




Rapport 2007:54 R

Postgraduate studies and research career

– the significance of gender and
social background



Högskoleverket (Swedish National Agency for Higher Education) • Luntmakargatan 13
Box 7851, SE-103 99 Stockholm • phone +46 8 563 085 00 • fax +46 8 563 085 50
e-mail hsv@hsv.se • www.hsv.se

**Postgraduate studies and research career
– the significance of gender and social background**

Titel in the original: Forskarutbildning och forskarkarriär
– betydelsen av kön och social bakgrund (2006:2 R)

Published by Swedish National Agency for Higher Education 2007

Högskoleverkets rapportserie 2007:54 R

ISSN 1400-948X

Contents: Högskoleverket, Department of Statistics and Analysis, **Helen Dryler**

Graphic Design: Information department

Printed by: Tryckeri, tryckort, månad år

Printed on environmentally certified paper

Contents

Summary	5
The merits of this study	5
Main findings	6
The problem and the framing of the questions	9
Why is recruitment bias a problem?	9
Background – what are the known facts?	13
Women and men – distribution in higher education and research	13
Studies of recruitment bias due to gender	15
Children from different social backgrounds – distribution in higher education	17
Studies of social selection	18
What is missing from earlier studies?	20
FINDINGS	23
Approach	25
How to read this report	25
Transition to postgraduate programmes	27
How analyses have been carried out	27
The population – a group with degrees from long university programmes	28
Gender, social background and subject area are important – Models 1 to 4	30
Men and children of parents with postgraduate degrees go on to postgraduate studies – a model with several explanatory variables	34
Attempts at explanations	37
The importance of social background for women and men	39
Does the importance of gender and social background vary between subject areas?	40
Women and men on different undergraduate programmes	45
The importance of class background for students from different undergraduate programmes	47
The importance of parents' education for students from different undergraduate programmes	49
Employment as postdoctoral fellow	53
Postdoctoral fellowship is an attractive form of employment	53
Measures to promote gender equality among postdoctoral fellows	54
The population – PhDs 1985–2001	56
Numbers of PhDs and postdoctoral fellows – growth and stagnation	56
Share of women and men employed as postdoctoral fellows	57
A model that takes PhDs' age and subject area into account	63
Natural and social sciences	64
Employment as professor	69
The professors at the top of the pyramid	69
Measures to promote gender equality among professors	70
The population – PhDs 1980–1991	71
The number of PhDs and the number of professors	71
More men than women are employed as professors	73
Older women and younger men	76
Does the subject area matter?	77
Discussion	81
Bibliography	87
Appendix	91
Data, method, and variables	91
List of Terms	97

Summary

Do women and men have the same opportunities of becoming postgraduate students and of pursuing a postdoctoral career? Do students with different social backgrounds, but who have completed similar university undergraduate programmes, go on to postgraduate studies to an equal extent?

These are the principal questions of this report. They have been studied using register data on

- 33 674 students who completed longer undergraduate programmes in 1995–1997, and
- nearly 29 000 individuals who received doctoral degrees (PhDs) between 1980 and 2001.

This study thus deals with issues concerning recruitment bias due to gender and social background at the national level, and includes a very large number of individuals.

The merits of this study

Men's and women's university careers have also been the subject of some previous studies. However, one problem with these studies has been that they have looked at cross sections of men and women at two different points in time. For example, gender distribution among recently awarded doctorates at a given point in time has been compared with gender distribution among postdoctoral fellows a number of years later. This means that the individuals included on the two occasions have not been exactly the same, which introduces an element of uncertainty in the findings. In this study, we have used a longitudinal approach instead, by following the career development of degree cohorts¹ of men and women from one point in time until another. This is a more reliable method, and gives more unequivocal answers to questions about recruitment bias due to gender.

The longitudinal approach is also, of course, the most suitable one for studies of social selection in postgraduate studies. This has been done before, but only in a few studies, and there are other problems with those studies. One advantage of the present study is that we have studied the importance of parents' social class as well as their level of education in one and the same analysis. This way we have been able to see if either dimension of the social background appears more important than the other. In studies of recruitment bias in the transition from undergraduate to postgraduate studies, due to both gender and social background, it is furthermore very important to take into

1. Degree cohorts here means a group of individuals who have received a degree of some sort (undergraduate or postgraduate level) in the same time frame. Other terms used in this report to express the same thing are graduate cohorts and degree batches.

account the fact that undergraduate programmes are vertically (duration of studies) and horizontally (field of study) stratified. This has been done in the present study.

Main findings

Men begin postgraduate studies to a greater extent than women – but in engineering things are equal.

When women and men have completed similar undergraduate programmes, a greater share of the men go on to postgraduate studies. In the batches we have studied (1995–1997), 14.6 per cent of men but only 11.6 per cent of women have become postgraduate students. This is the general gender effect. But there are differences between subject areas. The minority of women who have completed some form of engineering undergraduate programme have gone on to postgraduate studies to roughly the same extent as their fellow male students. In the humanities and natural sciences, on the other hand, men's likelihood of continuing to postgraduate studies is unusually high when compared with women.

Parents with postgraduate degrees have children who do PhDs

The children of parents who have taken a postgraduate degree often begin doctoral studies themselves. This link is particularly evident in the humanities, engineering, health care and nursing, and in physics, chemistry and earth sciences.

On the other hand, it does not make a difference if, for example, parents have a longer university education (but have not done postgraduate studies). Children of this type of university-educated parents do not go on to do postgraduate studies to a greater extent than other groups.

Working-class children also become postgraduates, but not if they studied medicine

Parents' social class is very important in connection with the educational choices an individual makes before postgraduate studies are an option. But when we look at whether there is any further social selection in the step from a longer undergraduate programme to postgraduate studies, we find no differences, generally speaking, between children of different social backgrounds. This indicates that the skewed social mix on postgraduate programmes has not come about in the transition from undergraduate to postgraduate studies, but in connection with choices and achievements at earlier levels in the educational system.

Analyses do show, however, that in the group which has trained as doctors or dentists, children of higher professionals have gone on to postgraduate studies to a slightly greater extent than children of the working class. This could be seen as a disheartening finding, given that numbers of working class children

are so small already among medical students – they represent less than 10 per. It will be the task of future studies to find out if this result is a coincidence, or if social selection to postgraduate studies will remain among doctors who are trained in the 21st century.

The 1990s – a temporary boost for gender equality among postdoctoral fellows?

Measured over time, men who were awarded PhDs during the period from 1985 up to and including 1990 became postdoctoral fellows to a somewhat greater extent than women, while the women in some mid-1990s PhD batches became postdoctoral fellows to a greater extent than the men in those batches. However, women's greater opportunities appear to be linked to the creation of posts directed specifically at the under-represented gender (i.e. women) during this period. Without these posts, in other words, men are likely to have gone on to appointments as postdoctoral fellows to a greater extent than women in these mid-1990s groups of PhDs as well.

Postdoctoral fellow – a utopia for both women and men

For postdoctoral fellows, there is a striking finding which is difficult to disregard. Since the number of PhDs has increased at an unparalleled rate over a period of years, while the number of postdoctoral fellows has remained more or less constant, it has become that much more difficult for PhDs to find employment as postdoctoral fellows.

These developments have been negative for both sexes, but they have been most negative for men. While this means that gender equality has increased, it is nevertheless difficult to regard these developments as wholly positive. It is the case that women who were awarded PhDs during the 1980s had considerably better chances of finding employment as postdoctoral fellows than the generations from the second half of the 1990s have had. In other words, neither men nor women appear to have benefited from the slashing of recruitment posts in higher education.

Difficult for women to become professors

One very clear finding is that men who do PhDs become professors to a greater extent than women. This applies to all the PhD batches we have studied. It also applies to all subject areas, although there are fairly big differences between them.

Let us illustrate this with a concrete example of how things have looked: Of the group of women and men who were awarded PhDs in 1991, 8 per cent of the men but only 4 per cent of the women managed to become professors within a twelve-year period. Men's chance of achieving a professorship was thus double that of women. We have not, however, looked at the more complex issue of *what this is due to*. Still, findings do show that there is every reason for researchers who focus more on explanations to carry on studying the reasons for the lack of gender equality in higher education.

The problem and the framing of the questions

Does recruitment bias due to gender and social background exist in Swedish postgraduate programmes and research? The purpose of this study is to answer that question. The focus is on two comprehensive issues:

- To what extent does gender and social background affect individuals' transitions to postgraduate programmes?
- To what extent does gender affect individuals' transitions to postdoctoral employment at universities and university colleges?

To some extent, other studies have already highlighted these issues. But it is the judgment of the Swedish National Agency for Higher Education (Högskoleverket) that the findings of these studies are incomplete, particularly with regard to their methodological considerations, and that further study of these issues is therefore warranted.

Why is recruitment bias a problem?

Does it actually make any difference if, for example, more men than women become professors, or that children of higher professionals are more likely to do a PhD than children of other social classes?

Yes, it does. That is the short answer if you look at the policy goals and the measures aimed at reducing recruitment bias of different kinds. In the most recent higher education bill, *Ny värld – ny högskola* (2004/05:162), the Government devotes a whole chapter to broadened recruitment.

Let us take a closer look at what underlies the conviction among politicians and others that it is important to combat recruitment bias in its various forms.

Equity

One reason is about equity for the individual. A person's gender or social background should not affect his or her opportunities for reaching sought-after positions in society. Only ability and qualifications should decide.

The basis of this line of reasoning is of course that a position as postgraduate student, a teacher or a researcher at a university really are attractive forms of employment. It is a known fact that individuals with a higher education experience a number of advantages compared with individuals without a higher education, and thus a higher education may be regarded as something desir-

able.² But what about the very highest education at universities, postgraduate studies? Do they lead to any further advantages if we compare with undergraduate university studies?

The area appears to be insufficiently explored. Nevertheless, there is some information that suggests that a PhD may actually have certain negative consequences for the individual, if you compare with undergraduate university studies. The disadvantages have to do, among other things, with the lifetime earnings of PhDs.³ That would undermine the equity argument.

Undoubtedly, however, both postgraduate studies and a university career to follow also have attractive advantages. It is an indication of this that competition is often fierce over admission to postgraduate studies and employment as postdoctoral fellow, senior lecturer, and so on.

And it is certainly possible, from an individual perspective, to regard postgraduate studies as an interesting learning journey providing scope for creativity. The possibility of seeking new knowledge will also likely satisfy those with an inquisitive nature. It is often possible during postgraduate studies to make international contacts, which in turn may open the way for a career abroad. A PhD, and even more so a professorship, also carries a certain status. While this may be totally unimportant to some, it may make a difference to others. And finally but not least importantly, people who have PhDs do tend to live longer, on average, than people with other types of education.⁴

Taking all this into account, it can certainly be regarded as an injustice against an individual if he or she is prevented from taking a PhD and pursuing an academic career because of gender or social background.

Quality

Promoting research and teaching talent as well as people's varied experiences ought to contribute to high quality within higher education and research. In this way, society's resources are utilised effectively, which could perhaps benefit both Sweden's international competitiveness and its welfare at the same time.

2. See, for example, Högskoleverket's Annual Report 2005 (p. 84) and Erikson and Jonsson (1993, Chapter 9). Among other advantages, a higher education often leads to employment which is characterised by better wage trends and lower unemployment risks, in comparison with other employment.

3. Birath, Fritzell, Homman, Regnér and Wadensjö (2003). Another possible disadvantage could be that some postgraduate students and PhDs, due to such factors as competition and insecure employment conditions, postpone forming a family for so long that they risk involuntary childlessness.

4. This applies to men, at least. Erikson (2001) found that men with PhDs have a lower mortality risk in relation to all other education groups, including people who have done more than three years of university studies (but not postgraduate studies). Erikson rounds off his study with the following words: "...we can use the present results as a good argument for why our students should finish their theses."

Such recruiting of suitable individuals with different experiences does, however, presuppose that no obstacles are placed in the way of talented people due to their having the “wrong” social background or gender.

Promoting talent

Postgraduate studies are long and demanding for the individual, and they cost the taxpayer money. Postgraduate students also contribute much of the research that is done in Sweden. Naturally, it is therefore important that the individuals who are recruited to a postgraduate programme are those best equipped to make good use of it. Moreover, in order to maintain consistently high levels of quality in teaching and research at universities, talented men and women need to remain at them as teachers and researchers.

Putting varied experience to good use

The other aspect of quality in higher education and research is promoting variety in terms of the experience that people bring to it. This means, for example, that people of different gender and different social backgrounds to some extent are likely to contribute varied perspectives, competencies, and interests. A prerequisite for this is of course that different groups of people really have different experiences – which they undoubtedly do in today’s society.⁵

Let us illustrate this with an example from reality. In medicine, research into cardiovascular diseases has been largely on men. Treatment offered to women with such diseases has been based on this, which has had such serious consequences as lower-quality care, more frequent complications, and higher mortality rates for women. What does this have to do with the gender distribution among postgraduate students and researchers? Well, one of the reasons why women in particular have been neglected in medical research is likely to be that men have for so long been in the majority among teachers, researchers, and tutors.⁶

5. This is not the same thing as a desire to promote differentiation, say, between men and women. All it means is that people in today’s society have different experiences and that this is tied in part to their gender and social background. Some of these circumstances can probably be evened out or kept at a reasonably low level, while others will likely remain.

6. Leijon, Alexanderson, Björkelund and Schenck-Gustafsson (1998).

Background – what are the known facts?

Under this heading, we will place our study in context. What are the known facts, and what have other studies concluded before ours? By briefly summarising the knowledge position, we can see more clearly what this study might contribute.

The focus is on the following questions: What is the distribution of men and women in higher education and research? How are individuals with different social backgrounds distributed in higher education? Is the distribution we see due to biased recruitment of individuals, based on their gender and social background?

Women and men – distribution in higher education and research

This section on women and men has used three principal sources. All three have been published in Statistics Sweden's (SCB's) series of statistical reports, and were produced for the Swedish National Agency for Higher Education (Högskoleverket). The reports are the following:

- 1) *Universitet och högskolor – Studenter och examina i grundutbildningen 2003/04* [Higher education. Students and graduated students in undergraduate education 2003/04] (UF 20 SM 0501)
- 2) *Universitet och högskolor – Forskarstuderande och examina i forskarutbildningen 2004* [Higher Education. Graduate students and graduate degrees awarded in 2004] (UF 21 SM 0501)
- 3) *Universitet och högskolor – Personal vid universitet och högskolor 2004* [Higher Education. Employees in Higher Education 2004] (UF 23 SM 0501).

Where other sources have been used, reference to these is made in the footnotes.

Women and men on undergraduate programmes

A larger proportion of women than of men begin and complete undergraduate programmes at universities.⁷ In the 2003/2004 academic year, women made up 63 percent of the total number of graduates. At particular undergraduate programmes, however, gender distribution can be completely the reverse, i.e. men are in the majority. This is particularly true of various types of engineering programmes. On civil engineering programmes, for instance, 76 per cent of entrants were men in the 2003/04 academic year.

7. Undergraduate programmes at universities refers to all forms of university education which are not postgraduate studies.

Men dominate prestige programmes

Civil engineering programmes can also serve as an example of the types of programmes which are regarded as prestigious – longer programmes on which competition for places is often fierce. The expected professions that follow on these programmes are furthermore associated with particularly high incomes and social status.⁸ Men are well represented on these programmes, although their share has dropped over time, and despite the fact that women now actually dominate on a few separate prestige programmes. But since the civil engineering programmes (6 624 entrants 2003/04, of which 24 per cent were women) are numerically superior to other prestige programmes where women dominate, such as the one for vets (82 entrants 2003/04, of which 89 per cent were women) or for agronomists (130 entrants 2003/04, of which 78 per cent were women), the outcome is that the total number of men is higher than the total number of women on these types of programmes.

More women on “shorter” occupational training programmes

Instead, women are well represented on “shorter” higher education programmes aimed at a specific professional career outside the academic world. These training programmes were incorporated into universities as a part of the 1977 higher education reform, and included several health care and teaching programmes dominated by women. It is still the case that women dominate these types of programmes. For example, of those who began a nursing programme in the 2003/04 academic year (5 281 individuals), women made up 85 per cent.

