised to 100. Throughout this publication, percentages are used in two ways:

- the number of women in category *i* (F_{*i*}) among women and men combined (T_{*i*}) in category *i*

Where the formula for the percentage (%) is expressed as $(F_i/T_i)*100$

- the number of women or men in category *i* (F_{*i*}) among the total number of women or men (F).

Where the formula for the percentage (%) is expressed as $(F_i/F)*100$

The denominator always includes the numerator. By using different numerators and denominators it is possible to build up a fuller picture of situations. For a more accurate picture, it is always important to review the combined results of several related indicators, including the Feminisation Ratio (FR_{*i*}).

The Feminisation Ratio

The Feminisation Ratio (FR_{*i*}) denotes the number of women per 100 men:

$$FR_i = (F_i/M_i)*100$$

Where: F_{*i*} is the number of women in category *i*

M_{*i*} is the number of men in category *i*

So, if FR_{*i*} = 100, there are equal numbers of women and men. Again, it is often best to regard the FR_{*i*} alongside other indicators, such as the ID (see Tables 2.5.a and 2.5.b and Box 2).

Table 3.1.a

Percentage of academic staff who are grade A by sex. Percentage of academic staff and grade A staff who are women, EU Member States, HC, 2000⁽¹⁾

	% GRADE A AMONG ACADEMIC STAFF		% WOMEN ALL GRADES	% WOMEN GRADE A
	Women	Men		
Belgium	3,9	20,0	28,1	7,2
Denmark	2,9	12,5	28,0	8,3
Germany	2,2	9,9	27,0	7,7
Greece	11,4	30,8	25,6	11,3
Spain	5,9	15,8	32,2	15,1
France	12,8	31,5	32,3	16,2
Ireland	2,2	12,7	30,3	7,0
Italy	15,1	37,5	29,8	14,6
Netherlands ⁽²⁾	2,5	14,2	27,7	6,3
Austria	3,4	17,5	25,5	6,2
Portugal ⁽²⁾	4,1	11,2	39,6	19,3
Finland	8,4	23,0	39,1	19,0
Sweden	11,7	28,8	28,3	13,8
United Kingdom	3,7	14,5	35,8	12,6

Source: DG Research, WIS database

Notes: ⁽¹⁾Exceptions to the reference year: DE, IT, SE: 2001; BE, ES, PT: 1999; AT: 1998

⁽²⁾FTE as exception to HC

Data are not yet comparable between countries due to differences in coverage & definitions

Table 3.1.b

Percentage of academic staff who are grade A by sex. Percentage of academic staff and grade A staff who are women, Associated Countries, HC, 2001⁽¹⁾

	% GRADE A AMONG ACADEMIC STAFF		% WOMEN ALL GRADES	% WOMEN GRADE A
	Women	Men		
Bulgaria	3,7	13,1	43,4	17,8
Cyprus	1,2	10,7	25,8	3,7
Czech Republic	2,4	14,1	34,0	8,1
Estonia	6,0	20,9	42,6	17,5
Hungary	:	:	34,6	:
Iceland	14,2	43,7	29,9	12,0
Israel ⁽²⁾	14,5	40,0	24,6	10,6
Latvia	3,7	17,5	55,4	20,9
Lithuania	1,8	12,0	47,5	11,8
Malta	5,3	21,0	8,3	2,2
Norway	5,6	20,4	35,7	13,3
Poland	9,4	21,2	32,8	17,7
Slovakia	2,3	15,4	36,2	7,9
Slovenia	11,6	31,5	25,4	11,1

Source: DG Research, WIS database

Notes: ⁽¹⁾Exceptions to the reference year: CY: 2000; MT: 1999

⁽²⁾FTE as exception to HC

Data are not yet comparable between countries due to differences in coverage & definitions

The first two columns in these Tables show the percentage of academic staff who are grade A for each sex. By calculating this percentage, the under-representation of women is disregarded. It is certainly alarming to see that in the European Union only 6.4% of academic women are reaching the top level in their professions, whereas this success is reserved for as many as 18.8% of male academics. These figures average out at 5.4% and 17.7% respectively for the Candidate Countries.

