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Where do researchers come from?

by

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Where do researchers come from?

The present study[1] concerns public research personnel (PRP), i.e. research personnel[2] in public employment, and it examines social and geographical mobility.

The data are so-called register data, that is information from the IDA database of Danmarks Statistik.[3] These data have then been combined with employment codes (STIKO) to identify the public research personnel, and with selected information on spouses and parents. The period covered is 1988 to 1997. However, due to the character of the registers, it is not possible to trace information on parents if the researcher was born before 1955 and if his or her parents were not alive or had left the country by 1955.

Age and gender

In 1997 a total of 18,280 persons are listed in the register data as public research personnel[4]. From 1988 to 1997, the Danish public research personnel (PRP) increased with 3,064 persons, according to these registers; 32 percent were women and 68 percent were men, the gender distribution moved from 29 percent female researchers to 32 percent over the period.

Table 1: Researchers distributed on age 1997; actual number and per cent

Age group	20 - 29	30 - 34	35 - 44	45- 54	55- 64	65-70	Total
Actual number	2.848	3.559	4.920	4.335	2.279	339	**18.280**
%	16	19	27	24	12	2	**100**

Source: own database.

Half the Danish PRP in 1997 were between 35 and 54 years old, only 14 percent were older (Table 1 & Figure 2).

***** Acknowledgements: Senior researcher Ebbe Graversen and stud.oecon. Michael Mark have constructed the database.

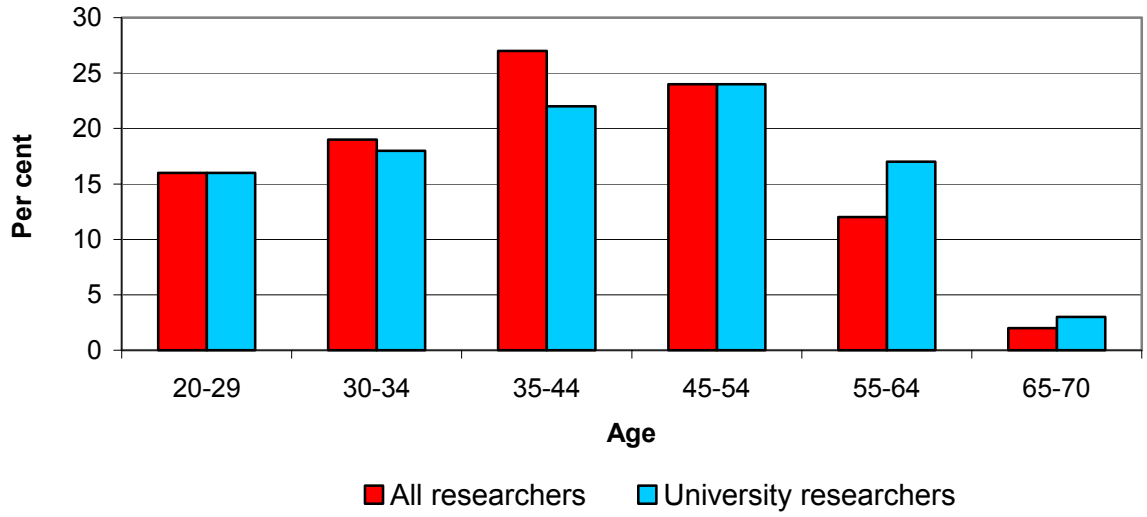
[1] This working paper is an abridged version of the report *Hvor kommer forskerne fra?*, The Danish Institute for Studies in Research and Research Policy (Analyseinstitut for Forskning) Report no.: 2002/4.

[2] That is, academic research personnel employed at universities and in government and other public research institutes. For technical reasons, hospital staff could only be included in so far as they were also university employees.

[3] IDA stands for Integrated Database for Labour Market Research (: **I**ntegreret **D**atabase for **A**rbejdsmarkedsforskning)

[4] See note 6.

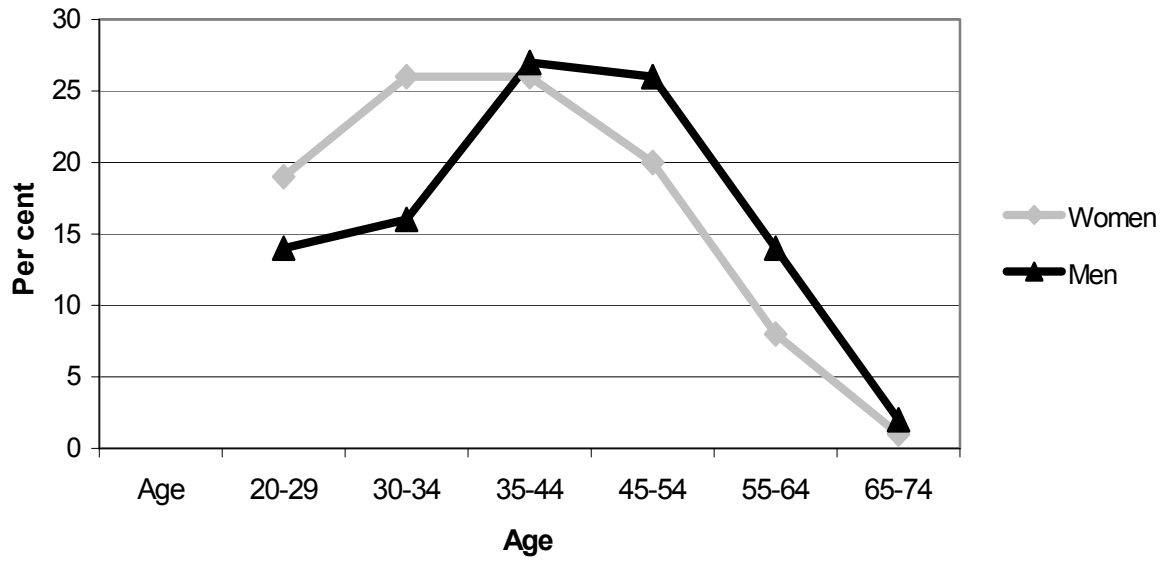
Figure 2: Comparative age profile for all public employed researchers 1997 versus university researchers 1996; per cent



Source: Table 2

Table 2 and figure 3 show that university researchers have a slightly higher age profile than public researchers in general[5].