Women and men in postgraduate studies

In 2004, slightly fewer women than men were awarded PhDs (55 per cent men). Since gender distribution among new postgraduate students is now completely even (50 per cent women and 50 per cent men), we can expect greater gender parity in future also among those awarded PhDs.

The share of women among new students and graduates in postgraduate studies has steadily increased over a long period. 25 years ago (in the 1979/80 academic year), only 27 per cent of entrants and 18 per cent of those awarded PhDs were women. One decade earlier, in the 1969/70 academic year, only 8 per cent of those awarded PhDs were women.⁹

8. Other programmes included here are those for physicians, dentists, the MBA at the Stockholm School of Economics, lawyers, pharmacists, vets, agronomists, and foresters. This selection is partly arbitrary and may change over time. e.g. if the status and employment prospects change for certain professions.

9. SCB (1991).

Women and men as teachers and researchers

Among the teaching and research staff in higher education, there are more men than women in total – 59 per cent men and 41 per cent women.¹⁰

The narrowing pyramid is an image which is often used to describe women's representation among students and staff at universities. At the base of the pyramid, on the undergraduate programmes, women are in the majority. As you go higher up the pyramid, their share drops, ending at the top with only a 16 per cent share of professorships. In other words, 84 per cent of professors are men. Moreover, 66 per cent of senior lecturers are men, 60 per cent of postdoctoral fellows, and 55 per cent of "other research and teaching" staff. Women, on the other hand, are in the majority among junior lecturers (55 per cent women) – a teaching category that does not require postgraduate qualifications.

Studies of recruitment bias due to gender

The low share of women among the professors at the top of the pyramid has of course partly to do with the fact that women historically have been grossly under-represented in the group doing a PhD. But is the pyramid's shape also a result of men having had an easier time getting from undergraduate studies to postgraduate studies, and further upward in their academic careers?

Below we will look at what other studies have concluded when it comes to recruitment bias due to gender specifically. Is it perhaps the case that women's careers at universities can be likened to a leaky pipeline?

Studies of Swedish conditions

The best way to study the issue of recruitment bias due to gender is to apply a longitudinal approach by tracking degree cohorts of women and men. This means that you begin with a group of individuals who have all taken some form of university degree in the same year, and you then follow the extent to which these particular individuals have been accepted for postgraduate studies, employed as postdoctoral fellows, etc.

Regrettably, cohort studies that look at recruitment bias due to gender are rare. It is much more common to note that there are few women at the top of the academic world's educational and professional hierarchy, but many women at its base. We have already reported such figures from Swedish reality.¹¹

There are, however, a few studies of Swedish higher education that have looked at the issue of possible female attrition, even if the analyses do not fol-

10. These numbers refer to 2004. The category "research and teaching staff" includes professors, senior lecturers, postdoctoral fellows, instructors, guest teachers and hourly-paid teachers, "other research and teaching staff", as well as technical and administrative staff who also teach or do research.

11. This pattern is repeated in other European countries, something which is confirmed by a European Commission report (European Commission, 2000). The most famous study to follow cohorts of women and men in their academic careers is possibly Nonnemaker's American study (2000).

low cohorts of women and men. Instead these studies investigate the share of women and men at different levels in higher education, at two separate points in time.¹² The period between these two points is based on how long it might be expected to take for someone to move from a lower post to a higher post. The problem with this type of comparison is that the individuals in each of the two groups are not all the same, which in turn introduces an element of uncertainty.

Bearing this uncertainty in mind, let us take a closer look at the results. Here is a brief summary of some different studies: recruitment bias due to gender exists in Swedish higher education. The problem, however, does not seem to apply across the board. Some subject areas have problems, to varying degrees, with female attrition; others not at all. And in one or two cases men are under-represented. The studies also give varying results as to which subject areas are problematic. This could be due partly to the fact that different types of transitions (from undergraduate to postgraduate studies or from postgraduate studies to postdoctoral fellow, etc.) have been studied.

Wold and Chrapkowska (2004) point to natural sciences as the least equal in the step from a PhD to employment as professor. This means, then, that the attrition of women is highest in natural sciences. Brandell (1994) studied gender selection in the step from a PhD to employment as postdoctoral fellow. He too found problems for women in natural sciences. Women were under-represented relative to how many had received PhDs a number of years earlier. But he found that women postdoctoral fellows were above all strongly under-represented in social science faculties. Ståhle (1996), who studied the extent to which the share of men and women with bachelors' degrees corresponds with the distribution among those with doctoral degrees a number of years later, found that women above all had difficulties moving on in medicine, odontology, and law. Jonung and Ståhlberg (2003) only analysed statistics specific to economists and hence made no comparison with other subjects, but it still merits mention that they found that women economists reached the level of reader and professor to a lesser extent than their male colleagues.

Högskoleverket too has presented figures showing to what extent women and men move on from undergraduate to postgraduate studies. These figures are regularly presented in Högskoleverkets annual report on universities and university colleges, and show that considerably more men than women go on to postgraduate studies. But despite the fact that the analysis tracks cohorts of students, there is a major problem. This is that men and women who have completed very different types of undergraduate studies have been studied together. Above all, the analysis has not taken into account to what extent men and women have done longer programmes aimed at preparing for postgraduate studies, or programmes primarily aimed at preparing the student for a career outside the academic world.

12. We are here dealing with studies at the national level, and do not include e.g. individual universities' tracking of careers for women and men.

Children from different social backgrounds – distribution in higher education¹³

Högskoleverket has commissioned SCB to publish a statistical report describing the social background of undergraduate and postgraduate students. This details parents' social class as well as their education. The most recent report covers university entrants up to and including the 2003/04 academic year, and postgraduate entrants up to and including the 2002/03 academic year.¹⁴ This source is used here to describe the social makeup of, and social selection in, higher education.

Social origin: parents' social class and education

Let us first clarify how the terms "social origin" and "social background" are used in this study. Both these terms include parents' social class as well as their education, and both these dimensions are covered in the analyses. It will be made clear in the text and in tables when only one of these dimensions is applicable, i.e. either parents' social class or their education.

Undergraduate programmes

Data on university entrants in the 2003/04 academic year show that

- children of unskilled manual workers are represented with 11 per cent
- children of higher professionals are represented with 28 per cent.¹⁵

If the two groups had gone on to higher education to the same extent, they would have been represented with about 18 per cent each. Since this is not the case, we have an example of social selection, and the transition to higher studies is thus not unaffected by class background.

A corresponding social selection emerges if we look at the importance of parents' education on children's educational career. For example, 32 per cent of university entrants have parents with a higher education of three years or more, while 12 per cent have parents with only compulsory education. If the two groups had had the same opportunities to go on to higher studies, they would be represented with roughly 20 per cent each.¹⁶

13. Please note that postdoctoral careers will not be looked at in light of social backgrounds; this section only discusses the social backgrounds of students. The question of what role social background plays in postdoctoral university careers is certainly an interesting one, but it falls outside the remit of this study.

14. Statistiska meddelanden (2004).

15. Children of workers (particularly unskilled manual workers) and children of higher professionals are probably the two groups that have been most described in studies of social selection in the education system. The reason for this is simply that these two groups represent two extremes, with workers' children typically going on to higher studies to the least extent, and children of higher professionals doing so to the greatest extent.

16. The data on the social makeup of student groups is for individuals under the age of 35. The data on the share of children from different social backgrounds in the population (of about the same age as university entrants) has been taken from a working paper at SCB.

Prestige programmes

The social makeup of certain specific degree programmes is even more skewed. This is primarily the case with the so-called prestige programmes.

One example is Master of Science in Engineering programmes, on which children of unskilled workers make up 6 per cent of entrants. Another example is medical programmes, on which working class (unskilled) children make up 3 per cent. In contrast, children of higher professionals make up 39 per cent of Master of Engineering entrants and as much as 58 per cent of medical doctor entrants. Furthermore, an unusually large proportion of students doing prestige degrees have parents who attended longer university programmes.

Shorter occupational undergraduate programmes

At the other end of the higher education spectrum are the “shorter” occupational training programmes. For example, the share of children of higher professionals among engineers (Diploma or Bachelor) is 22 per cent, and among nurses 21 per cent.

Comparing programmes for medical doctors and Masters of Engineering with programmes for nurses and engineers is also very illustrative with regard to the various links with the occupational hierarchy in the labour market. After completing their degrees, medical doctors and civil engineers often begin working in professions classified as belonging to the higher professionals category, while graduate engineers and nurses usually work in professions in the lower professionals category.

Postgraduate programmes

The social makeup at the postgraduate level is more skewed than it is at the undergraduate level. In total,

- Children of higher professionals represent 46 per cent of students
- Children of unskilled workers represent 5 per cent of students.

With regard to parents' education, 8 per cent of students have parents with compulsory schooling, and as much as 50 per cent have parents who have at least a three-year higher education. The social makeup is thus reminiscent of that of the prestige programmes at the undergraduate level.

Studies of social selection

It is a known fact that social selection occurs to a fairly large extent already in the transition from secondary to upper secondary school. This means that if we only study social selection in higher education for the group that has attended more pre-academic (theoretical) upper secondary programmes, the differences in transitional shares between children of different social classes is smaller compared to a group which also includes individuals who have at-

tended only secondary school or more occupationally oriented upper secondary programmes.¹⁷

At the same time, we must not forget that differences in fact also remain between children from different social classes in the transition from more pre-academic upper secondary programmes to universities. And since this means that total social selection is further reinforced in the transition to university studies, the social makeup becomes even more skewed at the university level than in upper secondary education.

Postgraduate programmes and social selection

Against this background – that social selection is reinforced at every upward step in the educational career that precedes postgraduate studies – it is not surprising that the social makeup, measured with reference to social origin, among postgraduate students is very far removed from the social makeup of the population as a whole.

The essential question remains, however. Does any further social selection occur in the transition from undergraduate to postgraduate studies? Expressed differently, does the attrition of e.g. working class children continue while children of higher professionals and other privileged groups continue to accumulate?

In the latest Statistical Report on social backgrounds, Högskoleverket and SCB note that of all the individuals who completed university undergraduate programmes from 1994/95 up to and including 1998/99, and who were under 35 years old, 8 per cent of the children of higher professionals had begun postgraduate studies as of the end of the 2002/03 academic year. The corresponding figure for working class children was 4 per cent. In a similar way, a larger share of children with university-educated parents move on to academic studies than of children whose parents only have 9-year compulsory school or less. The report also notes that the transition shares vary with the subject area and length of undergraduate studies. Moreover, it is particularly groups whose parents, irrespective of their social class, have attended longer education programmes after upper secondary school who begin postgraduate studies.

Yet another finding which touches upon social selection in postgraduate programmes was published in the mid-1990s by Erikson and Jonsson (1994). However, we can only refer to how the researchers themselves summarise their findings, as these have not been presented in the form of figures and model specifications. The group studied was individuals who had completed traditional university programmes. Just as in Högskoleverket's and SCB's report, it turned out that children of highly-educated parents had become postgraduate students to a greater extent than others. The researchers made this link even more specific when they found that among children of highly-educated parents, it was above all those whose parents had done postgraduate studies

17. See e.g. Statistiska meddelanden (2004) or Erikson and Jonsson (1993).

who themselves had gone on to postgraduate programmes. Children of higher professionals also moved on to the postgraduate level to a greater extent than other groups, even when the study compared children whose parents had the same education.

What is missing from earlier studies?

Society is constantly changing, which in itself is justification for regularly studying significant social phenomena. It is also a reason for studying recruitment bias due to gender and social background. We simply want to know what the picture is today. The principal reason, however, is another one. By improving analysis methods, we can answer with greater certainty the question whether recruitment bias due to gender and social background occurs in Swedish postgraduate programmes and postdoctoral careers.

Men, women and recruitment bias

Regarding recruitment bias due to gender, we have seen that some earlier studies have tried to make reasonable comparisons between men and women on different career levels at universities. But what has been lacking is a cohort approach, i.e. tracking the same individuals from one point (e.g. the awarding of a PhD) to another (e.g. employment as postdoctoral fellow).

In this study, we apply such a cohort approach, which allows us to achieve a considerably higher precision in the findings, and thus give a more reliable answer to the question: is there or not a recruitment bias due to gender in higher education and postdoctoral careers?

Furthermore, the analysis approach is ambitious in more ways. We will study the transition from undergraduate to postgraduate programmes as well as transitions from doctorates to employment as postdoctoral fellow and from doctorates to employment as professor. Previous studies indicate that there is every reason to study recruitment bias for different subject areas, which we intend to do in this study. Certain trends will also be studied. In particular, the transition from PhD to employment as postdoctoral fellow will be tracked over time.

Social background and recruitment bias

In order to answer the question whether any further social selection takes place in the transition from undergraduate to postgraduate programmes, it is essential to bear in mind that university undergraduate programmes are both vertically (level) and horizontally (subject) stratified. What we want to do here is compare like with like, i.e. compare whether children from different social classes who have attended similar undergraduate programmes have the same opportunity of moving on to postgraduate programmes. It is also important to apply this approach to how recruitment bias due to gender should be studied.

For women and men as well, therefore, we will take the length and specialisation of undergraduate studies into account.

It is moreover essential to study the significance of social background with regard to parents' education as well as their social class. Does one appear more important than the other?

FINDINGS

Approach

The findings are reported in three chapters:

1. Transition to postgraduate programme

The first chapter is about the transition from undergraduate higher education programmes to postgraduate programmes. Here we investigate whether men and women have the same opportunities for moving on to postgraduate programmes.

An interesting finding, which we will examine, is that men have greater opportunities than women to continue to postgraduate studies. Another interesting finding is that children of higher professionals and manual workers go on to do postgraduate studies to about the same extent.

2. Employment as postdoctoral fellow

The second chapter deals with the first phase of the postdoctoral career, i.e. the transition to employment as postdoctoral fellow. Gender equality is the focus here – do men and women who have a doctoral degree become postdoctoral fellows to the same extent?

The most striking finding is that developments over time have been so deeply negative for both women and men. Put simply, there is no longer very much gender equality to compute when it comes to postdoctoral fellows. It appears that neither men nor women have gained anything from the dramatic reduction of recruitment posts at universities, in relation to the number of awarded PhDs.

3. Employment as professor

In the third and final chapter, we follow women and men from their PhD until employment as professor.

The findings for professors are clear: women who have a PhD do not become professors to the same extent as men. All the PhD batches we have studied have one thing in common – a larger share of men than of women manage to secure professorships. The humanities and natural sciences are two fields in which it seems particularly difficult for women to become professors, in comparison with men.

How to read this report

The main analysis findings are summarised directly under each chapter heading. The reader who wishes to peruse the findings quickly can therefore limit his or her reading to these summaries. The first chapter, “Transition to post-

graduate programmes”, is very extensive, and therefore brief summaries of findings have also been included under some of the sub-headings.

Following this introductory summary of the main findings, each chapter presents information relevant to reading the findings, e.g. what the population is (which individuals are included in the analysis). Thereafter, findings are reported in greater detail, using figures and other means. A number of tables and diagrams are also presented.

Transition to postgraduate programmes

If men and women have completed similar university undergraduate programmes, do they then go on to postgraduate programmes to the same extent? And if working class children have the same undergraduate higher education as the children of professionals, does a roughly similar share of both groups become admitted to postgraduate programmes?

These are some examples of questions we will try to answer in this chapter. The answers to these and other questions are, in summary:

- In general, men move on to postgraduate programmes to a greater extent than women do.
- This greater tendency for men to begin postgraduate studies applies to most, but not all, subject areas.
- Parents' social class does not, in general, affect the likelihood of going on to do postgraduate studies. Note that the absence of a link is reported on condition that parents' educational level has also been considered.
- There is no correlation between parents' social class and the transition to postgraduate programmes, for either women or men.
- Children of parents with a postgraduate education generally move on to postgraduate studies to a distinctly greater extent than children of parents with other types of education. This correlation applies about equally to men and women.
- The finding that children of postgraduates move on to postgraduate studies to a greater extent than others applies to almost all the subject areas we have studied.
- The subject of one's undergraduate programme greatly affects the likelihood of continuing to postgraduate studies. Individuals with degrees from natural science undergraduate programmes go on to postgraduate studies to the greatest extent.