The opportunities seem to be comparatively less discriminatory in France, Italy, Sweden and Poland – but even in these countries men are two and half times more likely than women to obtain a full professorship. This situation appears to be at its worst in Ireland, the Netherlands, Cyprus, Czech Republic, Lithuania and Slovakia where men are at least five times more likely than women to obtain full professorships.

By comparing the indicators in each of the last two columns, we can see that the percentage of grade A staff who are women is consistently lower than the overall percentage of women among academic staff. These differences are lowest in Poland and highest in Cyprus.

Table 3.2

Percentage of grade A staff who are women by main field of science, all available countries, HC, 2001⁽¹⁾

	NATURAL SCIENCES	ENGINEERING AND TECHNOLOGY	MEDICAL SCIENCES	AGRICULTURAL SCIENCES	SOCIAL SCIENCES	HUMANITIES
Belgium ⁽³⁾	4,2	1,0	3,4	5,1	12,3	10,5
Denmark	4,2	2,8	9,8	9,8	9,7	13,3
Germany	4,6	3,2	4,0	8,0	6,8	13,7
France ⁽⁴⁾	15,7	6,4	8,9	X	23,8	X
Italy	15,0	5,2	9,5	10,2	16,8	22,9
Netherlands ⁽²⁾	3,2	2,7	5,2	7,1	7,0	14,2
Austria	3,1	1,7	7,6	9,3	6,4	11,1
Portugal ⁽²⁾⁽⁵⁾	22,4	3,1	30,2	17,6	21,8	X
Finland	8,3	5,2	21,3	12,8	24,7	33,2
Sweden	10,4	5,5	12,9	16,3	15,8	25,4
United Kingdom	7,7	2,3	14,5	7,9	17,8	17,9
Iceland	7,0	5,6	9,7	-	9,4	6,1
Israel ⁽²⁾	6,6	4,8	16,4	0,0	13,6	18,9
Norway	6,9	2,8	14,2	8,9	15,3	24,3
Poland	16,1	6,8	26,2	20,0	19,2	21,0
Slovakia ⁽⁶⁾	10,4	2,4	9,4	4,6	10,9	12,2
Slovenia	6,0	2,8	18,3	14,0	11,5	15,8

Source: DG Research, WiS database

Notes: ⁽¹⁾Exceptions to the reference year: BE, DK, FR, NL, FI, UK: 2000; PT, IS: 1999; AT: 1998

⁽²⁾FTE as exception to HC

⁽³⁾French-speaking community only

⁽⁴⁾NS includes AS; SS includes H

⁽⁵⁾SS includes H

⁽⁶⁾H = Sciences of culture & arts; SS = SS + rest of H

Data are not yet comparable between countries due to differences in coverage & definitions

In Chapter 2, we saw that the overall indicators presented in Chapter 1 hide differences in the concentration of women across the fields of science. In this table, we can see that this is also the case for grade A university staff, among all the countries, although the low figures make it harder to discern. In Engineering and Technology, less than 7% of women are grade A staff. It seems that the highest concentration of professors in Europe are to be found in Finland (Humanities) and in Portugal (Medical Sciences), but even so, they represent less than a third of grade A staff in the field. The highest concentrations of women are to be found in the Social Sciences for the European Union countries and in Medical Sciences among Associated Countries.