Figure 3: Gender distributed on age, 1997; per cent



Source: own database.

[5] The university researchers are counted twice as they also are represented in the group of all public researchers. The reel difference can be assumed larger than what appears from Table 2.

Almost half the female researchers are 34 years or younger, whereas less than a third of the male researchers belong to this age group. Women have a slightly younger age profile than men.

There are relatively more women than men among researchers younger than 40, while men strongly outnumber women among older researchers.

Scientific discipline

In 1997, one fourth of the Danish PRP was educated in the humanities and more than one third of all female research personnel were to be found here (Table 3). Researchers educated in natural science and social science each constitute almost one fifth of the PRP. 63 percent of all public employed researchers graduated from one of these three main areas.

Table 3: Researchers distributed on main research fields1997; actual number and per cent

Main fields	Actual number	%	Women %	Men %
Humanities	4.524	25	36	19
Social sciences	3.231	18	17	18
Natural sciences	3.586	20	16	21
Technical sciences	2.637	14	6	18
Health sciences	1.689	9	10	9
Veterinary & agriculture sciences	992	5	7	5
Other*	1.621	9	9	10
Total in per cent		**100**	**100**	**100**
Total in actual number	**18.280**		**5.805**	**12.475**

Source: own database.
** The category "Other" covers among others both Danish and foreign researchers educated abroad, therefore their education is not listed in the Danish registers, and other advanced educations, too.*

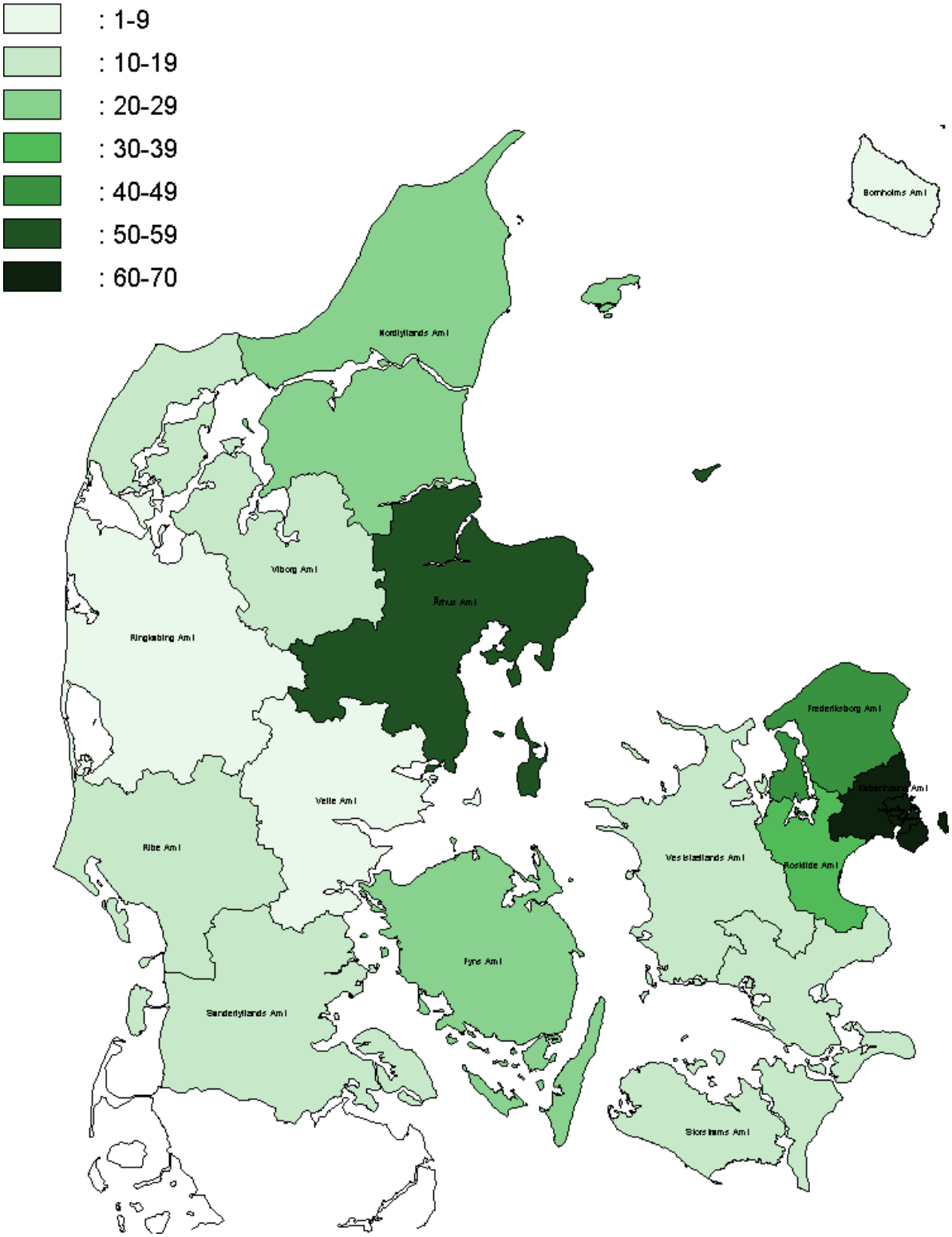
Only 23 percent of the public researchers had an academic background in either the technical or the health sciences. An explanation of this uneven distribution is that the employment potential in the private sector, in the semi public technological institutes[6] and at the hospitals, is directed primarily to the technical and the health sciences and in much lesser degree towards e.g. humanities and social sciences.