How analyses have been carried out¹⁸

Transition to postgraduate programmes (response variable) is made up of individuals admitted to postgraduate programmes up to five years after completing an undergraduate programme of at least four years' duration. Note that while it is the actual admission which is counted, we take the liberty of varying the language by using expressions like transition, moving on, etc. It goes without saying that there is a high degree of correlation between becoming admitted to a postgraduate programme and beginning it.

18. See the appendix for more detailed information on variables, methods and data.

The findings shown in Table 2 are based on logistic regressions. Models 1–4 include one independent variable (explanatory variable) at a time. For these bivariate models, both odds ratios and percentages are given. It is hoped that this double presentation will facilitate the understanding of the findings.

In Model 5 (Table 2), by contrast, several variables are included simultaneously in the analysis. They are:

- gender
- parents' social class
- parents' level of education
- subject area in undergraduate studies
- type of university in undergraduate studies
- age at the time of completing undergraduate programme.

With regard to odds ratios, a reference category has been chosen for all the variables in the models. The odds ratios for all other categories relate to this reference category. The reference category is always fixed at 1, and a value higher than 1 signals a greater likelihood of moving on to postgraduate studies than the reference category, while a value lower than 1 signals a lower likelihood.

The population – a group with degrees from long university programmes

A total of 33 674 individuals are included in the analyses. Of these, 17 946 are men (53 per cent) and 15 728 are women (47 per cent). There are thus just over 2 000 more men than women. All of them received their degrees in the period from 1995 to 1997, and all were under 55 years of age at the time.

The distribution of these individuals in terms of gender, subject area of undergraduate studies, etc. is described in detail in Table 1.

Table 1. Description of the population – 33 674 individuals who received their degrees 1995–1997 after longer undergraduate university studies (at least four years).

Variable	All		Women		Men	
	Number	Proportion	Number	Proportion	Number	Proportion
Gender						
Men	17 946	53.3%			17 946	100.0%
Women	15 728	46.7%	15 728	100.0%		
		100.0%				
Parents' social class						
Higher professionals	13 175	39.1%	5 910	37.6%	7 265	40.5%
Lower professionals	8 525	25.3%	3 896	24.8%	4 629	25.8%
Routine non-manuals	2 573	7.6%	1 260	8.0%	1 313	7.3%
Self-employed/employers	1 856	5.5%	945	6.0%	911	5.1%
Farmers	1 143	3.4%	633	4.0%	510	2.8%
Manual workers	3 956	11.7%	1 951	12.4%	2 005	11.2%
No data	2 446	7.3%	1 133	7.2%	1 313	7.3%
		100.0%		100.0%		100.0%
Parents' education						
Postgraduate programme	1 896	5.6%	887	5.6%	1 009	5.6%
University >= 3 yrs (excl. postgraduates)	11 928	35.4%	5 360	34.1%	6 568	36.6%
Upper secondary >=3 yrs/tertiary < 3 yrs	8 696	25.8%	3 912	24.9%	4 784	26.7%
Upper secondary <= 2 yrs	3 986	11.8%	1 956	12.4%	2 030	11.3%
Lower secondary	4 473	13.3%	2 313	14.7%	2 160	12.0%
No data	2 695	8.0%	1 300	8.3%	1 395	7.8%
		100.0%		100.0%		100.0%
Subject area in undergraduate studies*						
Teaching (14)**	5 610	16.7%	3 807	24.2%	1 803	10.0%
Art and media (21)	908	2.7%	531	3.4%	377	2.1%
Humanities (22)	894	2.7%	552	3.5%	342	1.9%
Social and behavioural sciences (31)**	2 045	6.1%	1 172	7.5%	873	4.9%
Journalism and information (32)	430	1.3%	343	2.2%	87	0.5%
Business, commerce and administration (34)	3 318	9.9%	1 612	10.2%	1 706	9.5%
Law and jurisprudence (38)	2 783	8.3%	1 537	9.8%	1 246	6.9%
Biology and environmental sciences (42)	1 082	3.2%	706	4.5%	376	2.1%
Physics, chemistry and earth sciences (44)	1 082	3.2%	547	3.5%	535	3.0%
Mathematics and other natural sciences (46)	146	0.4%	55	0.3%	90	0.5%
Computing (48)	540	1.6%	114	0.7%	426	2.4%
Engineering and engineering industries (52)	8 247	24.5%	1 440	9.2%	6 807	37.9%
Materials and manufacturing (54)	332	1.0%	77	0.5%	255	1.4%
Town planning and structural engineering (58)	1 917	5.7%	781	5.0%	1 136	6.3%
Agriculture, horticulture, forestry and fishery (62)	466	1.4%	240	1.5%	226	1.3%
Animal health (64)	202	0.6%	154	1.0%	48	0.3%
Health care and nursing (72)	3 383	10.0%	1 835	11.7%	1 548	8.6%
Social work and social care (76)	202	0.6%	176	1.1%	26	0.1%
Services (environmental protection, etc.) (84, 85 and 86)	88	0.3%	49	0.3%	39	0.2%
		100.0%		100.0%		100.0%

* The numbers in parentheses correspond to the first two digits in the orientations module established by the Swedish educational terminology system, Svensk utbildningsnomenklatur or SUN 2000 (SCB, 2000).

** Individuals with an education in pedagogy but without a teaching degree have been included in the Social and Behavioural Sciences category.

Four-year undergraduate programme

The university graduates whose transition to postgraduate studies we are going to look at have all completed university studies of at least four years. This way, we exclude students who have done “shorter” occupational programmes

aimed primarily at the labour market outside the academic world. The fact that the population has been selected according to length of undergraduate studies implies a certain control of educational qualifications – individuals are thereby rendered “alike”, in a manner of speaking.

The population amply fulfils the basic 120 credit point qualification for the postgraduate programme, which is equivalent to three years’ studies (Ch. 9, Section 4 of the Higher Education Ordinance).¹⁹

Makeup of women and men, etc.

Since many working class children and others have dropped out along the way to a long university education, the group of university graduates that we are going to study is a socially selected group. This is demonstrated by the fact that almost 65 per cent of the group with long undergraduate studies come from professionals’ homes at the high or low level. In contrast, only just under 12 per cent are working class children – even when sons and daughters of unskilled as well as skilled workers have been included. With regard to parents’ education, only a small group (about 13 per cent) have parents with 9-year compulsory school or less, while a large share (41 per cent) have parents with at least three years of university studies.

It is clear that women and men to some extent come from different subject orientations. Among the 19 subject areas for undergraduate programmes reported, we find the biggest divide in one of the technological areas: almost 40 per cent of the men do a degree in “engineering and engineering industries”, while only 9 per cent of the women do. By contrast, the biggest single area for women is teaching (over 24 per cent).

In the group we are going to study, only a few individuals (barely 6 per cent) have parents with postgraduate degrees. Still, this is considerably more than for the Swedish population as a whole. If we look at those born in 1970, for example, only about 1 per cent has at least one parent with a postgraduate degree.²⁰

Gender, social background and subject area are important – Models 1 to 4

Broadly speaking, the findings from the models in which one explanatory variable is included at a time (Models 1 to 4 in Table 2) tell us the following:

19. One reason for choosing the four-year limit is that it is common for the basic qualification to be complemented with locally established requirements for a special qualification of at least 160 credit points, which corresponds to four years’ studies (SOU 2004:27. p. 149). Another reason is that it makes the analysis simpler; it is difficult to judge at what point in time a person is “under risk” to go on to postgraduate studies when it is possible to do several degrees at different levels.

20. The information about the population as a whole is not shown in the table, but is based on data from SCB (Ewa Foss) about the social makeup of a number of student batches.

- Men go on to do postgraduate studies to a greater extent than women do.
- The children of professionals, particularly higher professionals, go on to do postgraduate studies to a greater extent than the children of manual workers, farmers or self-employed.
- The higher the level of education of the parents, the greater the likelihood that a child will go on to postgraduate studies. The transition likelihood is particularly high for children whose parents have done postgraduate studies.
- The tendency to move on to postgraduate programmes varies significantly depending on the subject area of the individual's undergraduate studies. The greatest tendency to move on is among those with undergraduate degrees in natural science subjects.

The bivariate models – one explanatory variable at a time

Note that these findings are based on models in which one variable at a time has been included – and that findings may change later, when we analyse several variables simultaneously in the multivariate model.

The importance of gender – Model 1

Among the men, 14.6 per cent go on to postgraduate studies. Women are 3 percentage points lower, at 11.6 per cent. If we express this using odds ratios instead, we get an odds ratio of 1 for women's tendency to go on to postgraduate studies, since they are the reference category. Since the share of men who go on to postgraduate programmes is bigger than the share of women who do, the odds ratio for men is greater than 1, or more precisely 1.30.

The importance of parents' social class – Model 2

The children of workers, self-employed/employers and farmers have the lowest transition tendency. The share that goes on to postgraduate studies is just under 11 per cent for these three groups. The highest transition tendency is shown by children of higher professionals. Of this group, 14.7 per cent go on to postgraduate studies, which is 4 percentage points higher than the groups with the lowest transition tendency.

The importance of parents' education – Model 3

With regard to parents' education, the group whose parents have themselves done postgraduate studies stands out – as much as 23 per cent move on. In the group whose parents only have some form of lower secondary education, only 10 per cent move on to postgraduate studies. The odds ratio is 2.66 for the postgraduates' children compared to the reference group, i.e. those whose parents have a lower secondary education.

Children whose parents have more than compulsory education (excluding postgraduates) also move on to postgraduate studies to a greater extent than those whose parents only have a lower secondary (i.e. compulsory) education.

However, the differences here are considerably smaller – at most there is a difference of just under 4 percentage points.²¹

The importance of the subject area – Model 4

As many as roughly half of those who receive degrees in the various natural sciences orientations go on to do postgraduate studies, while a very small proportion – about 2 per cent – of those with degrees in law and teaching do the same. The transition to postgraduate programmes thus varies widely depending on the subject area in undergraduate studies. In other words, the difference between individuals who studied different subjects at the undergraduate level can, depending on which subjects are compared, be considerably bigger than the difference between men and women and between individuals from different social backgrounds.

21. This applies for a comparison between children whose parents have a longer university education (at least three years, excluding postgraduates) and children whose parents have a lower secondary education.

Table 2. Individuals admitted to postgraduate programmes up to five years after receiving a degree in a longer undergraduate university programme (at least four years) 1995 to 1997. The importance of gender, social background, and subject area in undergraduate studies. Logistic regressions, estimates in the form of odds ratios. For Models 1–4, percentages are also given.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5*
	Pro- por- tion	Odds ratio	Pro- por- tion	Odds ratio	Pro- por- tion	Odds ratio	Pro- por- tion	Odds ratio	Odds ratio
Gender									
Men	14.6%	1.30							1.31
Women (reference)	11.6%	1.00							1.00
Parents' social class									
Higher professionals			14.7%	1.44					1.04
Lower professionals			13.2%	1.28					1.08
Routine non-manuals			12.8%	1.23					1.16
Self-employed/employers			10.7%	1.01					1.02
Farmers			10.8%	1.02					0.92
Manual workers (reference)			10.7%	1.00					1.00
No data			12.6%	1.21					1.03
Parents' education									
Postgraduate studies					23.0%	2.66			1.89
University >= 3 yrs (excl. postgraduates)					13.8%	1.42			1.11
Upper secondary >=3 yrs/tertiary < 3 yrs					12.7%	1.29			1.01
Upper secondary <= 2 yrs					11.8%	1.19			1.10
Lower secondary (reference)					10.1%	1.00			1.00
No data					12.4%	1.26			1.07
Subject area in undergraduate studies									
Teaching							2.3%	0.13	0.20
Art and media							5.0%	0.29	0.49
Humanities							26.7%	2.01	2.53
Social and behavioural sciences							17.5%	1.17	1.53
Journalism and information							6.3%	0.37	0.73
Business, commerce and administration							3.9%	0.22	0.26
Law and jurisprudence							2.1%	0.12	0.14
Biology and environmental sciences							55.0%	6.72	7.76
Physics, chemistry and earth sciences							49.6%	5.42	6.00
Mathematics and other natural sciences							47.6%	5.00	5.23
Computing							13.9%	0.89	0.99
Engineering and engineering industries (reference)							15.4%	1.00	1.00
Materials and manufacturing							21.1%	1.47	1.48
Town planning and structural engineering							11.0%	0.68	0.76
Agriculture, horticulture, forestry and fishery							21.7%	1.52	1.77
Animal health							14.4%	0.92	1.16
Health care and nursing							13.7%	0.87	1.06
Social work and social care							8.9%	0.54	0.90
Services (environmental protection etc.)							26.1%	1.95	2.58
Number	33 674		33 674		33 674		33 674		33 674

* Control variables for Model 5, not shown in the table, are age and type of university at time of undergraduate degree.

Men and children of parents with postgraduate degrees go on to postgraduate studies – a model with several explanatory variables

The multivariate model, which includes several explanatory variables, tells us the following:

- Men go on to postgraduate studies to a greater extent than women do.
- Parents' social class does not affect the tendency to go on to postgraduate studies. Thus, for the step from longer undergraduate studies to postgraduate studies, it makes no difference if parents are working class, higher professionals, or something else.
- If at least one parent has done postgraduate studies (a licentiate or doctoral degree), the likelihood that the child will go on to postgraduate studies increases. Parents with other types of education affect their child's tendency to go on to postgraduate studies to a roughly equal degree. There is, for example, no difference in influence between parents who have had a longer university education (excluding postgraduate studies) and parents who have only had compulsory education.

What does the multivariate model tell us?

The results of this section, summarised above, are based on a multivariate model (Model 5 in Table 2). That means that several explanatory variables are included in the model. This particular model includes:

- gender
- parents' social class
- parents' level of education
- subject area in undergraduate studies
- type of university in undergraduate studies
- age when taking undergraduate degree.

Model 5, the multivariate model, is the most interesting one in that it brings us closer to a real answer to the questions about recruitment bias due to gender and social background. For example, since the model takes account of the fact that men and women in part come from different types of undergraduate studies, any remaining difference between the sexes cannot be explained by this.

How the findings of the multivariate model are presented

The findings of this type of analysis are only presented in the form of odds ratios in the table. No computed percentages are given for any categories since, in the multivariate model, they only apply under certain conditions: the percentage share for one category (e.g. women) is only applicable in combination with selected categories for the other variables.

In the interests of increasing the understanding of the findings, percentages will nonetheless be computed in individual cases, and these will be presented in the text.

The importance of gender, parents' social class, and parents' education – Model 5

Gender

Men go on to postgraduate studies to a greater extent than women do. This is shown in the results of the multivariate model, which controls, among other things, for subject orientation in undergraduate studies.

Expressed using odds ratios, women's tendency to go on to postgraduate studies corresponds to 1, while men's higher tendency corresponds to an odds ratio of 1.31. In other words, men's higher tendency to go on to postgraduate studies is the same as in the bivariate model (the odds ratio for men was 1.30 in Model 1). Thus the difference between the sexes is not due to any difference between men and women in terms of the number of factors included in the model, such as subject area for the first degree.

Parents' social class

Children from working class homes and higher professionals' homes go on to postgraduate studies to the same extent. In fact, for all groups the transition probability comes close to that of the working class group (which is the reference category). This means that recruitment bias due to social background, measured by parents' social class, is not reinforced by the move to postgraduate studies.

Thus the difference between children from different social backgrounds that we observed earlier, when the influence of parents' social class was looked at by itself (Model 2), does not remain. In the multivariate model (Model 5), children who have grown up in different social classes have about the same tendency to go on to postgraduate studies, provided that they are similar in all other respects. In other words, the difference between working class children and the children of higher professionals in Model 2 was due to class background covariance with a number of other factors which affect the move to postgraduate studies.