Figure 3.2.a

Distribution of grade A staff across the fields of science by sex in EU Member States, HC, 2000⁽¹⁾

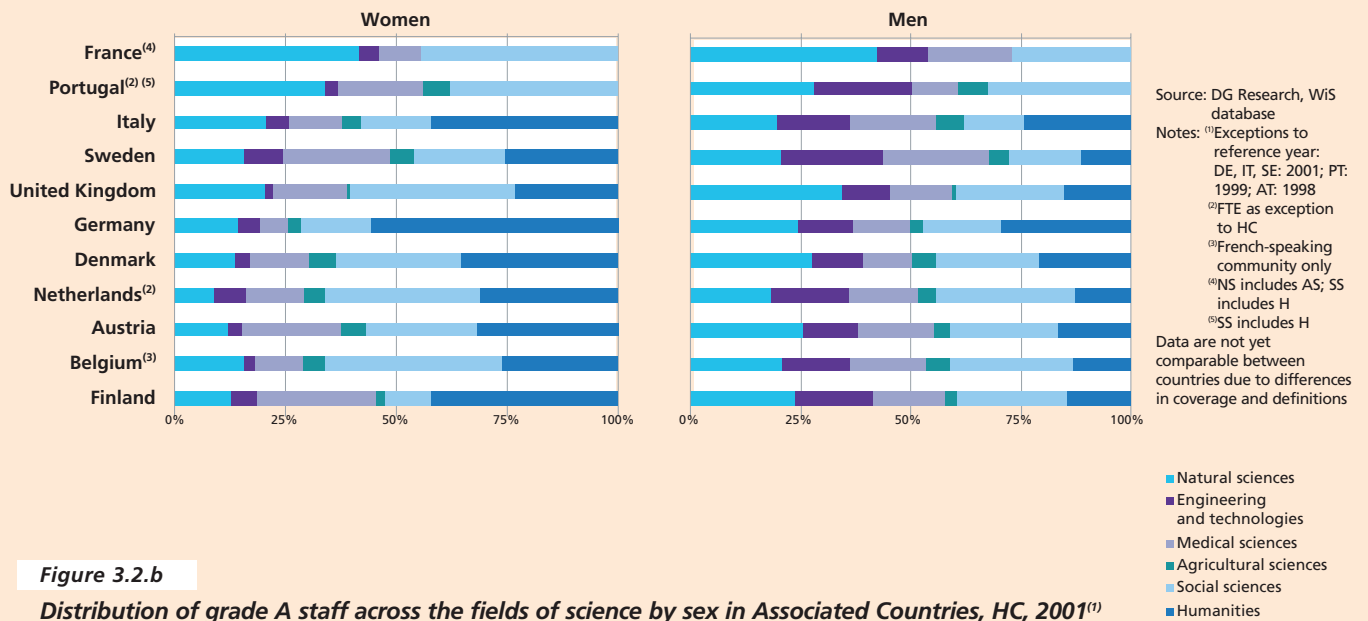


Figure 3.2.b

Distribution of grade A staff across the fields of science by sex in Associated Countries, HC, 2001⁽¹⁾