Denmark is divided into 14 *amter.* An 'amt' is an administrative unit corresponding in Great Britain to a county and to a 'Departement' in France (see Figure 4: map of Danish counties).

[6] Godkendte Teknologiske Serviceinstitutioner (GTS'er) (: Authorised Technological Service Institutions).

Half the counties are to be found in Jutland that houses half the population. The population size varies substantially from county to county.

Figure 4: Distribution of Researchers on counties in relation to population size, 1997; actual number pr 10.000 inhabitants



Source: Table 4.

Table 4 shows the PRP per 10,000 inhabitants in the counties and it shows the PRP gender distribution. For instance, in Nordjyllands amt we find five female researchers and 19 male researchers per 10,000 inhabitants. Put otherwise - 1,201 PRP live in this county and of this group 951 persons are male researchers. Nordjylland's county hosts a cluster of public and private research institutions and enterprises engaged primarily in technological research and telecommunication. Female researchers appear to cluster in counties that host a broader range of research institutes, including especially the humanities, social and health sciences.

Table 4: Actual number of public employed researchers in relation to the population per 10.000 inhabitants, distributed on counties 1997; actual number

	Inhabitants in the county; in 10.000	Female researchers per 10.000	Male researchers per 10.000	Researchers per 10.000
Bornholm	4,5	1	4	5
Frederiksborg amt	35,7	14	26	40
Fyns amt	47,1	8	20	28
Københavns amt *	118,2	24	45	69
Nordjyllands amt	49,2	5	19	24
Ribe amt	22,3	7	9	16
Ringkøbing	27,1	2	4	6
Roskilde amt	22,7	8	24	32
Storstrøms amt	25,8	2	8	10
Sønderjyllands amt	25,4	2	8	10
Vejle amt	34,2	3	6	9
Vestsjællands amt	29,1	4	7	11
Viborg amt	23,3	4	9	13
Århus amt	62,9	17	38	55
Total	**527,5**	**11**	**24**	**35**

** Including the municipalities of Copenhagen and Frederiksberg.*
Source: Danmarks Statistik[7] & own database. (2001).

[7] Danmarks Statistik 2001.

Geographic mobility

To be able to sketch the geographic mobility from place of origin to present place of residence, we have assumed a high degree of overlap between the researchers' county of origin and their parents' county of residence. Mother's county of residence represents county of origin. We choose to follow the mothers as we had information on slightly more mothers than fathers. Table 5 and figure 5 show which counties receive and which counties give off researchers.

Table 5. Researcher's native county, that is mother's county versus researcher's county of residence in 1997; actual number and per cent

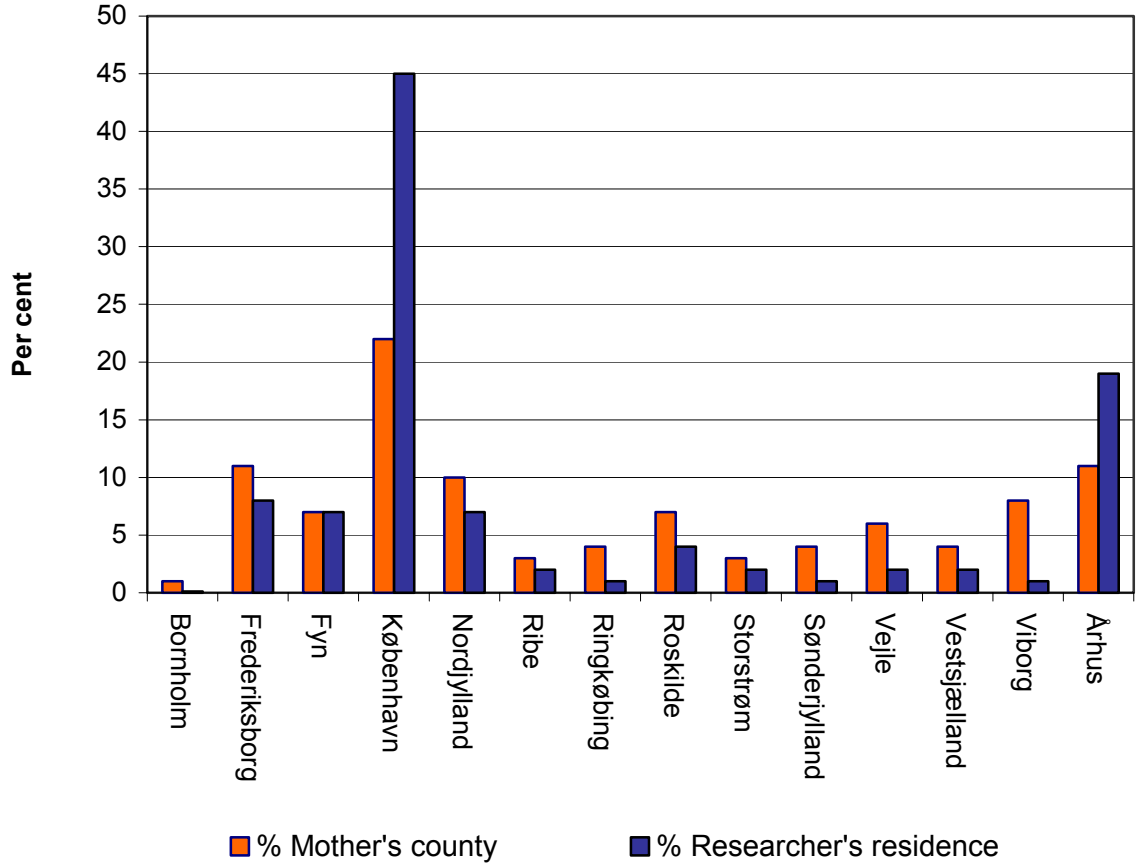
Amt	Mother's county; Pct.	Actual number Mother's county	Researcher's residence; Pct.	Actual number Researcher' residence	Net migration (÷) and immigration (+)
Bornholm	1	60	0	24	**÷ 1**
Frederiksborg Amt	11	977	8	1.416	**÷ 3**
Fyns Amt	7	640	7	1.326	**0**
Københavns Amt*	22	2.042	45	8.138	**+ 23**
Nordjyllands Amt	10	893	7	1.201	**÷ 3**
Ribe Amt	3	294	2	368	**÷ 1**
Ringkøbing Amt	4	364	1	152	**÷ 3**
Roskilde Amt	7	611	4	730	**÷ 3**
Storstrøms Amt	3	296	2	275	**÷ 1**
Sønderjyllands Amt	4	409	1	266	**÷ 3**
Vejle Amt	6	570	2	291	**÷ 4**
Vestsjællands Amt	4	371	2	320	**÷ 2**
Viborg Amt	8	726	1	316	**÷ 7**
Århus Amt	11	1.058	19	3.457	**+ 8**
Total	**100**	**9.311**	**100**	**18.280**	**Migration in per cent point**