In order further to clarify that no difference exists between children of higher professionals and working class children, here are some calculations of percentage shares: let us assume that two groups of individuals resemble each other in all respects except their social backgrounds. Let us further assume that the groups are made up of women who were no older than 25 when they did a first degree in technology at an older university (see the Appendix for an explanation of different types of university), and that their parents had had the shortest possible education (i.e. lower secondary schooling). The calculation shows that 14.6 per cent of the group whose parents are higher professionals can be expected to go on to postgraduate studies, while 14.1 per cent of those

whose parents have working class occupations will do the same. The difference, then, is of a mere half percentage point.²²

Parents' education

There is, however, one factor related to background whose influence remains, albeit at a lower level, in the multivariate model as well. The likelihood of going on to postgraduate studies remains significantly higher for individuals whose parents have a postgraduate degree than it is for other groups. The odds ratio for children of parents with postgraduate degrees is 1.89 in comparison with children of parents with only lower secondary schooling.

In fact, this relationship (1.89 compared with 1.0) also applies in relation to the other groups – with parents that have everything from shorter upper secondary school studies, to longer university studies (but not postgraduate studies). An example of what this means is that it hardly makes any difference whether parents have done more extended university studies (at least three years, but not postgraduate studies) or only have compulsory education.

What do these relationships imply expressed in percentage terms? This time, let us make the calculation for two groups of individuals who have in common that they are women and that their parents are higher professionals, and that they have done a technology degree at an older university before the age of 26. The only difference between the groups is that in one individuals have at least one parent with postgraduate studies, while in the other they have at least one parent with three years or more of university studies (but not postgraduate studies). In percentage terms, 24.4 per cent of the group with at least one parent with postgraduate studies goes on to postgraduate studies of their own. Among those with parents who have a higher education but no postgraduate degree, 16 per cent go on to postgraduate studies.

In comparison with earlier studies, of which there are only a few, it can be noted that the finding that parents with postgraduate degrees have a particularly large influence on the move to postgraduate studies matches the findings presented in a study by Erikson and Jonsson (1994). In contrast, a 2004 report on social backgrounds by the Swedish National Agency for Higher Education (Högskoleverket) and SCB, which also looked at the influence of parents' education for the move to postgraduate studies, did not single out parents with postgraduate studies. Would perhaps the effect that was observed – that having parents with at least three years of university studies increases the likelihood of going on to postgraduate studies – disappear if the parents with postgraduate studies were removed from the university-educated parents group?

22. As neither the intercept nor all the coefficients are shown in the table, readers will be unable to calculate the percentage shares for themselves.

Subject area for first degree – most important after all...

We should also bear in mind the large differences that exist between subjects. This can be illustrated by yet another arithmetic example. In the example above, we saw that the model predicts that among women who are the children of higher professionals with at least three years' university studies (not postgraduate) and who have done a technology degree no later than at 25 at an older university, 16 per cent will go on to postgraduate studies. If a person has a degree in biology instead, but in other respects has the same background and traits, the model estimates that as much as 60 per cent will go on to postgraduate studies.

Attempts at explanations

The analyses do not answer the question *why* men and the children of parents with postgraduate degrees go on to postgraduate studies to a higher extent than others. Neither do they tell us why there is no difference between children of different backgrounds with respect to their parents' social class. But let us nevertheless pause for a moment over the question about what the findings might be due to.

Why do children of parents with a postgraduate degree themselves go on to postgraduate studies?

The children of parents who have completed a postgraduate degree need to go all the way to the postgraduate programme level in order to reach as far as their parents, which is not necessary for any other group. It is a reasonable assumption that the children of parents with postgraduate degrees have educational aspirations which are unusually elevated, and that this is due to their parents' level of education.

Another interpretation is that the children of parents with postgraduate degrees have significantly better information about which routes lead to postgraduate studies. This may be important in a situation, such as the one in Sweden, where the way into postgraduate studies is sometimes very unclear.

Perhaps there is even an element of preferential treatment of the children of PhDs in connection with admission to postgraduate programmes. This might happen if a parent or both parents are acquainted with the people on the admissions board. Although these are purely speculations, it cannot be ruled that such preferential treatment occurs here and there within the Swedish system.

The different interpretations need not rule each other out. On the contrary, they can certainly complement each other while still leaving room for further interpretations.

Why is class background without influence in the transition to postgraduate studies?

Perhaps we should simply be pleased with the finding that class background is without significance, and leave it at that. But some people may find it rather striking. It is therefore pertinent to reiterate emphatically the point that those working class children (as well as the children of some other “underprivileged” groups) who have completed longer university programmes are likely to be selected. This simply means that it is those in the group with the highest academic aptitude who have managed to complete one of the universities’ longer undergraduate programmes. Among children of higher professionals – numerous on longer undergraduate programmes – the spread of aptitude, for example, is probably bigger.

What is the gender difference due to?

But what is the gender difference due to? It could not, after all, be “explained away” by the fact that men and women differ in a number of relationships. This question has no simple and obvious answer either. On the one hand it could be said that the difference does not seem that big (an odds ratio of 1.31 for men and 1 for women). But on the other hand, this difference proved unusually resilient against a number of control variables related to the transition to postgraduate studies. Moreover, we are talking about a very large group, given that women make up 47 per cent of the population we are studying.

One possibility is that the model still does not sufficiently consider differences which exist between men and women, and which are significant for the transition to postgraduate studies. Do the subject areas in undergraduate studies perhaps need to be broken down even further? Do we perhaps need information on qualifications, which we do not have in this data?

But before this kind of model is further developed in a future study, it would seem to be of interest to repeat our analysis on later data. The reason for this is that the gender distribution among the postgraduate beginners has been increasingly evened out in recent years (2003 and 2004). Is this possibly a sign that women’s lower probability, when compared with men, of carrying on to do postgraduate studies has disappeared? But at the same time the share of women, compared with the share of men, who complete long undergraduate programmes has increased over time. The increased share of women among beginners in postgraduate studies could be explained by this. It is therefore quite possible that the share of women who move on among those who have completed long undergraduate programmes still falls short of men’s transition share.

The importance of social background for women and men

The analyses on which these findings are based are presented in Table 3. Men and women have been analysed separately. In other respects, the model is the same as Model 5 (in Table 2), although only the effects of parents' class and education are shown.

Women and men are equally affected by social background

Does social background have the same effect for men and women in the transition to postgraduate studies? The answer is that the pattern is highly similar for both sexes. One example of this is that women from homes of higher professionals have about the same transition probability as women from working class homes, which is the same relationship that applies between men from homes of higher professionals and men from working class homes. Additionally, both women and men whose parents have postgraduate degrees move on to postgraduate studies to a greater extent than any of the other groups.

If we make the effort to find the biggest possible difference between women and men, our attention falls on children of the self-employed homes. Women who come from that kind of background move on to postgraduate studies to a slightly lower extent than daughters of the working classes, while men from self-employed homes instead move on to postgraduate studies to a slightly higher extent than men with working class backgrounds. Still, the difference is slight for both women and men.²³ All in all, then, the findings still support the conclusion that social background affects women and men equally in the transition to postgraduate studies.

23. If one analyses the 1995–1997 graduate cohorts separately, it turns out that among men, the children of the self-employed have a slightly higher transition tendency in all three groups. For the women findings vary somewhat, with the transition tendency sometimes being the same for the children of the self-employed and manual workers (1997 graduate cohort) and sometimes being notably higher for workers' children.

Table 3. Individuals admitted to postgraduate programmes up to five years after receiving a degree in a longer undergraduate university programme (at least four years), 1995–1997. The importance of social background for women and men (separate analyses). Logistic regressions, estimates in the form of odds ratios.

Social background	Women	Men
Parents' social class		
Higher professionals	1.02	1.06
Lower professionals	0.97	1.15
Routine non-manuals	1.06	1.23
Self-employed/employers	0.78	1.20
Farmers	0.95	0.89
Manual workers (reference)	1.00	1.00
No data	1.00	1.07
Parents' education		
Postgraduate degree	2.02	1.83
University >= 3 yrs (excl. postgraduates)	1.09	1.14
Upper secondary >=3 yrs/tertiary < 3 yrs	1.08	0.98
Upper secondary <= 2 yrs	1.18	1.06
Lower secondary (reference)	1.00	1.00
No data	1.11	1.07
Number	15 728	17 946

Control variables are age, subject orientation and type of university at time of first degree.

Does the importance of gender and social background vary between subject areas?

How general are the relationships we have found between gender and social background on the one hand, and transition to postgraduate studies on the other? Does the importance of gender or social background vary depending on individuals' subject areas in undergraduate studies?²⁴ Earlier studies have found this to be the case.²⁵

The results are presented in Table 4

Table 4 summarises the findings from a number of analyses divided by subject. This means that the effects of gender as well as parents' class and education are studied for individuals who have completed undergraduate studies in the same subject area.

The findings in the table have been organised according to how big a share of the subject group moved on from undergraduate to postgraduate studies. Biologists moved on to the highest extent, so gender differences for biologists are shown in column 1. This is followed by the subject in which the second

24. Note that the individual's field of study at the postgraduate level may be different from his or her subject area in undergraduate studies. Examples of this are individuals with a first degree in biology who go on postgraduate studies in medicine. For the undergraduate group as a whole, however, the commonest case is that individuals are admitted to postgraduate programmes within the same subject areas as that of their first degree.

25. See the chapter entitled "Background – what are the known facts?"

biggest share moved on (physics, chemistry and earth sciences), and so on in descending order.

How to read the comments to Table 4

The comments to Table 4 are fairly extensive. For this reason, the most important findings are summarised at the beginning, and followed by information about how men and women, as well as children from different social backgrounds, are distributed among the different subject areas on the undergraduate programmes. The findings of the analyses are then presented under three headings:

Women and men on different undergraduate programmes is about the importance of gender in different subject areas.

The importance of class background for students from different undergraduate programmes is about the possible effect of class background in the different subject areas.

The importance of parents' education for students from different undergraduate programmes, finally, is about whether parents' education affects children's likelihood of moving on to postgraduate studies in the same way for the different subject areas.

Summary of the findings in Table 4

Analyses of recruitment bias due to gender and social background within eight different subject areas show the following:

- Men go on to postgraduate studies to a greater extent than women in six of the subject areas studied.
- The differences between men and women, to men's advantage, are particularly big in natural sciences and the humanities.
- Women are in the minority among those who complete an undergraduate programme in engineering, but they move on to postgraduate studies to about the same extent as men do.
- In the area of agriculture, forestry and fishery, more women than men go on to postgraduate studies. This is the only area we have studied in which the attrition is of men.
- In some subject areas, it seems that children of higher professionals move on to a greater extent than working class children, while in other areas this is not the case. However, the number of individuals has dropped so dramatically in the various social groups of the by-subject analyses that we should probably be wary of drawing any very far-reaching conclusions based on the differences.
- The area in which we find the most evident difference between children of the working class and children of higher professionals is health care and nursing, in which children of higher professionals move on to postgraduate studies to a distinctly greater extent than working class children. If we focus exclusively on trained medical doctors and dentists in the

health care and nursing group, we find that children of higher professionals still have a higher likelihood of going on to postgraduate programmes, even if the difference is smaller now.

- In seven of eight subject areas, children of parents with postgraduate degrees themselves move on to postgraduate studies to a greater extent than children of parents with only a lower secondary education.
- Big differences exist between children of parents with only compulsory schooling on the one hand, and children of parents with postgraduate degrees on the other, in the following five subject areas: (1) the humanities, (2) engineering, (3) town planning, (4) health care and nursing, and (5) physics, chemistry and earth sciences.

Eight subject areas have been studied

The subject areas correspond to the categories for the “subject area in undergraduate studies” variable in Model 5 (Table 2). Eight of the nineteen subject areas have been selected for analysis by subject. Two criteria were applied in making the selection of subject areas: that different subject orientations should be represented, and that the groups should be large enough to allow the use of Model 5, which includes two variables for social background with a fairly large number of categories.²⁶

The number of graduates varies widely between the eight subject areas. The smallest number is in agriculture, forestry and fishery (466 individuals), and the biggest in engineering (8 247 individuals). The transition shares also vary, despite the fact that subjects in which only a very small portion go on to postgraduate studies have not been included.

Gender and subject choice in undergraduate studies

Gender distribution varies between different subject orientations in undergraduate studies (see Table 1). It falls within the equality interval of 40–60 for graduates in the areas agriculture, forestry and fishery; chemistry and earth sciences; town planning; health care and nursing; and social sciences. However, in engineering men make up as much as 83 per cent of graduates, while women represent 65 per cent in biology and 62 per cent in the humanities.

Social background and subject choice in undergraduate studies

The social makeup only varies to a small extent between the undergraduate subject areas (not shown in any table). Even if there are differences, the pattern is largely the same among graduates in all subject areas. For example, a large proportion have grown up in higher professionals’ homes, and a small

26. Some further subjects, other than the ones presented, have been tried (in which the transit share is noticeably lower, or the number of graduates is low), but the models could only be solved numerically (i.e. they converged) in a few single cases. This could most probably be remedied through changes to the model, but that type of adjustment would take us too far from the study’s main track.

proportion have grown up in working class homes. The biggest deviation consists of the group of farmers' children who have completed studies in agriculture, forestry or fishery. Farmers' children make up as much as 19 per cent of the graduates in this subject area, while they only make up about 3 per cent of graduates in the other subject areas.

About the interpretation of the findings

Discriminating analyses by subject leads to a drastically lowered number of individuals in each model. The total number would appear to be sufficient, but certain categories (e.g. children of farmers) become rather small. It is therefore advisable to interpret the findings, at least in part, with some prudence.²⁷

27. If similar patterns were to appear in a study that repeated these analyses for later years' batches of graduates, the results for the small groups would also gain in substance.

Table 4. Individuals admitted to postgraduate programmes up to five years after receiving a degree in a longer undergraduate university programme (at least four years), 1995 to 1997. The importance of gender and social background for graduates from eight different subject areas in undergraduate studies. Logistic regressions, estimates in the form of odds ratios.

Variables	Subject area in undergraduate studies			
	Biology	Physics/ Chem./ Earth sciences	Human- ities	Agriculture, forestry, fishery
Gender				
Men	1.53	1.67	1.87	0.69
Women (reference)	1.00	1.00	1.00	1.00
Parents' social class				
Higher professionals	1.23	1.36	1.26	0.97
Lower professionals	1.07	1.73	1.10	1.07
Routine non-manuals	0.83	2.49	0.59	0.80
Self-employed/employers	1.04	1.42	0.63	1.52*
Farmers	0.87	2.08	0.90	0.45
Manual workers (reference)	1.00	1.00	1.00	1.00
No data	1.64	0.67	3.20	1.48*
Parents' education				
Postgraduate degree	1.20	3.37	1.96	0.83
University >= 3 yrs (excl. postgraduates)	0.98	1.45	0.61	1.64
Upper secondary >=3 yrs/ university < 3 yrs	0.94	1.29	0.86	0.92
Upper secondary <= 2 yrs	1.24	2.00	1.08	0.92
Lower secondary (reference)	1.00	1.00	1.00	1.00
No data	0.92	2.72	0.56	**
Number	1 082	1 082	894	466
Proportion (%) admitted to postgraduate programmes	55.0%	49.6%	26.7%	21.7%

Variables	Social sciences	Engineering	Health care/ nursing	Town planning
	Gender			
Men	1.34	1.05	1.27	1.16
Women (reference)	1.00	1.00	1.00	1.00
Parents' social class				
Higher professionals	1.14	0.84	1.73	1.01
Lower professionals	1.09	1.00	1.40	1.11
Routine non-manuals	0.78	1.11	1.36	1.43
Self-employed/employers	0.88	1.02	0.93	0.80
Farmers	1.02	1.02	1.08	0.75
Manual workers (reference)	1.00	1.00	1.00	1.00
No data	0.82	1.20	0.78	2.26
Parents' education				
Postgraduate degree	1.19	2.06	1.69	1.99
University >= 3 yrs (excl. postgraduates)	0.85	1.12	1.10	0.74
Upper secondary >=3 yrs/university < 3 yrs	0.66	1.08	1.12	0.94
Upper secondary <= 2 yrs	0.87	0.86	1.13	1.00
Lower secondary (reference)	1.00	1.00	1.00	1.00
No data	0.94	1.16	1.09	0.65
Number	2 045	8 247	3 383	1 917
Proportion (%) admitted to postgraduate programmes	17.5%	15.4%	13.7%	11.0%

Control variables for all models are age and type of university at time of first degree.