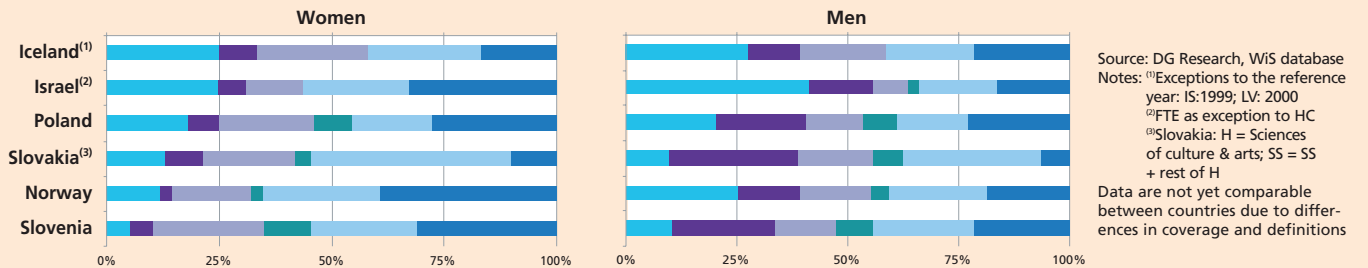


Table 3.3.a

Country	Occupation	HIGHER EDUCATION SECTOR		GOVERNMENT SECTOR		BUSINESS ENTERPRISE SECTOR	
		Distribution of women	Distribution of men	Distribution of women	Distribution of men	Distribution of women	Distribution of men
Belgium	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Denmark	Researchers	50,3	84,6	:	:	30,8	43,2
	Technicians	49,7	15,4	:	:	42,6	41,1
	Others	:	:	:	:	26,5	26,5
Germany ⁽²⁾	Researchers	37,6	81,5	33,5	63,8	:	:
	Technicians	17,6	9,6	66,5	36,2	:	:
	Others	44,8	8,9	:	:	:	:
Greece	Researchers	50,4	62,3	34,9	34,6	38,4	48,5
	Technicians	22,8	18,4	21,9	17,5	18,4	35,2
	Others	26,8	19,2	43,1	47,9	43,2	16,2
Spain	Researchers	75,8	86,1	51,2	62,4	32,7	38,6
	Technicians	5,9	5,0	25,7	18,6	34,6	41,5
	Others	18,3	8,9	23,1	19,0	32,7	19,9
France	Researchers	56,9	76,8	41,8	62,5	38,9	48,3
	Technicians	:	:	:	:	:	:
	Others	43,1	23,2	58,2	37,5	61,1	51,7
Ireland ⁽²⁾	Researchers	:	:	:	:	55,7	66,0
	Technicians	:	:	:	:	24,3	23,8
	Others	:	:	:	:	20,0	10,2
Italy	Researchers	:	:	42,0	45,2	46,0	42,5
	Technicians	:	:	37,4	36,3	29,7	41,3
	Others	:	:	20,6	18,5	24,3	16,2
Luxembourg	Researchers	87,5	89,3	65,9	74,6	:	:
	Technicians	0,0	10,7	25,4	11,3	:	:
	Others	12,5	0,0	8,7	14,1	:	:
Netherlands	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Austria	Researchers	44,8	83,3	29,8	47,5	32,8	60,2
	Technicians	25,1	8,3	22,3	18,8	34,8	31,6
	Others	30,2	8,4	47,9	33,7	32,4	8,2
Portugal	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Finland	Researchers	66,1	74,7	49,9	71,0	49,8	65,2
	Technicians	33,9	25,3	50,1	29,0	50,2	34,8
	Others	:	:	:	:	:	:
Sweden	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
United Kingdom	Researchers	:	:	33,7	56,7	:	:
	Technicians	:	:	27,0	18,9	:	:
	Others	:	:	39,3	24,5	:	:

Distribution of R&D personnel across the occupations by sector and sex in EU Member States, HC, 2000⁽¹⁾

In order to fully analyse these percentages, it is helpful to calculate the Index of Dissimilarity (see Box 2) across the occupations. For the countries and sectors with data in all three R&D occupations, the ID reveals that by far the highest levels of vertical dissimilarity occur in Germany and Austria's Higher Education sectors (44% and 39% respectively). In Germany, the dissimilarity is so pronounced that almost half of all R&D personnel would have to change occupation in order to replicate the overall average of 36% women in each activity. This is also the case for a quarter of R&D personnel in Greece and Austria (both 27%) in the BES. GOV is the only sector, where the ID is relatively low: 5% in Greece and 3% in Italy, although the United Kingdom has the highest ID at 23%.

The main causes of this dissimilarity seem to be disproportionately high numbers of men who are researchers and high numbers of women who are auxiliary personnel.