** Including the municipalities of Copenhagen and Frederiksberg.*
Source: Danmarks Statistik[8] & own database. (2001).

Viborg amt is the greatest looser. Eight percent of the Danish researchers originate in Viborg amt, but only one percent lives here. The county of Fyn holds the third largest university in Denmark, but this county as well as Bornholm's are neutral in the researcher exchange – they receive about as many researchers as they deliver. Århus and especially København's (: Copenhagen) amt receive researchers. In 1997, eleven percent originated in Århus and 19 percent lived here, another 22 percent of all Danish researchers originated in København and 45 percent lived here.

[8] Danmarks Statistik 2001.

Figure 5: Researcher's native county and their county of residence; per cent



Source: Table 5.

Scientific main area and researcher's county of residence

It appears that the distribution of sexes on scientific main areas and on counties is unequal. In addition, the counties differed widely in their ability to attract researchers. Table 6 grades the scientific main areas on counties.

Table 6: Main research field and county of residence; per cent

	Humanities	Social sciences	Natural sciences	Technical sciences	Health sciences	Veterinary & agriculture	Other
Bornholm**	0,2	0,4	0	0,04	0	0,2	0
Frederiksborg amt	6	6	11	11	8	11	18
Fyns amt	6	9	9	2	14	5	2
Københavns amt	50	37	47	44	37	47	37
Nordjyllands amt	5	7	3	18	1	1	90
Ribe amt	1	5	0	5	0	0	1
Ringkøbing	1	2	1	0	0	1	0
Roskilde amt	3	2	5	5	2	6	10
Storstrøms amt	1	1	1	1	0	3	9
Sønderjyllands amt	1	2	0	4	0	1	0
Vejle amt	1	4	1	1	2	2	0
Vestsjællands amt	3	1	2	1	1	6	4
Viborg amt	1	2	2	1	1	11	0
Århus amt	20	20	20	7	32	7	11
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: own database.

* *The category "Other" covers among others both Danish and foreign researchers educated abroad, therefore their education is not listed in the Danish registers, and other advanced educations, too.*

** *Due to the small numbers for Bornholm's county the per cent information here are presented with decimals.*

The greater part of the PRP in the humanities, natural science and social science – in this order – lived in the university counties København, Århus, Odense and Roskilde. For the natural sciences, 81 percent of the researchers lived in these four counties and 70 percent of the researchers in the humanities lived in Copenhagen (50%) and Århus (20%) counties. Nordjyllands amt is an important area for technological research and has the second largest "settlement" of public research personnel. The research centres in agriculture and veterinary sciences in Viborg county make this the second most important county to these fields. Only very few researchers from any other scientific main area lived in Viborg county.

Spouse's employment categories

The Danish researchers had a significantly higher marriage rate than the population in general. 73 percent of all PRP were married or lived in registered partnerships in 1997 whereas only 57 percent of the Danish population over 24 years were married or lived in a registered partnership. Moreover, the researchers marry academics; 78 percent of married researchers had married another academic.

Table 7. Spouse/partner's occupation 1997; actual number and per cent

	Pct	Actual number
Manager	3	408
Leading salaried worker	46	6.101
Salaried worker	16	2.157
Wage earner wfi**	4	539
Self-employed	4	575
Skilled wage earner	10	1.350
Unskilled wage earner	1	102
Other***	2	262
Total	1	193
Manager	12	1.658
Total	**100**	**13.345**

Source: own database.
** Leading salaried worker covers a.o. the categories senior researchers, associate professors and full professors.*
*** Wage earner wfi = without further indication*
**** The category other covers receivers of various forms of transfer income, assisting spouse, and persons not counted as part of the work force etc.*

Table 7 shows spouse's employment categories. The employment categories differ from the categories found in the educational background (Table 8), because questions about employment and education implies each their different cut of society. Anyhow, the same tendency appears as only e.g. ten percent were married to a skilled worker.

Academics' marriage patterns

The tendency for academics to marry another academic is in fact so narrow that one may speak of intra-disciplinary endogamy (Table 8). Common to all scientific main areas in this study was the preference for colleagues as spouses; second choice was in most cases a person from the field of humanities.

Table 8: Disciplinary endogamy 1997; per cent

Partner's training / Researcher's training	Humanities	Social sciences	Natural sciences	Technical sciences	Health sciences	Veterinary & agriculture	Other
Humanities	**51**	22	14	22	20	6	21
Social sciences	11	**41**	7	16	9	5	17
Natural sciences	12	10	**62**	12	14	11	19
Technical sciences	6	16	6	**32**	17	6	16
Health sciences	6	7	8	10	**37**	4	11
Veterinary & agriculture	2	3	4	6	4	**68**	6
Other *	13	0	0	1	0	0	10
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: own database.
** Other* that is unknown academic field.*

Parents' employment categories

In order to correlate the developments in the social recruitment of researchers to the social developments in society, the youngest researcher age group cohorts from 1988 was not limited to a comparison with the youngest researcher cohorts from 1997 – that is, the 25 to 39 years old. In addition, the whole Danish cohorts of all the 25 to 39 years old in 1988 and 1997 were included to examine whether changes in researchers social recruitment corresponded to changes in society as such. Fathers and mothers employment categories were examined separately to check for general societal developments, like: do men and women share the same pattern of movements between different employment categories?