* Category with fewer than 20 individuals.

** The individuals in the category "No data" (parents' education) correspond exactly to the individuals in the category "No data" (parents' social class).

Women and men on different undergraduate programmes

To begin with, we can note that the relationship between gender and transition to postgraduate studies is different for different subject areas. For some, men move on to postgraduate studies to a considerably greater extent than women, while for one area they do so to a lesser extent than women.

The humanities – considerably more men than women in postgraduate studies

Among students of the humanities, we find that men carry on to do postgraduate studies to a distinctly greater extent than women. The odds ratio for men is as high as 1.87. That is the biggest difference between men and women for all the subject orientations we have studied.

Even if men move on to a considerably greater extent than women, quite a few women will begin postgraduate studies in some humanities subject. The reason for this is that as a group, students of the humanities go on to postgraduate studies to a fairly great extent – in total, almost 27 per cent of them do. Furthermore, women make up the majority of those who complete their undergraduate programmes (62 per cent).

Natural sciences – more men than women move on to postgraduate studies

In a completely different subject area, natural sciences, there are also clear gender differences. Men go on to postgraduate studies to a considerably greater extent than women do. The odds ratio for women who have graduated in biology, chemistry, physics or earth sciences is 1, while the odds ratio for men is 1.53 in biology and 1.67 in chemistry, physics or earth sciences.

Students of natural science subjects go on to do postgraduate studies to a very great extent. Counting men and women together, as many as 55 per cent of biologists and nearly 50 per cent of those with degrees in physics, chemistry or earth sciences make the transition. Women are also in the majority among the students who take their undergraduate degree in biology (65 per cent), while gender distribution is even for chemistry, physics or earth sciences (51 per cent women).

Social sciences and health care/nursing – slightly more men in postgraduate studies

In both social sciences and health care/nursing, it is more common for men to go on to postgraduate studies than it is for women. However, the difference between men and women is smaller than it is in the humanities and natural sciences. Expressed as odds ratios, men's transition is 1.34 in social sciences and 1.27 in health care/nursing.

The gender distribution among those who have completed longer undergraduate programmes in these subjects is reasonably even, and the share that

makes the transition to postgraduate studies is about average (18 per cent in social sciences and 11 per cent in health care/nursing).

Engineering programmes – no gender difference

In engineering subjects (engineering and town planning), men and women move on to postgraduate studies to about the same extent.

However, as women are often in the minority on undergraduate engineering programmes (for instance, women make up only 17 per cent of those with first degrees in engineering), men will be clearly in the majority on postgraduate programmes. But at least, as we have just shown, this male majority among postgraduate students is not due to women disappearing on the cusp of postgraduate studies.

Agriculture – more women than men carry on to the postgraduate level

Programmes in agriculture, forestry and fishery are the only ones (among the programmes we have studied) on which more women than men make the transition to postgraduate studies. Consequently, men's odds ratio for the transition tendency is less than 1, or more precisely, 0.69. Gender distribution is even at the undergraduate level.

However, women's higher transition tendency in the agriculture, forestry and fishery area exerts a very limited influence on the overall gender effect (in which all undergraduate subject areas are included, see Table 2), as the area is so small. In the material for this study, only 466 students or 1.4 per cent have completed programmes in the area (see Table 1).

There are no simple relationships

As has been pointed out previously, this is not an analysis of why the differences are what they are. But we can at least note that we have not found any simple relationships to do with how large a share of students move on to higher studies after their undergraduate degree, or with how men and women are distributed on undergraduate programmes.

An example: men are slightly under-represented in biology and the humanities on undergraduate programmes. It could therefore be tempting to regard their high share of transitions to postgraduate studies in these subjects as a result of their lower numbers. But at the same time, a clearly larger share of men than women move on to postgraduate studies in chemistry, physics or earth sciences – and in these subjects gender distribution at the undergraduate level is even.

The results from the subject-discriminated analyses should nevertheless serve as a basis for discussions among representatives of different subjects. To begin with, one might ask why it is so much more likely among humanists and natural scientists for a man to move on to postgraduate studies than a woman. And why is the relationship between gender and transition reversed in

agriculture, forestry and fishery? Furthermore, why is the transition tendency just about gender neutral in engineering subjects?

If we take the engineering subject area as an example, we find that the interpretation of the findings is far from obvious. As was mentioned earlier, there are many more men than women at the undergraduate level. Perhaps, then, an equal share of women and men go on to postgraduate programmes since women are compensated by the fact that they are heavily selected on undergraduate programmes. That assumption is based on the fact that women as a group have higher marks and better qualifications than men, since they are so few. It could also be the case that when women make up a small minority it does not matter if they move on to the same extent as men, because men will anyway dominate in numbers at the postgraduate level. Another interpretation has to do with the labour market. If it is easier for men than for women to have a non-university career in the traditionally male-dominated engineering sector, perhaps postgraduate programmes are seen as an attractive alternative for women. Several interpretations are of course possible, and may interact with each other.

The importance of class background for students from different undergraduate programmes

The findings of the subject-discriminated analyses show that, depending on the subject area in question, children of higher professionals make the transition to postgraduate studies to a greater, an equal or, to some degree, a lesser extent than working class children. Recalling the general effect of class background, it showed that when all subject areas were analysed together, the children of higher professionals and of manual workers made the transition to about the same extent (cf. Model 5 in Table 2).

Children of higher professionals and of manual workers

For the purpose of simplifying the presentation, comparisons will principally be between the children of manual workers and of higher professionals. Such a comparison is essential given the high representation of higher professionals' children on postgraduate programmes. They are also the category that most distinguishes itself from working class children at earlier levels in the educational system: in educational achievement, marks, and educational choices.

Health care and nursing – working class children do not reach postgraduate studies

In one subject area, health care and nursing, the transition shares for children from higher professionals' homes clearly exceed those of working class children (the odds ratio for higher professionals' children is 1.73). Might this be due to the fact that children of higher professionals are particularly well represented on undergraduate medical programmes, for instance – from which

a fairly large proportion move on to postgraduate studies, whereas working class children attend health care programmes, from which fewer move on to postgraduate studies? If we single out those individuals who have received a medical doctor's or dentist's degree, the following occurs: the odds ratio for children of higher professionals drops to 1.37 (these findings are not shown in the table). Compared with the other subject areas, however, this is still a fairly high figure. The finding is also disheartening given the fact that working class children are clearly under-represented already among medical students. Since medical programmes are hard to get into, we can assume that those working class children who have succeeded in passing through the eye of the needle are academically gifted. Despite this, then, they do not move on to postgraduate programmes to the same extent as children of higher professionals do.²⁸

Natural sciences and the humanities – slightly more professionals' children on postgraduate programmes

Natural scientists and students of the humanities who grew up in higher professionals' homes move on to postgraduate programmes to a slightly greater extent than working class children.

More even transition levels could perhaps be expected for the two classes with reference to the fact that a large share makes the transition to postgraduate studies, both among graduates of natural science subjects and humanities subjects.

Engineering programmes, social sciences, and agriculture, forestry and fishery – the class background is of no importance

In the very large group (10 164 individuals of 33 674) of graduates from undergraduate engineering and town planning programmes, children of higher professionals do not show a greater tendency to begin postgraduate studies than working class children do. In the engineering subject area, the tendency is in fact almost the opposite, i.e. that working class children move on to a greater extent.

Similar conditions are found to obtain for other subject areas as well. In agriculture, forestry and fishery, the transition tendency is the same for the two groups, and among graduates of social sciences, the transition tendency of higher professionals' children is only moderately higher than that for workers' children (the odds ratio is 1.14 for higher professionals' children relative to working class children).

28. Remember, however, that the number of individuals in the various groups has dropped dramatically for the subject-discriminated analyses. Therefore, the analysis of the medical students in particular would need to be repeated on a larger group of graduates by including more graduate cohorts.

Farmers' children

Farmers' children make up as much as 19 per cent of undergraduates in agriculture, forestry and fishery. In other subject areas, they only make up about 3 per cent. But to what extent do they carry on to postgraduate studies once they have completed an undergraduate programme in agriculture, forestry or fishery?

The answer is that very few in this group begin postgraduate studies. The odds ratio for farmers' children with an undergraduate degree in agriculture, forestry or fishery is very low in comparison with other groups (the odds ratio is only 0.45 when compared with working class children)²⁹. The transition tendency for farmers' children is not nearly as low when their undergraduate degree is in one of the other subject areas.

Why is this? Could it be that many in this group have good opportunities for another type of career? Possibly many intend to take over a working farm, a forestry or a fishery business? It may be assumed, at least, that many have good contacts with people who are active in the sector, which in turn could facilitate both setting up a business and doing a non-university career.

The importance of parents' education for students from different undergraduate programmes

How does the importance of parents' education – the other indicator of social origin – vary between subject areas? In the overall model which included all individuals, the children of parents with postgraduate degrees had a higher tendency than the others to continue to the postgraduate level.

The findings of the subject-discriminated analyses show, in summary, that in seven of the eight subject areas, children of parents with postgraduate degrees go on to do postgraduate studies to a greater extent than children of parents with little education (only lower secondary schooling). But the size of "greater" is markedly varied.

Parents with postgraduate degrees and parents with lower secondary schooling

Children of parents with postgraduate degrees will be compared principally with children of parents with only lower secondary schooling. It was, after all, the children of parents with postgraduate degrees who stood out in the

29. It can be difficult immediately to estimate the size of odds ratios which are less than 1. For the sake of comparison, a 0.45 odds ratio corresponds to the logarithmic odds ratio -0.79 (i.e. a negative number, and the value for the reference category here equals 0). A logarithmic odds ratio with the same relationship to the reference category, but on the positive side (i.e. 0.79) corresponds to an odds ratio of 2.20. Thus, if the farmers' children rather than the workers' children had been the reference category, the odds ratio for the workers' children would have been 2.20 relative to the farmers' children, which might be a clearer way of expressing the relationship between the two groups.

analysis of all individuals with longer undergraduate studies. But it is worth keeping in mind that the group with parents who have postgraduate degrees is fairly small.

Natural scientists – parents with postgraduate degrees make both a big and a small difference

For chemists, physicists and earth scientists, all children whose parents have an education beyond the most basic level make the transition to a greater extent than children whose parents have only lower secondary schooling. However, the transition probability is particularly high for children of parents with postgraduate degrees. The odds for this group are more than three times higher, or more precisely, the odds ratio is 3.37 relative to children of parents with lower secondary schooling.

A calculation example may lend more substance to the differences. If we compare a group of chemists, physicists and earth scientists whose parents have postgraduate degrees with a group whose parents only have lower secondary schooling (the conditions for the two groups are otherwise similar: they are women, the children of higher professionals, 25 or younger when they complete undergraduate studies at an older university or university college), the model estimates that 70 per cent of the group with degree-holding parents will make the transition to postgraduate studies, while only 40 per cent of the group whose parents only have compulsory schooling will do the same.

For the other group of natural scientists, biologists, the relationship looks different. Children of parents with postgraduate degrees also make the transition to a greater extent than children of parents with lower secondary schooling. But the odds ratio is only 1.20 for the children of PhDs, which means that the difference between the two groups is small in comparison with the other group of natural scientists (physicists etc.) It is also a rather small difference compared with all the subject areas taken together (the odds ratio for degree-holding parents is 1.89 in the overall model, see Model 5 in Table 2).

Engineering programmes, the humanities and health care/nursing – big differences

We have previously seen that working class children hold their own well in the transition to postgraduate studies, compared with higher professionals' children, among graduates of the two engineering areas. The pattern looks different when we look at the importance of parents' education. The group with parents who have a postgraduate degree distinguishes itself sharply from individuals whose parents have other types of education. In approximate terms, the children of PhDs make the transition to postgraduate studies to about twice the extent that children of parents with only compulsory schooling (the odds ratio is about 2.0).

Among humanities graduates as well, the children of PhDs are about twice as likely to begin postgraduate studies themselves as are the children of parents with the shortest type of education.

For graduates of health care and nursing programmes, we found earlier that children of higher professionals went on to postgraduate studies to a great extent. Additionally, it now turns out that there is an effect of having at least one parent who is a PhD: this group makes the transition to a considerably greater extent (the odds ratio is 1.69) than individuals from homes where parents have a shorter education.

Social sciences and agriculture, forestry or fishery – small differences

In social sciences, children of parents with little education deal well with the competition. The only group that exceeds their transition tendency, and then only to a moderate degree, is the group whose parents hold postgraduate degrees, as might be expected.

Among graduates in agriculture, forestry or fishery as well, a relatively large share of children of parents with little education makes the transition to postgraduate studies. The relationship is in fact almost reversed, i.e. children of minimally schooled parents move on to a greater extent than children of PhDs. It is important, however, not to over-interpret this finding, since the number of children of PhDs is small (the agriculture, forestry and fishery area is the smallest one we have chosen to study).³⁰

Parents with postgraduate degrees make all the difference

What can we say about the groups of students whose parents have other types of education than postgraduate programmes? There is, after all, a very considerable educational distance between a longer university education (but no postgraduate studies) and a lower secondary schooling. Is this at all important?

Six times out of eight, the transition tendency is about the same or lower for children of university-educated (no postgraduate studies) parents than for children of parents with lower secondary schooling. It is only among graduates in two subject areas that children of parents with longer university educations make the transition to a greater extent. One is agriculture, forestry and fishery, which at the same time is the only area in which children of parents with little education move on to postgraduate studies to a greater extent than children of PhDs. Chemistry, physics and earth sciences is the other area in which children of university-educated (no postgraduate studies) parents move on to a large extent. But in this group, as we can recall, children of parents with little education appear to stand out from all other educational backgrounds.

30. We can note that children of university graduates (at least three years, but no postgraduate studies) make the transition to a greater extent. But it is probably important not to over-interpret this either.

These additional comparisons support the conclusion from the overall analysis: parents with postgraduate degrees make all the difference in the transition to postgraduate studies. In other respects, the influence of parents' educational level – so important for the transition between lower and upper secondary school, and between upper secondary school and university – has disappeared or greatly diminished in importance for the transition to postgraduate studies.

Employment as postdoctoral fellow

Are women employed as postdoctoral fellows to the same extent as men? Have changes occurred over time in this context? Do men and women take the same length of time to go from a doctoral degree to employment as postdoctoral fellow? These are some of the questions which will be answered in this section. In summary, the answers are:

- In the group that were awarded PhDs between 1985 and 1990, men's employment as postdoctoral fellows has been slightly greater than women's.
- In the group awarded PhDs in the mid-1990s, women's employment as postdoctoral fellows has been slightly higher than men's. This difference is likely to be connected with the preferential employment policies directed at women during this period to balance men's over-representation in the workplace. In the absence of this, it is possible that men would have been employed as postdoctoral fellows to a greater extent than women.
- The share of postgraduate students who move on to employment as postdoctoral fellows has decreased over time, for both women and men. Since this trend has been more negative for men, gender equality has improved. But the women who became PhDs during the latter half of the 1990s have still had more difficulties becoming postdoctoral fellows than earlier generations of women. It therefore appears as if the year in which the PhD was awarded has been more important than gender.
- The tendency is for women to take somewhat longer than men in securing employment as postdoctoral fellows.
- It has not been possible to analyse the development of men's and women's transition to postdoctoral fellowships in the years since 2000 to a sufficient extent, but we can see certain tendencies. For example, it appears that we can expect a gender-balanced development in the social sciences, while men will increase their lead in the natural sciences.