Source: Eurostat, S&T statistics
 Notes: ⁽¹⁾Exceptions to the reference year: LU: 2001; DK (BES), DE, EL, ES (BES), IE, IT, FI: 1999; AT: 1998
⁽²⁾FTE as exception to HC

Table 3.3.b

Country	Occupation	HIGHER EDUCATION SECTOR		GOVERNMENT SECTOR		BUSINESS ENTERPRISE SECTOR	
		Distribution of women	Distribution of men	Distribution of women	Distribution of men	Distribution of women	Distribution of men
Bulgaria	Researchers	74,9	80,7	50,9	71,2	49,3	59,3
	Technicians	13,5	13,6	32,4	19,0	34,0	29,9
	Others	11,6	5,7	16,7	9,9	16,7	10,8
Cyprus	Researchers	78,5	89,3	22,5	30,7	35,5	61,6
	Technicians	1,9	3,3	31,7	37,3	23,0	28,3
	Others	19,6	7,4	45,8	32,0	41,4	10,1
Czech Republic	Researchers	56,2	79,7	40,2	68,7	25,1	46,6
	Technicians	26,3	14,9	35,5	17,1	43,5	37,5
	Others	17,5	5,4	24,3	14,1	31,4	15,8
Estonia	Researchers	66,4	83,9	50,4	76,5	42,5	65,5
	Technicians	15,5	7,4	21,7	6,8	32,4	22,7
	Others	18,1	8,7	27,9	16,7	25,1	11,8
Hungary	Researchers	53,3	81,0	36,0	59,1	40,8	69,2
	Technicians	16,6	8,8	27,3	19,4	45,0	22,1
	Others	30,1	10,2	36,7	21,5	14,2	8,7
Iceland	Researchers	59,9	79,1	60,8	69,4	56,4	64,2
	Technicians	11,9	12,5	22,7	17,9	25,5	24,3
	Others	28,2	8,5	16,5	12,7	18,1	11,5
Israel	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Latvia	Researchers	78,0	82,6	51,0	65,1	51,5	57,0
	Technicians	12,5	8,8	14,3	12,8	24,6	13,6
	Others	9,5	8,5	34,7	22,1	23,9	29,4
Lithuania	Researchers	70,3	88,1	41,3	59,8	53,4	70,0
	Technicians	9,4	5,1	32,2	15,6	26,1	10,4
	Others	20,3	6,7	26,5	24,6	20,5	19,6
Malta	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Norway	Researchers	:	:	:	:	:	:
	Technicians	:	:	:	:	:	:
	Others	:	:	:	:	:	:
Poland	Researchers	71,8	87,2	47,6	65,7	39,6	54,0
	Technicians	13,6	8,1	28,0	18,6	32,3	26,1
	Others	14,6	4,8	24,4	15,7	28,1	20,0
Romania	Researchers	67,5	81,6	65,5	74,4	52,2	59,8
	Technicians	11,0	6,9	18,6	15,1	27,8	15,3
	Others	21,5	11,5	15,9	10,6	20,0	25,0
Slovakia ^(a)	Researchers	78,7	90,9	49,3	73,9	35,4	53,4
	Technicians	18,7	7,1	33,4	15,5	37,9	33,5
	Others	2,6	2,1	17,4	10,6	26,7	13,1
Slovenia	Researchers	59,0	79,9	56,6	65,7	27,7	35,7
	Technicians	11,0	9,8	22,3	17,0	35,1	27,9
	Others	30,0	10,3	21,1	17,3	37,2	36,4

Distribution of R&D personnel across the occupations by sector and sex in Associated Countries, HC, 2000⁽¹⁾

The Czech Republic and Hungary both have IDs ranging from 22-29% across all three sectors and Estonia and Slovakia have IDs of 26% and 25% respectively in the GOV.

The lowest vertical ID scores are to be found in Iceland and Slovenia in the GOV and the BES (both 9% and 8% respectively); in the HES for Bulgaria and Latvia (6% and 5%) and in the GOV in Romania (9%). It is most important to note that an above-average FR, which is largely the scenario in the Associated countries, is not necessarily indicative of vertical equality.

Source: Eurostat, S&T statistics
 Notes: ⁽¹⁾Exceptions to the reference year: LV (BES), LT: 2001; IS: 1999
⁽²⁾FTE as exception to HC

Box 4

How to read the Scatter Plots (Figures 3.3, 3.4 and 3.5)

The analysis of the relationship between the FR of researchers and FR of technicians is well illustrated by using scatter plots. Each country is positioned on the graph according to the combination of the values of the FRs for researchers and technicians. The X-axis refers to FR for researchers and the Y-axis refers to the FR for technicians.