The tendency for fathers of researchers as well as for all fathers was that the two top categories – when seen as one - had seen a decrease over the period[10].

Table 9: Occupation categories for all fathers with children in Age group 25-39 years old and fathers to researchers in Age group 25-39 years old; actual number and per cent

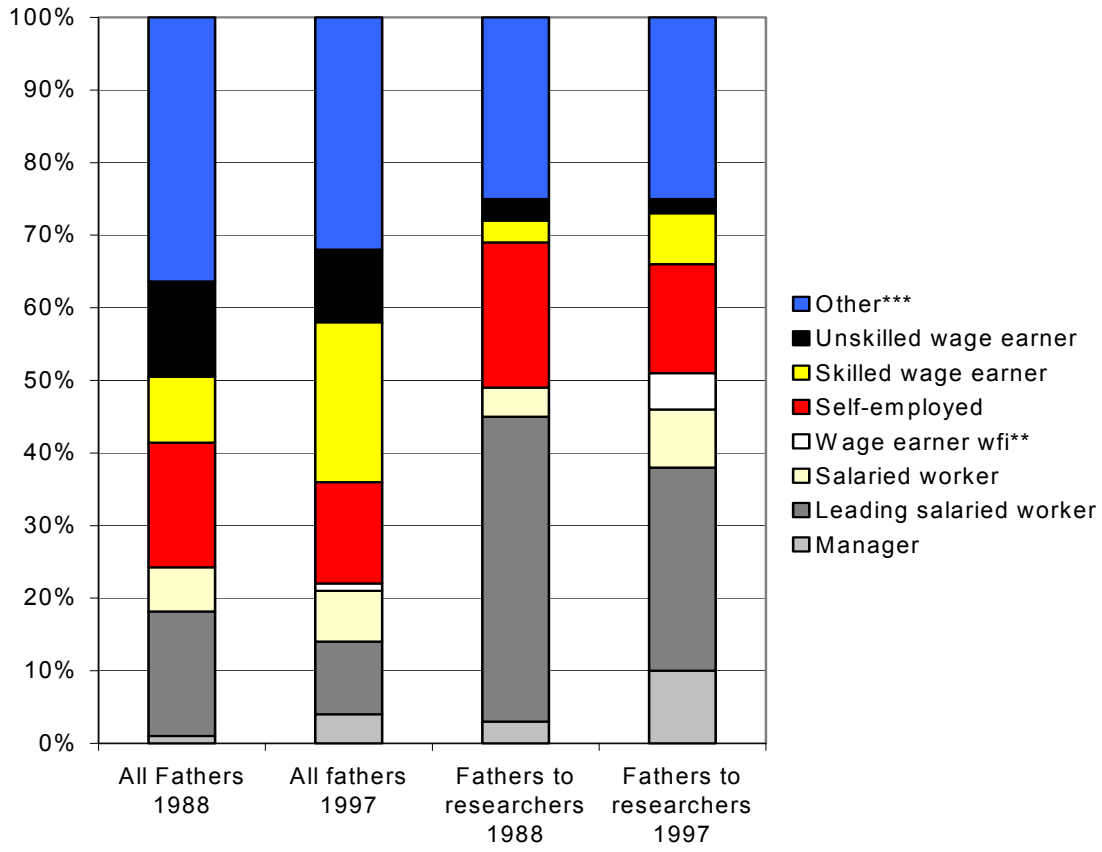
Occupation	1988				1997			
	Fathers to all 25-39 years		Fathers to all 25-39 years researchers		Fathers to all 25-39 years		Fathers to all 25-39 years researchers	
	Pct.	Actual number	Pct.	Actual number	Pct.	Actual number	Pct.	Actual number
Manager	1	7.309	3	95	4	36.352	10	681
Leading salaried worker	17	88.091	42	1.477	10	83.274	28	1.931
Salaried worker	6	33.528	4	149	7	64.158	8	576
Wage earner wfi**	0	2.403	0	12	1	10.003	5	371
Self-employed	17	92.195	20	703	14	125.500	15	1.067
Skilled wage earner	9	46.831	3	117	22	189.279	7	487
Unskilled wage earner	13	70.513	3	113	10	82.915	2	119
Other***	36	191.730	25	889	32	274.074	25	1.701
Total	**100**	**532.600**	**100**	**3.555**	**100**	**865.555**	**100**	**6.933**

Source: own database.
Note: In general it is only possible to match information on parents on data for children born 1955 or later. As the 34-39 years old in 1988 are born before 1955 information on these parents might be missing in the table. It counts for almost 40 per cent of the population.
Den largest group, however, is the 25-33 years old; they are born after 1955 and constitute about 60 per cent of the entire cohort.
** Leading salaried worker covers a.o. the categories senior researchers, associate professors and full professors.*
*** Wage earner wfi = without further indication*
**** The category other covers receivers of various forms of transfer income, assisting spouse, and persons not counted as part of the work force etc.*

[9] For the 'all fathers group' the two top categories shrank from 18 to 14 percent. The 'fathers of researchers group' fell from 45 to 38 percent.

The lowest employment categories, including the category of transfer income receivers, had diminished, and the middle categories like salaried staff and skilled workers had grown correspondingly (Table 9 & Figure 6).

Figure 6: Occupation categories for all fathers to children in Age group 25-39 years old and fathers to Researchers in Age group 25-39 years old; per cent



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In 1988, Denmark was facing recession and unemployment while 1997 was a period of prosperity.