Postdoctoral fellowship is an attractive form of employment

Postdoctoral fellowships are established by higher education institutions with the aim of recruiting recent or relatively recent PhDs. Chapter 4, Section 10 of the Swedish Higher Education Ordinance (SFS 1999:1037) begins with the following sentences: "Persons who have completed a doctoral degree, or who possess a foreign academic degree deemed equivalent to a doctoral degree, are qualified for employment as postdoctoral fellows. Preference should be given to applicants who completed their degree no more than five years prior to the end of the application period." Employment as postdoctoral fellow is open-ended, but does not usually extend beyond four years (Ch. 4, Section 30 of

the Higher Education Ordinance). During that time, the postdoctoral fellow has ample opportunity, mainly by means of research but also through teaching, to qualify for promotion to reader. Beyond that, tenure as senior lecturer or professor is a possibility.³¹

A postdoctoral fellowship is thus an attractive form of employment from the individual's perspective. It follows that equal employment opportunities for men and women to such posts is partly a fairness issue. From the institutions' point of view, qualification posts are an important means of recruiting new generations of teachers and researchers – which is particularly topical considering the impending wave of retirements. If it turns out that one gender has greater difficulty moving on to employment as postdoctoral fellow, this would imply a loss of research and teaching talent.

In sum, it is important both from a fairness and a quality perspective to investigate how the transition to employment as postdoctoral fellow occurs for women and men. If it is true that women drop out of a postdoctoral career in higher education, is this apparent already in the transition to postdoctoral fellowships?

Measures to promote gender equality among postdoctoral fellows

Since transitions to employment as postdoctoral fellow are studied over time, it is pertinent to mention some measures taken by the government during the 20th century to promote gender equality among postdoctoral fellows.

Preferential treatment

The government bill entitled *Jämställdhet mellan kvinnor och män inom utbildningsområdet* (1994/95:164) is the basis for some of the measures.

One deals with preferential treatment based on gender. In the mid-1990s, a new section was added to the Higher Education Ordinance (Ch. 4, Section 16 of the Ordinance, 1993:100). It allows universities, under certain circumstances, to treat either under-represented gender preferentially when employing postdoctoral fellows, with the purpose of promoting gender equality in the workplace.³² Since it is most often women who are under-represented, it is understood that such treatment may be extended primarily to them.

However, universities are not in any way obliged to apply the section about preferential treatment. The responses to the Swedish National Agency for Higher Education's (Högskoleverket's) 2002 questionnaire study of different hig-

31. This is one possible scenario. No fixed career ladder exists in higher education. It is, for instance, possible to be employed as professor or senior lecturer without having done a PhD.

32. The government's intention with the amendment was to make it clear that preferential treatment of the under-represented gender was permissible, if there was a need. However, this principle was first established in the 1980 Equal Opportunities Act and could thus have been applied with reference to that Act.

her education institutes, which asks about their work on gender equality, indicate that several institutes have established in their recruitment policies that preferential treatment may be applied.³³ However, not many institutes report that they actually apply preferential treatment in practice. One reason seems to be that there is uncertainty about how and when it should be applied.

Posts established for women

The government bill quoted above further states that: “It is urgent that the share of women among postdoctoral fellows increase markedly.” And in March 1996, an appropriation was made for the appointment of 73 postdoctoral fellows in areas with an uneven gender distribution. Preferential treatment favouring the under-represented gender could be applied when making the appointments. The majority of the posts (45) were filled during 1997. Six women were employed in 1996, and between 1998 and 2000 the remaining 22 posts were filled. There were male applicants to the posts, but all of them were filled by women.³⁴

Institutes’ gender equality objectives

In another bill, *Högskolans ledning, lärare och organisation* (1996/97:141), the government proposed that universities should be charged with drawing up their own objectives for gender distribution among newly recruited teachers – which would include postdoctoral fellows.³⁵ As of 1998, this requirement is included in the appropriations documents for universities.

Institutes’ work on gender equality

Overall, it is probably the case that institutes’ work on gender equality has improved during the period. For example, in a comparison between institutes’ gender equality work in 1999 and 2002, Högskoleverket’s assessors note that “... gender equality is an area which has progressed and which often holds a relatively strong position at Swedish universities today”.³⁶

Other changes

Some other changes have also occurred. For example, the employment period for postdoctoral fellows has been shortened from six to four years. This followed the government’s wish to allow more PhDs to be employed as postdoctoral fellows,³⁷ and since 1999 such employment is therefore limited to a maximum of four years (amended in SFS 1998:1003, Ch. 4, Section 30 of the Higher Education Ordinance). However, another change occurred which held back the

33. Högskoleverket (2003a).

34. Högskoleverket (2000a).

35. Objectives for professors are established by the government.

36. Högskoleverket (2003a, p. 21).

37. Government bill 1996/97:141.

expansion of postdoctoral fellowships: universities terminated postdoctoral fellowships in connection with the financial restraints of the 1990s.

One might reasonably assume that these two changes are of limited, or even nonexistent, significance to gender equality in recruitment. But could they perhaps be negative all the same, from a gender equality perspective? Note, for instance, that the changes for the worse (the shortening of employment periods to four years can also be seen as a change for the worse, at least from the individual's point of view) become a reality in connection with women's numbers among PhDs growing strongly and with gender balance within reach at last.

The population – PhDs 1985–2001

The transition to employment as postdoctoral fellow has been studied for those individuals who were awarded a doctorate before the age of 60 – starting with the PhD batch for 1985 and up to and including the PhD batch for 2001.

Numbers of PhDs and postdoctoral fellows – growth and stagnation

It has been pointed out from several quarters that postdoctoral qualification opportunities at universities have lessened over time.³⁸ The strong growth in numbers of new PhDs, in relation to the more or less constant number of postdoctoral fellowships, has made it more difficult for PhDs to build qualifications for a further academic career.

Imbalance between the numbers of PhDs and postdoctoral fellows

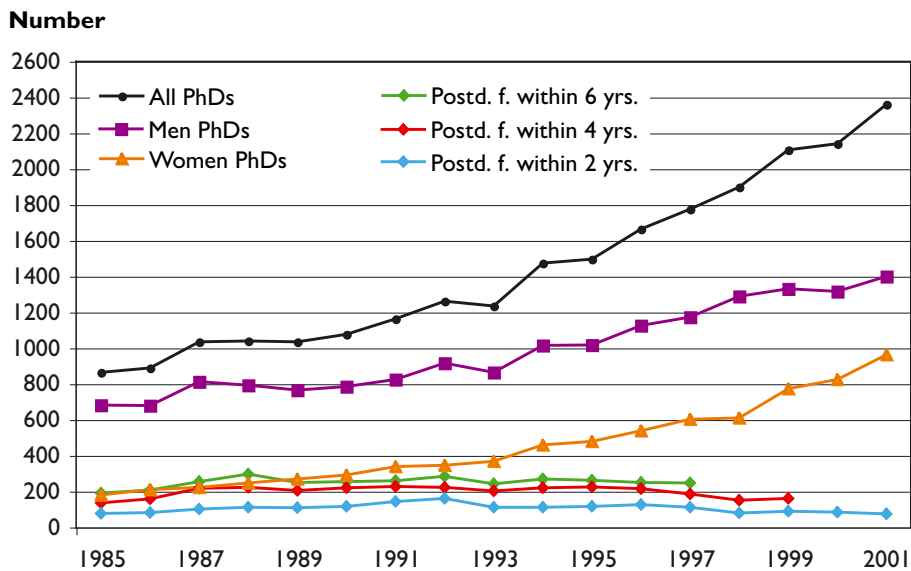
This unbalanced development in the numbers of PhDs and postdoctoral fellows is also clear in the present study.

The development is shown in Diagram 1. The three upper curves show the total number of PhDs, and then the total divided into men and women, respectively (all under the age of 60), for 1985–2001. The three lower curves show how many of the PhDs had employment as postdoctoral fellows within six, four and two years, respectively. The diagram shows, for example, that at the beginning of the period (i.e. in 1985), a total of just under 900 individuals were awarded doctoral degrees. Of these, about 200 were employed as postdoctoral fellows within six years (i.e. no later than 1990), almost 150 were employed within four years, and about 75 within two years.

38. On government instructions, both Högskoleverket (2003b) and Forskarutbildningsutredningen (SOU 2004:27) have surveyed the postdoctoral qualification-building possibilities for new PhDs. See also the two research policy bills 2000/01:3 and 2004/05:80. Högskoleverket's 2005 Annual Report (the section on postgraduate programmes) charts the development of employment as postdoctoral fellow for different subject areas (corresponds to Diagram 6 in the present report).

The figure shows that while the number of doctorates awarded has grown sharply, the number of PhDs who have been employed as postdoctoral fellows has remained about level. That of course means that the share of PhDs who are employed as postdoctoral fellows has decreased over time.

Diagram 1. Number of individuals (under 60 years of age) who were awarded doctoral degrees (PhDs) 1985–2001, and the number of these who were employed as postdoctoral fellows (postd. f.) within six, four, and two years, respectively, after their doctorate.



Greater gender balance among recently awarded PhDs

Numbers of both female and male PhDs have increased, with a particularly sharp rise from about 1994. Women started out at a very low level in 1985, so in percentage terms their increase is considerably greater than men's up until 2001 (431 per cent compared with 105 per cent). The difference in actual numbers is much smaller – an increase of 781 female PhDs compared with 717 male ones. There has been a marked increase in the gender balance, with the share of women among recent PhDs rising from 21 per cent to 41 per cent in the years from 1985 to 2001.

Share of women and men employed as postdoctoral fellows

We are now going to take a closer look at the main issue: whether women and men move on to employment as postdoctoral fellows to the same extent. Additionally, we will investigate possible changes over a period of about 15 years.

The development over time should be seen against a background of the scenario which has just been described. Point by point:

- The number of individuals awarded doctoral degrees has grown sharply (for women as well as men).

- The gender distribution has become more even among recent PhDs.
- The share of PhDs who become employed as postdoctoral fellows has dropped.

We can further recall that the section about preferential treatment for the under-represented gender in connection with teacher recruitment was added to the Higher Education Ordinance in the mid-1990s. At that time, the government also allocated means to increase the recruitment of female postdoctoral fellows.

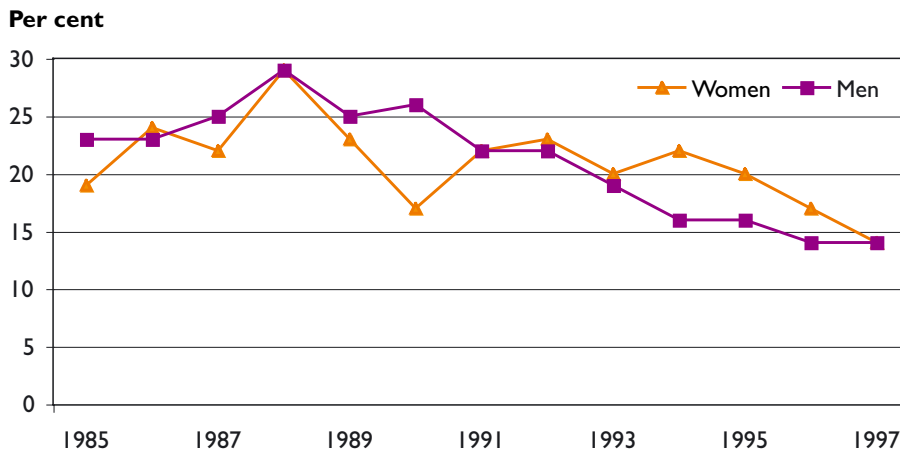
Transitions during a 13-year period – from male to female dominance

Diagram 2 shows the transition to employment as postdoctoral fellow within six years, for individuals with PhDs awarded 1985–1997. Diagram 2 thus covers virtually all the individuals in these degree cohorts who have had employment as postdoctoral fellow at any time.³⁹

Summarising developments, sometimes a larger share of men than of women become postdoctoral fellows, sometimes the opposite applies, and sometimes there are no gender differences. Men appear to have a slightly stronger position than women at the beginning of the period (up until the 1990 degree cohort), while women who received PhDs during a few years in the mid-1990s moved on to a greater extent than men did.

39. As has been mentioned earlier, the Higher Education Ordinance stipulates (Ch. 4, Section 10) that postdoctoral fellowships should go primarily to PhDs whose doctorate was awarded no more than five years prior to the end of the application period for the employment in question. By checking the data, we have verified that it is very rare for employment to occur more than six years after the doctorate was awarded. However, there is information about cases of employment as postdoctoral fellow in the year *before* individuals are awarded post-graduate degrees, despite the fact that the Higher Education Ordinance clearly stipulates an awarded doctorate as a qualification requirement. Although the reasons for this are unclear, those individuals who have been employed as postdoctoral fellows one year before they receive their degree are also included.

Diagram 2. Share of women and men who were employed as postdoctoral fellow within six years of receiving their doctorate, among those who were awarded it 1985–1997 (and were under 60 years of age).



Preferential employment of women has increased gender equality

Women, then, have a greater chance than men of becoming postdoctoral fellows among those who received their doctorate in the mid-1990s. Is this the result of preferential employment policies directed at the under-represented gender (for which read: women) which were applied in the mid-1990s? To investigate this, we turn to Diagram 2 and to Diagrams 3 and 4, which represent transitions within four and two years, respectively.

If we focus on the 1985 to 1990 cohorts, men have a slightly stronger position than women – and this is true for transitions within two, four, and six years. Let us now move forward a few years in time, choosing the 1994 degree cohort as our example. This cohort was not affected by the preferential treatment posts directed at the under-represented gender, if we look at transitions within a two-year period (since it was not until 1996 that such posts were established). We can note that, for transitions within two years, men’s preponderance was equivalent to two percentage points. If we look at the transitions within four and six years instead, the 1994 degree cohort is affected by preferential treatment posts (particularly within six years). In these cases, women make the transition to a greater extent than men, which supports the notion that the allocated funds did affect gender distribution in a few batches of new PhDs in the mid-1990s.

Diagram 3. Share of women and men who were employed as postdoctoral fellow within four years of receiving their doctorate, among those who were awarded it 1985–1999 (and were under 60 years of age).

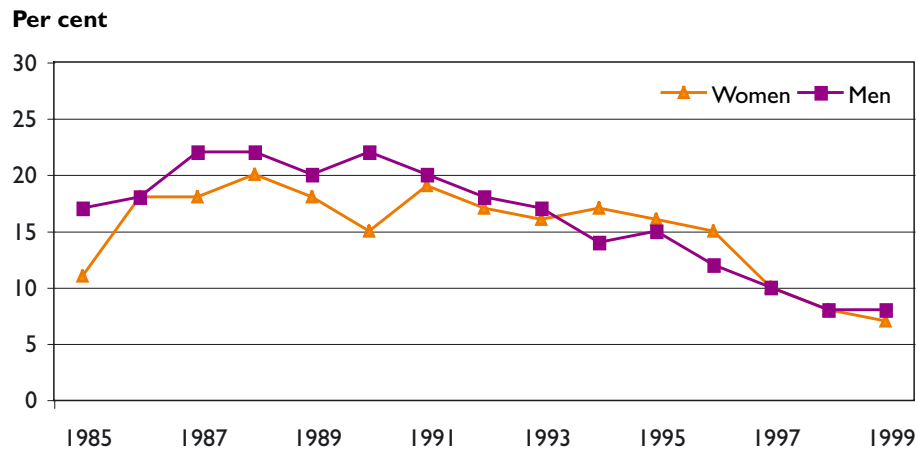
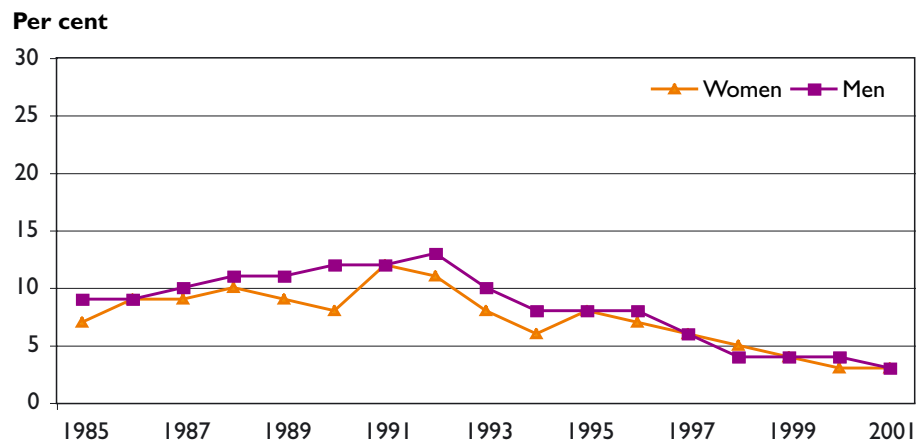


Diagram 4. Share of women and men who were employed as postdoctoral fellow within two years of receiving their doctorate, among those who were awarded it 1985–2001 (and were under 60 years of age).