Data to the right hand side of the X-axis indicate the countries in which female researchers outnumber their male colleagues, while in countries to the left, the men researchers outnumber the women. The upper parts of the graphs indicate the countries where female technicians outnumber their male counterparts and the lower parts of the graphs show where male technicians outnumber their female counterparts.

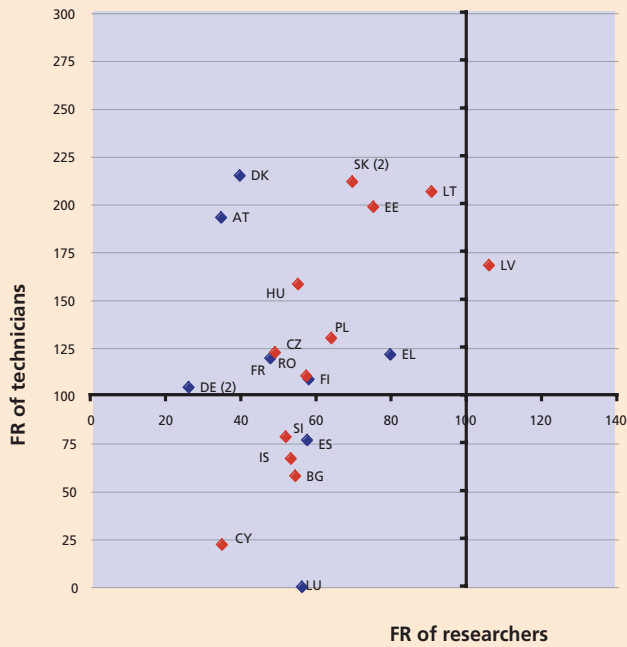
The graphs are therefore composed of four quadrants in which countries can be positioned. Each of the quadrants shows a 'type' of situation:

FR Technicians	Female technicians outnumber male technicians Male researchers outnumber female researchers	Female technicians outnumber male technicians Female researchers outnumber male researchers
	Male technicians outnumber female technicians Male researchers outnumber female researchers	Male technicians outnumber female technicians Female researchers outnumber male researchers
	FR Researchers	

The positions of the Member States are indicated in blue and the positions of the Associated Countries are indicated in red.

Figure 3.3

Scatter plot of the Feminisation Ratios of researchers and technicians in HES, all countries, HC 2000⁽¹⁾

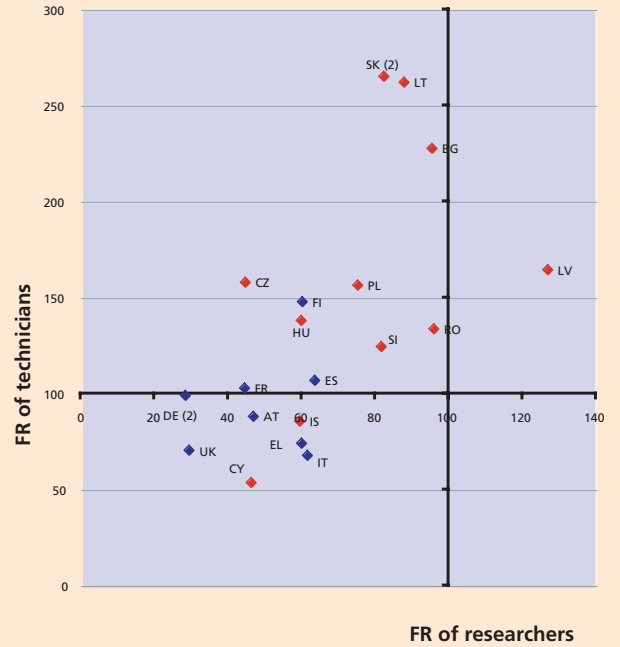


Source: Eurostat, S&T statistics

Notes: ⁽¹⁾Exceptions to the reference year: LU, LT: 2001; DE, EL, FI, IS, SE: 1999; AT: 1998
⁽²⁾FTE as exception to HC