Table 10: Occupation categories for all mothers to children in Age group 25-39 years old and mothers to Researchers in Age group 25-39 years old; per cent

Year	1988				1997			
Occupation	Mothers to all 25-39 years		Mothers to all 25-39 years researchers		Mothers to all 25-39 years		Mothers to all 25-39 years researchers	
	Pct.	Actual number	Pct.	Actual number	Pct.	Actual number	Pct.	Actual number
Manager	0	401	0	2	1	5.613	3	256
Leading salaried worker	5	31.993	20	799	5	47.517	21	1.570
Salaried worker	14	87.907	21	843	10	98.011	14	1.039
Wage earner wfi**	4	25.739	7	268	4	36.636	3	244
Self-employed	3	21.335	4	174	4	38.236	4	277
Skilled wage earner	0	2.002	0	12	20	195.204	16	1.217
Unskilled wage earner	20	121.535	6	238	12	116.130	3	219
Other***	53	326.144	42	1.719	46	455.395	37	2.782
Total	**100**	**617.056**	**100**	**4.055**	**100**	**992.742**	**100**	**7.604**

Source: own database.
Note: In general it is only possible to match information on parents on data for children born 1955 or later. As the 34-39 years old in 1988 are born before 1955 information on these parents might be missing in the table. It counts for almost 40 per cent of the population.
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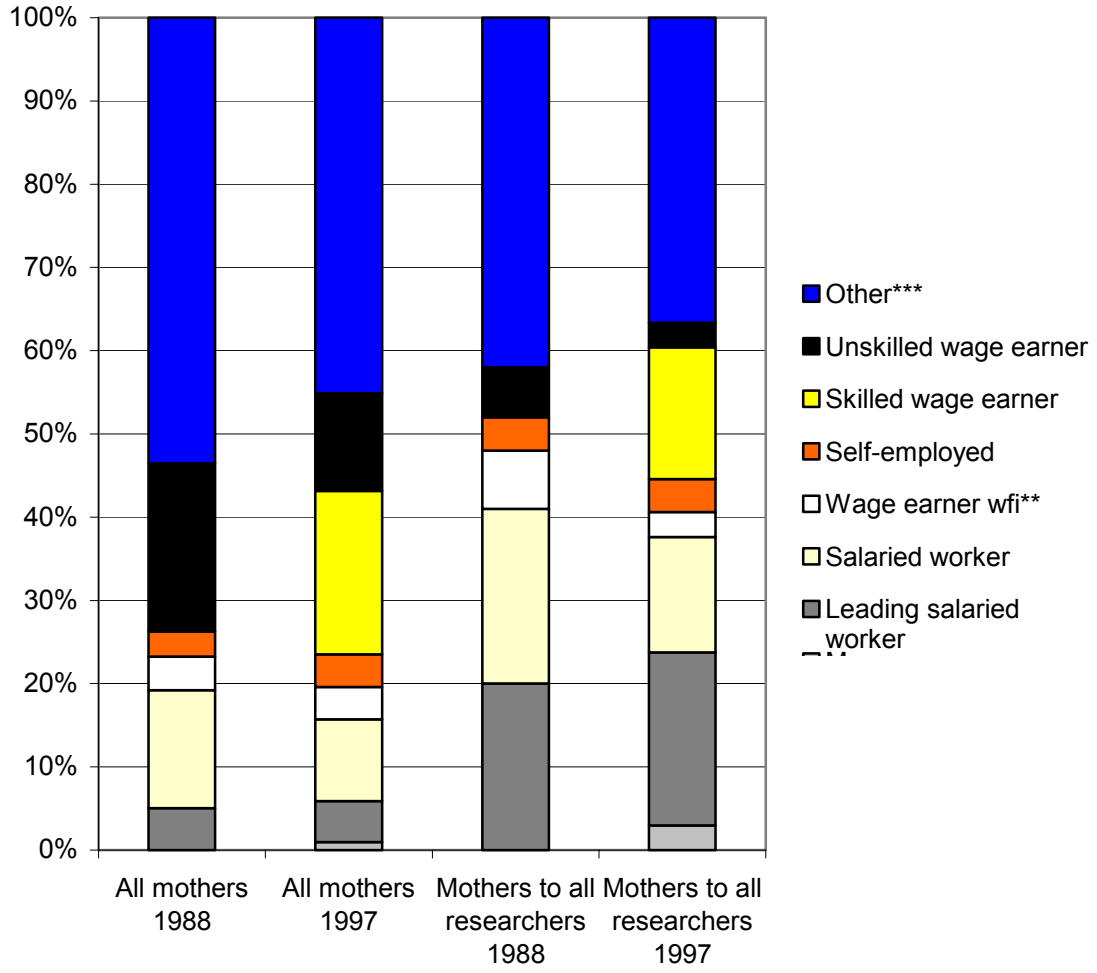
The group of mothers of researchers and the group of all mothers displayed more differences when compared (Table 10 & Figure 7).

Figure 7: Occupation categories for all mothers to children in Age group 25-39 years old and mothers to Researchers in Age group 25-39 years old; per cent



Source: Table 10.
Note: In general it is only possible to match information on parents on data for children born 1955 or later. As the 34-39 years old in 1988 are born before 1955 information on these parents might be missing in the table. It counts for almost 40 per cent of the population.
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**** The category other covers receivers of various forms of transfer income, assisting spouse, and persons not counted as part of the work force etc.*

In the “mothers of researchers” group employment in the two highest job categories had increased from 20 percent to 24 percent between 1988 and 1997, while amongst “all mothers” the representation of women in these job categories had hardly changed. In both groups there had been substantial decrease in the middle categories and in the lowest categories. However, the category of skilled workers grew here, too. In 1988 no mothers were found at all in this category, while 20 percent of the “all mothers” group belonged here in 1977 and so did 16 percent of the mothers of researchers. The lowest categories

remained the largest to both mother groups, though they were followed closely by the middle categories.