A calculation

We will now further illustrate women’s and men’s transitions to employment as postdoctoral fellows with the help of a calculation example. First, we divide the degree cohorts into two groups. One group is made up of individuals who received their PhD in 1985–1990, while the other group received theirs in 1991–1997. The calculations are done on transitions within six years.

For the first group (PhDs 1985–1990), we can thus calculate that 317 women were employed as postdoctoral fellows. We then calculate how many women would have been employed if the transition shares among the female PhDs had corresponded to an average of women’s and men’s transition shares. The calculation shows that 349 women would then have become postdoctoral fellows, i.e. 32 more women than what was actually the case.

For the second group of PhDs (1991–1997), things look different. In reality, 601 women moved on to employment as postdoctoral fellows, but if the women's transition shares had corresponded to an average of women's and men's transition shares, only 558 would have become postdoctoral fellows, i.e. 43 fewer women. This confirms the connections we presented earlier, but the calculations lend them more substance. But if the 73 postdoctoral fellowships, preferentially directed at women, had not been established, the results for the later period would probably also have been negative from a female point of view.

Beyond 2000 – what will happen to gender equality now?

Available data suggests a gender balanced development for the very latest degree cohorts – with the emphasis on “suggests”. The conclusion is based on transitions within two and four years respectively (not shown in any diagram), and extends at most until the 2001 degree cohort. However, the question about what lies ahead for gender equality in the first important step of a postdoctoral career it is still a fairly open one. For one thing, a further few batches of later PhDs would need to be analysed, and for another, transitions would need to be extended to a six-year period. It is furthermore possible that developments will be different for different subject areas.

Fast men and slow women?

Do women and men secure employment as postdoctoral fellows equally quickly after receiving their PhD? Or are women's careers a more extended process in time? If we look at the whole period 1985–1997, there is a small tendency for women to take longer in moving on to employment as postdoctoral fellows. For transitions within six years, there were six batches of female PhDs who were employed as postdoctoral fellows to a greater extent than male PhDs. For transitions within four years, three cohorts of women with doctorates were ahead of the men, and if we look at the fastest transition (within two years), there was no annual batch of women who moved on to employment to a greater extent than men (until 1997 for doctoral degrees). We do not know what the explanation for this is. It could possibly be relevant that a larger share of women than men seem to take parental leave after receiving their doctorate.⁴⁰

Is the year of the degree more important than gender?

What should one make of the fact that the shares of both women and men who become postdoctoral fellows are so small among new PhDs in recent years? A proposed target is that 25–30 per cent of a batch of new PhDs should

40. Statistiska meddelanden (2003, Table 1c).

be employable almost immediately following their degree.⁴¹ But the shares of women as well as men who move on to employment as postdoctoral fellows is currently far below this target.

While the development for women in recent years has been less negative than for men, it has nonetheless been negative. For example, if we look at the share of women who were employed within a four-year period, this was 10 per cent or less for the 1997–1999 degree cohorts (lowest for the 1999 cohort with only 7 per cent). Among the women who received doctorates 1986–1996, considerably larger numbers were employed as postdoctoral fellows – between 15 and 20 per cent.⁴² The same negative trend can also be seen for those who succeeded in securing employment as postdoctoral fellows within a two-year period – for which the degree cohorts extend all the way to 2001.

Equally bad career opportunities

Figuratively speaking, the universities are leaking both women and men who could have pursued careers as teachers and researchers. The only equality is in how bad things are for both genders. Still, it appears vexingly typical that, just as women began filling their space in 1990s by comprising a bigger share of new PhDs, the possibilities of building further qualifications from there by means of reasonably secure employment have grown markedly fewer. It is an unfortunate coincidence, and one which could perhaps have a negative effect on the possibilities of achieving a better gender balance among senior lecturers and professors in connection with the coming generation change.

Both research policy bills passed since 2000 have addressed the problem of insufficient postdoctoral qualification opportunities. The government has expressed the wish that recruitment of postdoctoral fellows increase, and both bills also allocate funds to this end.⁴³ However, a large portion of the suggested allocation in the most recent research policy bill is intended for the final year of the period, i.e. 2008. This certainly seems a bit late in relation to the developments we have described here, and also to what the bill itself states (page 122): “To replace retired senior lecturers and professors will take not just a sufficient number of persons with PhDs, but also a sufficient number who, beyond their PhDs, have had time to develop their scientific and pedagogic skills.”

41. The proposal is Högskoleverket's (2000b). In connection with the government's 2000/01:3 research policy bill, all referral bodies saw it as important and urgent that the number of postdoctoral fellowships increase (page 177).

42. Note, however, that this is still on the low side in relation to the 25–30 per cent target.

43. In its most recent research policy bill (2004/05:80, page 122), the government wants to allocate funds both to higher education institutions (for the 2005–2008 period) and to research councils (2006–2008) for the purpose, among others, of increasing the number of postdoctoral fellowships.

A model that takes PhDs' age and subject area into account

On average, women are older than men when they receive their PhDs, and to some extent women and men become PhDs in different subject areas. Is this of any importance for the relationships we have just presented? We are going to test this using a model which considers age differences and subject areas for PhDs. That way we will be able to compare women and men who are "alike".⁴⁴

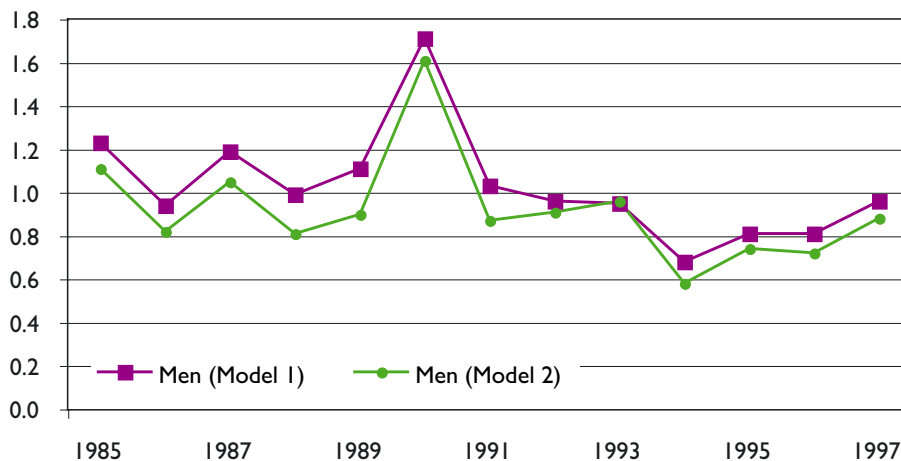
Findings from Diagram 5

Diagram 5 contains two curves that correspond to two models. Both illustrate to what extent men have been employed as postdoctoral fellows in relation to women (within six years). The relationships are expressed as odds ratios. If the odds ratio is equal to value 1, there is no difference between women and men. If the odds ratio is greater than 1, this means that men have been employed as postdoctoral fellows to a greater extent than women, and an odds ratio of less than 1 consequently means the reverse.

The curve for Model 1 actually expresses the same development that was shown in Diagram 2, which presented percentage shares. This presentation possibly illustrates even more clearly that men seem to have a certain advantage over women among PhDs awarded in the 1980s. By contrast, women make the transition to a greater extent than men do among PhDs awarded in the mid-1990s.

Diagram 5. The odds for men to be employed as postdoctoral fellow within six years of their PhD, compared with the odds for women (odds ratio). Individuals who received their doctorate 1985–1997 (and were under the age of 60).

Odds ratio



Women's odds ratio is fixed at 1 for all years.

Model 1: Men compared to women.

Model 2: Men compared to women, with controls for age at and subject of PhD.

44. Note also that there is a connection between age and subject area on the one hand, and transition to employment as postdoctoral fellow on the other. If there were no such connection, the analysis would be superfluous.

Age of a certain importance

Model 2 considers both at what age and in which subject areas PhDs were awarded. This curve lies slightly below the previous one. In other words, when men and women are compared who received their degrees at the same age and in the same subject area, the odds ratio drops. This in turn means that men's advantage over women in the transition to employment as postdoctoral fellow lessens or disappears for those who received their degrees until 1990, while women's relatively higher transition frequency becomes a little higher still among those with degrees from the mid-1990s.

A closer examination of the models shows that the control variable with the greatest importance is how old you are when you receive your doctoral degree. Men's odds ratio relative to women's drops when age at PhD is added to the model, while the control for subject area generates less systematic relationships (its effect varies in different years).⁴⁵

The conclusion is that age is a factor of a certain importance to take into account in studies of men's and women's transition from PhD to employment as postdoctoral fellow. Looking at Model 2, one can no longer talk about female attrition for the degree cohorts of the 1980s. The remaining big gender difference for the 1990 degree cohort, to men's advantage, should perhaps be seen as a deviation from the prevalent pattern.

Final questions to ask are whether age really should have any significance (within certain limits), and why it does. Thus it does not go without saying that the age of PhDs should be "controlled away". It is, however, both interesting and important at least to present the results of such an exercise.

Natural and social sciences

A logical next question is if developments look the same for PhDs in different subject areas. In Diagram 6 we can see the shares of PhDs in different subject areas who have been employed as postdoctoral fellows. Once again, transition shares are for the 1985–1997 degree batches.⁴⁶

The trend is clear – the share of PhDs who have moved on to employment as postdoctoral fellows has dropped in all subject areas. This development has been particularly negative in social sciences/law and natural sciences/mathematics. For example, only 9 per cent of social sciences PhDs in 1997 were employed as postdoctoral fellows within a six-year period, which is dramatic reduction compared to PhDs from 1988, of which as many as 34 per cent be-

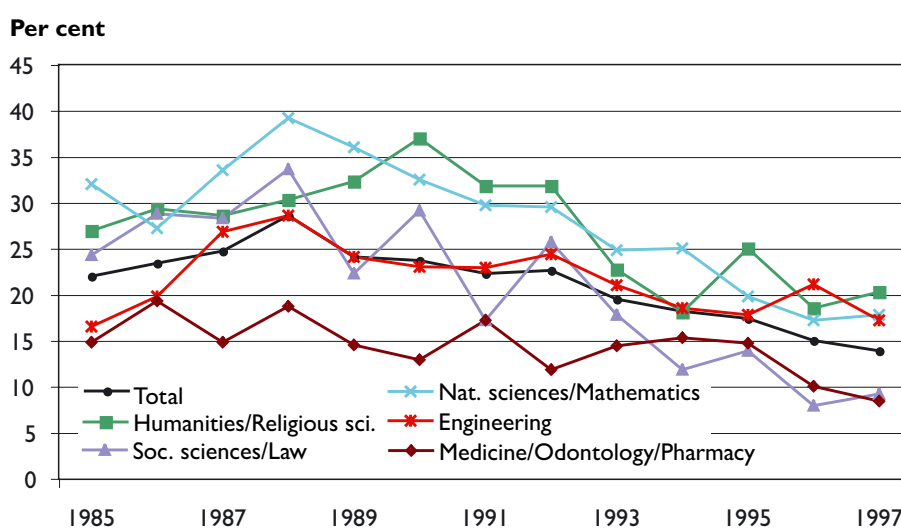
45. Further breaking down subject areas did not alter this (the analysis is not shown; the test was done on the 1985 degree cohort).

46. This diagram is also found in Högskoleverket's 2005 Annual Report (page 48).

came postdoctoral fellows. For this reason, we will track gender equality developments for PhDs in social and natural sciences.⁴⁷

PhDs in social sciences are of particular interest for another reason. In an analysis of a number of degree cohorts in the 1980s, Brandell (1994) found that women who had been awarded doctorates at the social sciences faculty had distinctly worse chances than men of being employed as postdoctoral fellows. None of the other faculties showed such a clear gender discrepancy in this respect, but women who had received their PhD at mathematics and natural sciences faculties also showed slightly lower transition shares than men.⁴⁸

Diagram 6. Share employed as postdoctoral fellows within six years of receiving PhD, of those awarded PhDs 1985–1997 (and under 60 years of age) – in total and per subject area.



Findings from Diagram 7

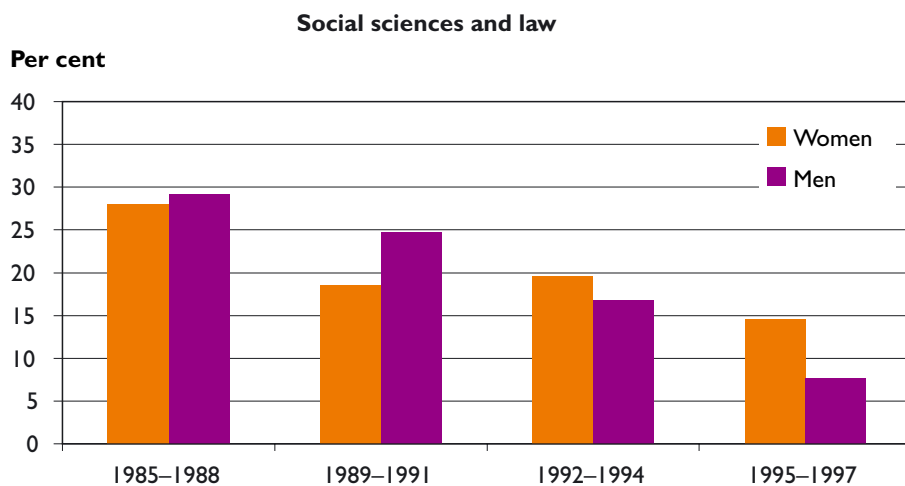
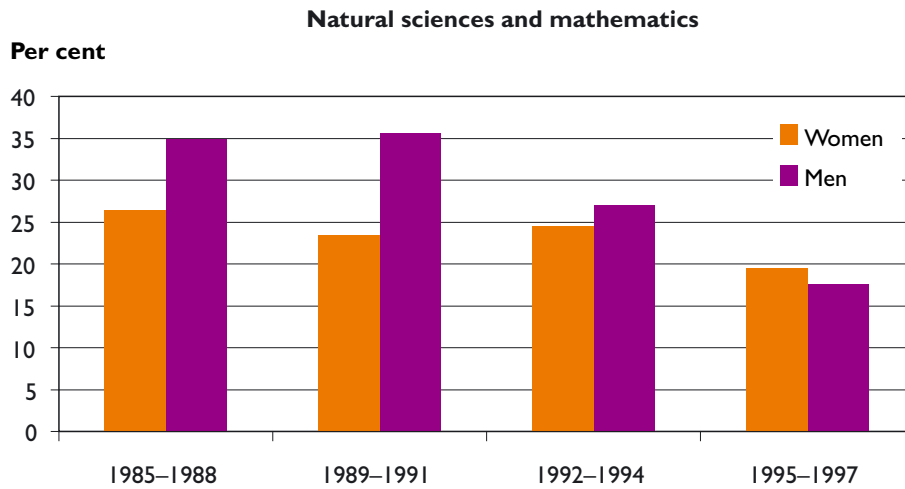
So how have men’s and women’s opportunities of becoming postdoctoral fellows evolved during the period, in natural and social sciences? The short answer is that gender equality differs slightly between the two subject areas. But in contrast with Brandell’s analysis, we find that the attrition of women is particularly evident in natural sciences. Women in social sciences, on the other hand, have done broadly well when it comes to moving on to employment as postdoctoral fellows, and the tendency for the future is for women to remain in step with men.

These findings are mainly illustrated in Diagram 7, which shows the analyses for transitions within a six-year period. Some degree cohorts have been merged as the number of PhDs drops in the analysis of individual subject areas. The results are described in greater detail below.