Figure 3.4

Scatter plot of the Feminisation Ratios of researchers and technicians in GOV, all countries, HC 2000⁽¹⁾

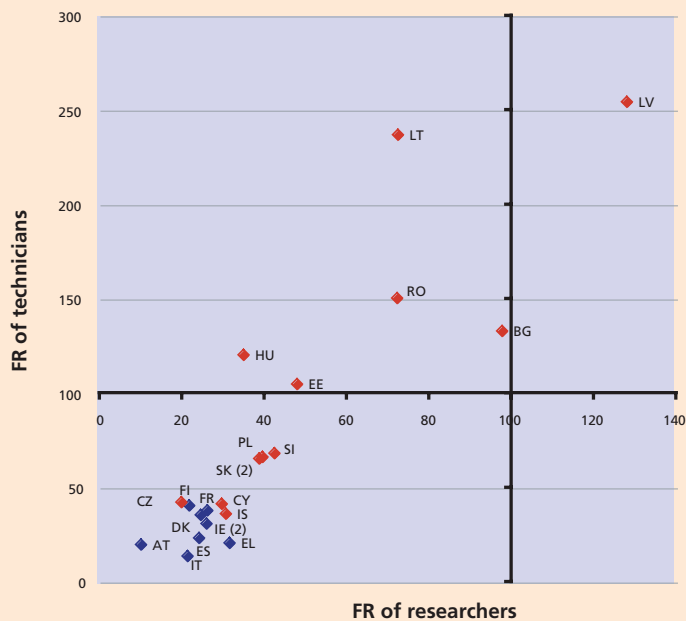


Source: Eurostat, S&T statistics

Notes: ⁽¹⁾Exceptions to the reference year: LU, LT: 2001; DE, EL, IT, IF, IS: 1999; AT: 1998
⁽²⁾FTE as exception to HC

Figure 3.5

Scatter plot of the Feminisation Ratios of researchers and technicians in BES, all countries, HC, 2000⁽¹⁾



Source: Eurostat, S&T statistics

Notes: ⁽¹⁾Exceptions to the reference year: LV, LT: 2001; DK, EL, ES, IE, IT, FI, IS: 1999; AT: 1998

⁽²⁾FTE as exception to HC

The relationship between the FR value for researchers and technicians (see Box 4) gives us a further insight into the roles of women in R&D. Two questions spring to mind here. Firstly are women opting for occupations for which they are in fact overqualified, as a trade-off that enables them to juggle the work-life balance? Secondly does the presence of women as technicians have a positive impact on the numbers of researchers – that is, can we see evidence of women coming up through the ranks of R&D?

We can see from the upper part of the graphs that female technicians outnumber their male counterparts in half of the countries in the HES and GOV sectors. We have also seen that women and men are equally qualified in the labour force. Unfortunately, the data that would enable us to answer this question, although already available in some countries, will not be collected at European level until 2004.

If we calculate Pearson's product-moment correlation coefficient 'r' for the FRs of RSEs and TECs in the HES, it appears that there is no firm correlation between the occupations ($r=35\%$). However, closer inspection reveals that there are very different 'r' statistics for the Member States and Iceland ($r = \text{minus } 36\%$) and a strong positive correlation in the Candidate Countries ($r = 74\%$). In the GOV however, a slightly stronger 'r' is obtained when both groups of countries join forces, but it is still just 57%. The strongest correlation between the Feminisation Ratios of technicians and researchers emerges in the BES (89%) and is largely propelled by the Candidate Countries (80%).

The breakdown by occupation and sex is not available for Portugal, but if it were, Portugal would join Latvia on the right hand side of Figure 3.5.