For both categories of mothers the employment profile was lower than it was for fathers in 1988.

However, a comparison shows that the development in occupational categories follow the same tendencies if we either compare the two father groups or the two mother groups with each other - though the mother groups displayed greater internal differentiation and more mobility between the categories than did the father groups.

If the father groups are compared with the corresponding mother groups deviations in occupational development patterns appear: The relative proportion of fathers in the two top categories fell while it rose for the mothers. Likewise, the relative proportion of fathers in the middle categories increased, while participation in the same categories saw a decreasing share of mothers - the radical growth of mothers in the category skilled worker being the only exception.

Parents' education

In addition to employment category, the educational background of each parent was included as a question in the examination of the youngest researcher age cohorts in 1988 and again in 1997. These data have not been correlated with the corresponding cohort of the general population.

For the fathers of researchers, the most remarkable development was the increasing number/share of fathers with an academic training. It grew from 26 percent to 33 percent (Table 11).

Table 11: Father's education in 1988 and 1997; actual number and per cent

For researchers, 25-39 year				
Year	**1988**		**1997**	
Education category:	**Pct.**	**Actual number**	**Pct.**	**Actual number**
All academic educations	26	911	33	2.278
Short advanced	13	461	15	1.063
Secondary school	45	1.585	52	3.576
Other, incl. unknown education	17	598	0	16
Total	**100**	**3.555**	**100**	**6.933**

Source: own database.

In the mothers' group, too, there was a remarkable increase in the number/share of academically trained mothers; the percentage of mothers with academic training grew from seven to 15 (Table 13).

Table 12: Mother's education in 1988 and 1997; actual number and per cent

For researchers, 25-39 year				
Year	**1988**		**1997**	
Education category:	**Pct.**	**Actual number**	**Pct.**	**Actual number**
All academic educations	7	299	15	1119
Short advanced	54	2175	53	4006
Secondary school	30	1226	32	2446
Other, incl. unknown education	9	355	0	33
Total	**100**	**4.055**	**100**	**7.604**

Source: own database.

The main difference between the parents with regard to education was the relative share of parents with so called shorter advanced studies[11], more than half the mothers are found in this category, while only 15 percent of the fathers.

In 1997, a total of 2.278 fathers and 1.119 mothers of researchers from the youngest cohorts had an academic education. More than a third of the academic fathers of PRP were trained in the technical sciences, and almost a fifth of them were educated in the health sciences (Table 12).

Table 13: Scientific field for academically trained fathers 1988 and 1997; actual number and per cent

Year	**1988**		**1997**	
	Pct.	**Actual number**	**Pct.**	**Actual number**
Humanities	15	135	11	259
Social sciences	17	157	13	290
Natural sciences	2	15	3	77
Technical sciences	42	387	43	981
Health sciences	17	158	24	553
Veterinary & agricultural sciences	6	59	5	114
Other*	0	0	0	4
All academic educations	**100**	**911**	**100**	**2278**

Source: own database.
**' Other* that is unknown academic field.*

[11] Like schoolteachers and nurses (Shorter advanced studies = Kort videregående).

More than a third of the academic mothers was found in the health sciences, too, and an almost equal share was found in the humanities.

Table 14: Scientific field for academically trained mothers 1988 and 1997; actual number and per cent

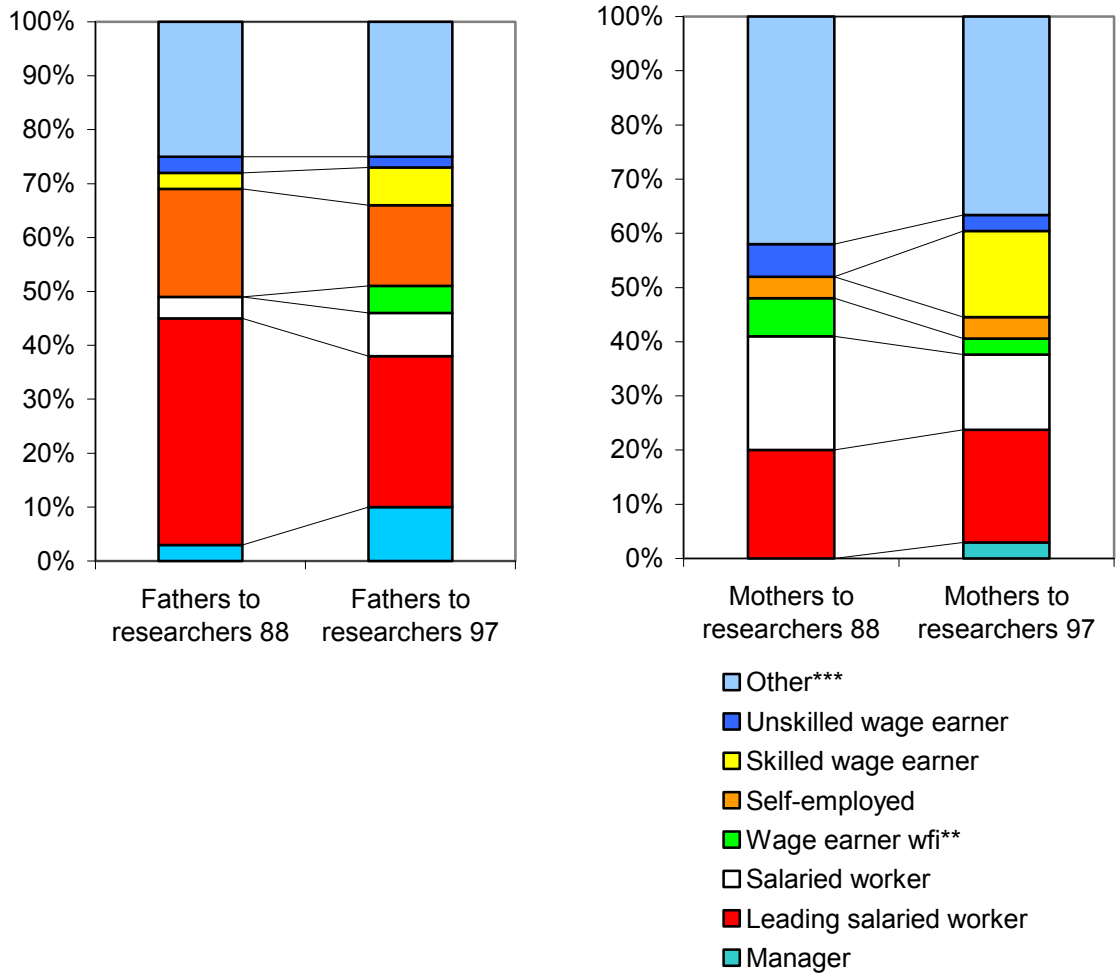
Year	1988		1997	
	Pct.	Actual number	Pct.	Actual number
Humanities	37	112	34	386
Social sciences	10	29	6	63
Natural sciences	2	6	3	33
Technical sciences	5	16	2	26
Health sciences	42	126	51	575
Veterinary & agricultural sciences	1	2	0	4
Other*	3	8	3	32
All academic educations	**100**	**299**	**100**	**1.119**

Source: own database.
**' Other* that is unknown academic field.*

Common to academic fathers and mothers was that only minor movements between disciplinary training took place over the period.
However, to both parents the only category which did see a growth was the health sciences.

Figure 8 depicts the level and development of education amongst researchers' parents in the period 1988 to 1997.

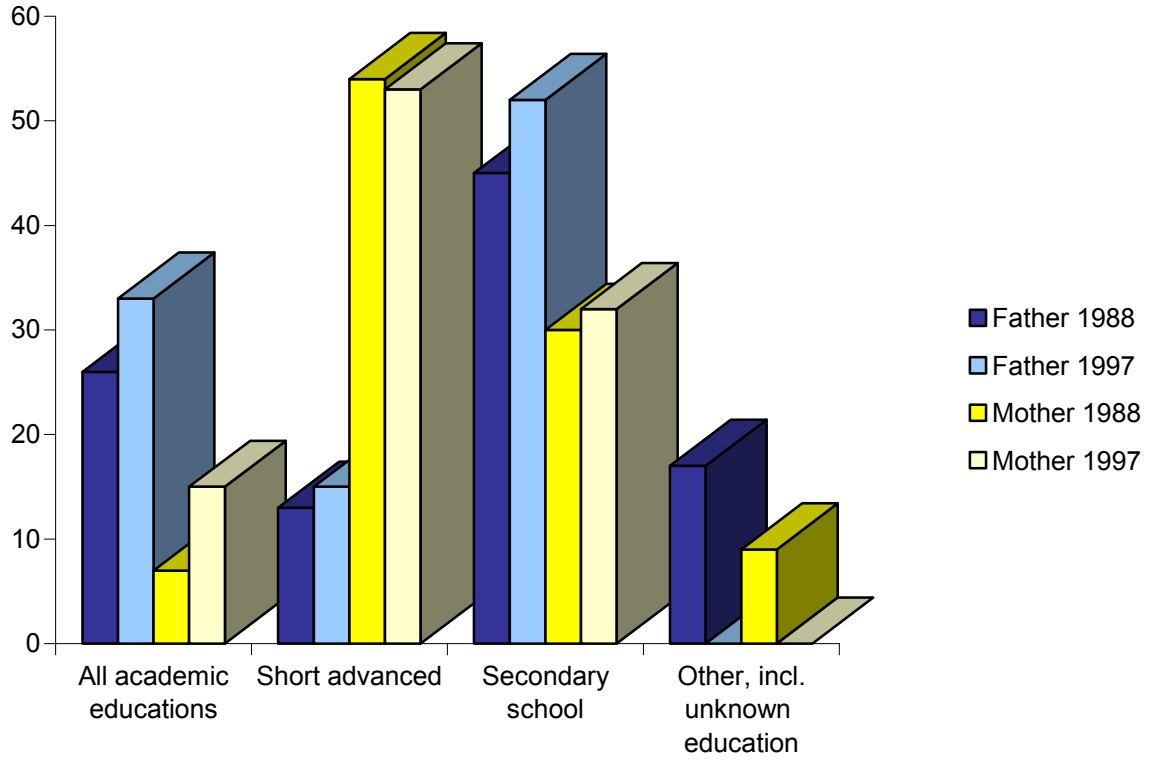
Figure 8: Developments in employment categories during the period 1988 – 1997 for parents to researchers in the age group 25-39 years; per cent



Source: Tables 9 & 10.

It is, however, difficult to say whether the social recruitment has become more equal, because society has changed, too, in the period under study. The general tendency is growth in the middle employment categories for all parents as well as for parents of researchers (Tables 9 & 10) and a corresponding decline in the lower categories. This, in turn, has consequences for the social catchment area.

Figure 9: Education level for researchers' parents 1988 and 1997; per cent



Source: Tables 11 & 12.

Closing remarks

Half the Danish researchers in public employment live in København and the neighbouring Frederiksborg counties. This was to be expected, because a large number of government institutions are placed in København, the country's capital. The clustering of research institutions will influence the future recruitment of researchers – the career choices of future researchers – and the high degree of academic endogamy will aggravate the latent problem. The Danish public labour market has no tradition for considering the spouse of a prospective employee. In North America, on the other hand, where there is extensive geographic mobility, it is common for employers to seek to provide relevant employment possibilities for spouses – even when they are academics.

This report only examines publicly employed research personnel. Researchers in private employment and the geographical location of private research enterprises are important additional factors in determining the geographic mobility options of researchers. This is accentuated by the endogamous marriage habits

If counties and other regions or local areas wish to attract more researchers to develop local trade and industry, or if they wish to attract or keep government and other public research institutions, they have to consider private or public academic employment possibilities for the spouses.

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