47. Note that the subject area is that of the doctoral degree and not of the employment as postdoctoral fellow.

48. See also the chapter “Background – what are the know facts?” in this report.

Diagram 7. Share of women and men employed as postdoctoral fellows within six years of receiving their PhD, of those with PhDs in natural sciences/mathematics and social sciences/law, respectively (and who were under 60 years of age at the time). Four different PhD cohorts: 1985–1988, 1989–1991, 1992–1994, and 1995–1997.



Natural sciences

Among natural sciences PhDs awarded 1985–1988 and 1989–1991, a notably larger share of men than women moved on to employment as postdoctoral fellows (within six years). Among PhDs awarded 1989–1991, for example, 36 per cent of men and 24 per cent of women secured such employment – a difference of 12 percentage points. In later years, a balancing occurs between the sexes. The shares of women and men who have been employed as postdoctoral fellows are about even for the two most recent PhD groups, 1992–1994 and 1995–1997.

Social sciences

Developments look slightly different in social sciences. It is not as clear that men have an advantage among the oldest PhD batches. Among those awarded PhDs 1985–1988, about an equal share of men and women have succeeded in

becoming postdoctoral fellows. But for those awarded PhDs 1989–1991, men have moved on to a greater extent than women. The difference is 6 percentage points, which is nevertheless smaller than the gender difference was for natural scientists.

And when it comes to the mid-1990s cohorts (PhD 1995–1997), it is clear that women made the transition to a greater extent than men: 14.5 per cent of women against just under 8 per cent of men.

Gender equality tendencies reversing in natural sciences?

The movement towards ever fiercer competition for employment as postdoctoral fellow among social and natural scientists has thus not been detrimental to the development of gender equality, as far as we have been able to measure (until the PhD batches 1995–1997).

Still, women's greater likelihood of moving on in the most recent PhD batches probably has to do with the establishment, between 1996 and 1999, of posts directed at the under-represented gender. In order to say something about what has happened since preferential treatment measures ceased, we can use calculations for transitions within two and four years (the analyses are not shown).

For social sciences, the tendency looks gender balanced. For PhDs in natural sciences, however, there is a tendency for men to get ahead again, after the drop connected with the preferential treatment measures. In the natural science graduate groups of 1998 and 1999, just under 9 per cent of men made the transition within a four-year period while only 5.5 per cent of women did the same. We should recall in this connection that male and female natural scientists who receive a doctoral degree are about the same age – the majority (73 per cent) of both women and men being 35 or younger. That means that age differences between men and women can have no more than a marginal influence on gender difference.

It thus looks doubtful that the gender equality tendency will continue for PhDs in natural sciences. Besides the fact that women seem to be slipping behind men, there are few women who move on among the degree cohorts at the end of the 1990s, which makes for an alarming situation for women in natural sciences. Only 5 per cent of women who received PhDs 1989–1999 in natural sciences were employed as postdoctoral fellows within a four-year period. In previous years, positions as postdoctoral fellows went to:

- 18 per cent of women in the 1985–1988 PhD cohorts
- 21 per cent of women in the 1989–1991 PhD cohorts
- 15 per cent of women in the 1992–1994 PhD cohorts
- 14 per cent of women in the 1995–1997 PhD cohorts.

Women in social sciences, on the other hand, appear to be keeping in step with men. But just like women in natural sciences, they have lost something in comparison with earlier generations of women: 8 per cent of women who

received their PhD 1998–1999 in social sciences were employed as postdoctoral fellows within a four-year period. In previous years, positions as postdoctoral fellows went to:

- 18 per cent of women in the 1985–1988 PhD cohorts
- 15 per cent of women in the 1989–1991 PhD cohorts
- 14 per cent of women in the 1992–1994 PhD cohorts
- 11 per cent of women in the 1995–1997 PhD cohorts.⁴⁹

49. The development for recent male PhDs in these subject areas is also negative compared with earlier generations of men.

Employment as professor

Do women PhDs succeed in becoming professors to the same extent that men PhDs do? Is the pattern the same for all subjects, or are there differences? Using a number of different analyses, we will answer these and some further questions in this section. In summary, the analyses show the following:

- Men PhDs become professors to a greater extent than women PhDs. This applies both for transitions within a 12-year period and within an 18-year period.
- Men become professors to a greater extent than women in all subject areas.
- Among PhDs in the humanities and natural sciences/mathematics, the differences between men and women are particularly large. There are very considerable gender differences in other subject areas too, but as the number of women among the PhDs in these areas is small, percentage calculations become less reliable.
- The promotion reform has led to an increase in the number of both male and female professors.
- The fact that women, on average, receive their PhD at a higher age than men appears to be prejudicial to them. But even when the age difference is taken into account, it is more likely for a man to become a professor than for a woman.

The professors at the top of the pyramid

Chapter 3 of the Higher Education Act states that “The position of professor is the foremost teaching position.” For many teachers and researchers pursuing a research career it is thus very desirable to become professor. Compared with other teachers and researchers, the group as a whole enjoys higher status, higher salaries, and a higher degree of power. Whether professors also have the greatest opportunities to do research is perhaps less certain – postdoctoral fellows are likely to be in the lead on this count. But professors are subject representatives and as such exercise great influence over the content and direction of research. This influence of course applies to the direction of and activities at their own departments, but it also extends outwards via seats on research councils, for example. So, from the point of view of higher education institutes and of society, it is highly significant who the professors are. In Sweden, women make up only 16 per cent of professors (2004). There are thus compelling reasons to believe that women constitute a talent reserve in this context.

Measures to promote gender equality among professors

During the 1990s, the Higher Education Ordinance and other steering documents were altered in a way which may have been significant to gender equality among professors. Let us look a little closer at some of these changes.

The Tham professorships

In the bill entitled *Jämställdhet mellan kvinnor och män inom utbildningsområdet* (1994/95:164), the government noted that the share of female professors was very low, and that the development towards a more balanced gender distribution was moving extremely slowly. The government therefore proposed that resources be allocated to establish new professorships directed at the under-represented gender (these became known as the Tham professorships). It also stipulated that preferential treatment of the under-represented gender could be applied when making appointments. The result was that 31 professorships aimed at the under-represented gender were advertised between 1996 and 1998. Of these, 30 have been filled, all of them by women.⁵⁰

Preferential treatment

Since the mid-1990s, the Higher Education Ordinance contains, as was mentioned in the chapter on postdoctoral fellows above, a section that specifically regulates preferential treatment of the under-represented gender among teachers (Ch. 4, Section 16 of the Higher Education Ordinance, 1993:100). But, as was also mentioned, the higher education institutes seem to make little use of this possibility.

Recruitment objectives for female professors

In its bill *Jämställdhet mellan kvinnor och män inom utbildningsområdet*, the government further announced that each university and university college should have objectives for gender distribution among newly recruited professors. Such objectives now exist, and were first presented as preliminary objectives in the budget bill for 1998 (1997/98:1, expenditure area 16). Definitive objectives were specified in the higher education institutes' appropriations documents for 1998. These initial recruitment objectives were for the three-year period from 1997 to 1999. According to a report from the Swedish National Agency for Higher Education (Högskoleverket) (2000c), a majority of the institutes fulfilled the objectives for the 1997–1999 period. Since then things have looked less positive. The 2006 budget bill (2005/06:01, expenditure area 16) states that only a third of the 24 higher education institutes with recruitment objectives actually achieved the objectives for the later period, 2001–2004.

50. Bondestam (2003, pp. 117–118).

The promotion reform

On 1 January 1999, the so-called promotion reform came into force.⁵¹ It amounted to a systemic change in that promotion to professor in competition was complemented with promotion on individual qualifications alone. The prerequisites for the latter are that the person is tenured as senior lecturer at a university college (Ch. 4, Section 30 of the Higher Education Ordinance, SFS 1998:1003). It is conceivable that this reform – in one way or another – could be significant for gender equality among professors. When the reform was launched, there were some concerns that it would constrain the share of female professors. So far these concerns appear to have been unfounded.⁵²

The population – PhDs 1980–1991

The transition to employment as professor has been studied for those individuals who were under 60 when they received their PhD – from the 1980 PhD batch up to and including the 1991 batch. While there is no data on professors prior to 1984, it is not nearly as important to track professors immediately following their PhD as it was for postdoctoral fellows. Hardly anyone becomes employed as professor that quickly.⁵³ Since it normally takes a long time to become professor, the 1991 PhD batch is the most recent one in our study.

The number of PhDs and the number of professors

The number of PhDs grew in the 1980s

As Diagram 8 shows, the number of PhDs also grew during the period we are now studying, i.e. the degree cohorts from 1980 up to and including 1991. And while the rate of increase is not nearly on a par with that for the 1990s PhD cohorts (see Diagram 1), neither is it negligible. For example, in 1980 nearly 800 individuals received PhDs; just over ten years later, in 1991, the number had increased to about 1150. That is equivalent to a 46 per cent increase. Considerably more men than women received PhDs during the period. Even if women increased more than men both in number and percentage terms over

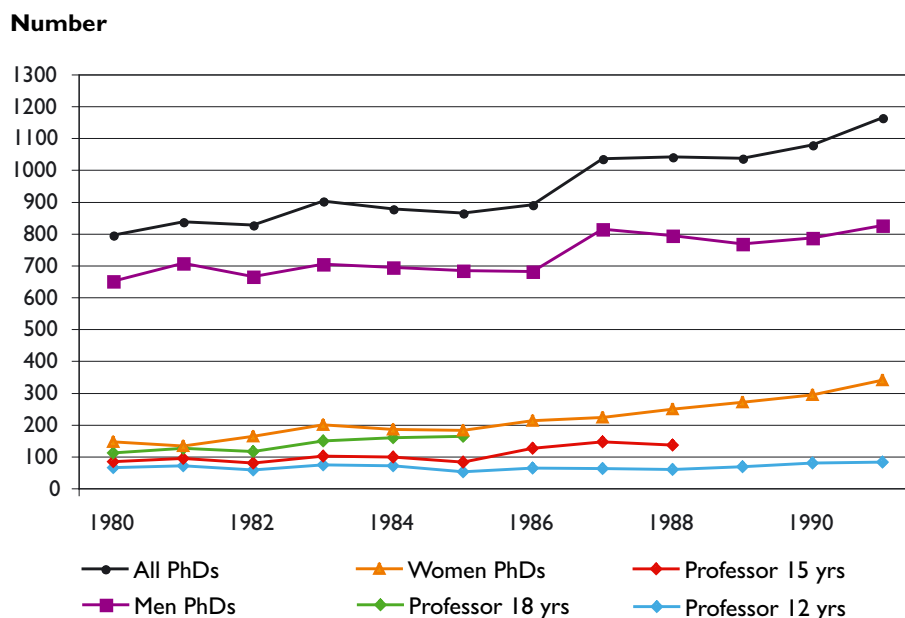
51. Approved by the Swedish Parliament in October 1997, in accordance with the government's bill 1996/97:141.

52. See Högskoleverket's report *Karriär genom befordran och rekrytering – slutrapport* (2003c). The report notes that "Even if women are slightly under-represented among persons seeking promotion, our material shows that once the application has been submitted, women have about the same chance as men of promotion – or even a slightly bigger chance" (page 19).

53. In such cases where PhDs have managed to become professors more or less immediately after their doctorate, we have still been able to register them as professors, as they will have been included in the personnel statistics since 1984. Exceptions could be if they had moved abroad for an extended period, found employment outside the academic world, or something else.

the period, there were still nearly 500 more men than women who received PhDs at the end of the period (1991).

Diagram 8. Number of individuals (under the age of 60) who received PhDs 1980–1991 and the number of these who were employed as professors within 12, 15 and 18 years of their doctorate.



Promoted professors

It appears as if the number of professors has increased at the same time as the number of PhDs. This is at least what we can note by looking at the relationship between the curves for PhDs and the curves for transitions to employment as professor. It also looks as if the number of PhDs employed as professors within 18 and 15 years increases in connection with the promotion reform. For example, employment of professors within a 15-year period increased quite markedly between the 1985 and 1986 degree cohorts, after which it stabilised. The calculations for 1986 PhDs extends up to and including 2000. That was clearly the time that was needed from the introduction of the reform (1 January 1999) for a larger number of senior lecturers to be promoted to professor on individual qualifications alone. Similarly, an increase occurs between the 1982 and 1983 degree cohorts for transitions within 18 years. It is more doubtful, looking at this diagram, that the transition shares within 12 years were affected by the promotion reform – there is no indication they were. Could it be that not enough individuals have had time to accumulate qualifications in that time?

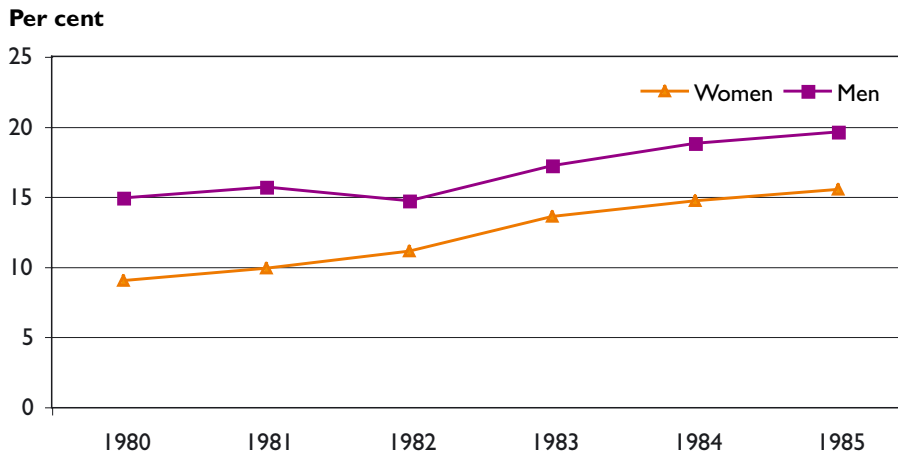
More men than women are employed as professors

The interesting question remains: Does an equally large share of men and women move on from a PhD to a professorship? And has this relationship changed over time?

Diagrams 9 and 10

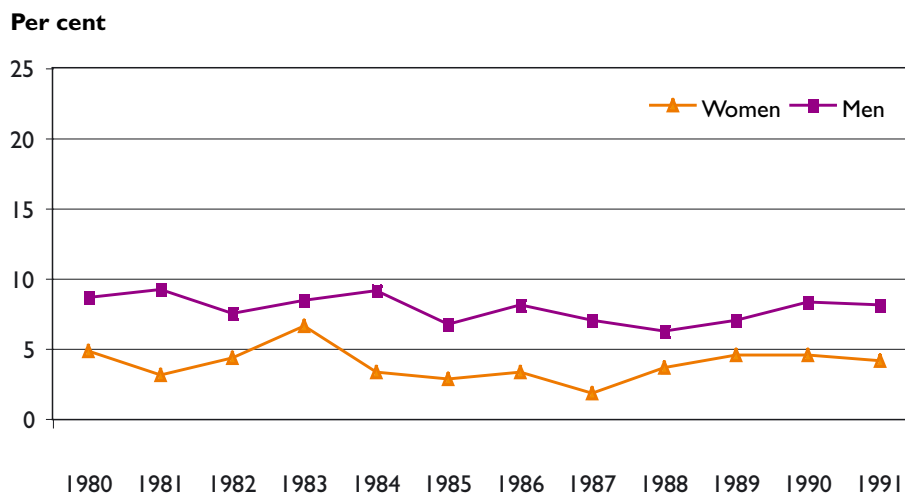
Diagram 9 shows the share of men and women who have become professors within an 18-year period. Diagram 10 shows the transitions shares within a 12-year period. If there are differences in how quickly women and men progress towards a professorship, it is important that the period for accumulating qualifications is long enough, which is why we have applied a 18-year limit.⁵⁴ A 12-year period instead allows us to track developments for PhDs a few years further into the future.

Diagram 9. Share of women and men who were employed as professor within 18 years of receiving their doctorate, among those who were awarded it 1980–1985 (and were under 60 years of age).



54. There may be reason to extend this period even further, but then hardly any cohorts remain to be studied in the present material. Such an analysis will therefore have to wait until future studies.

Diagram 10. Share of women and men who were employed as professor within 12 years of receiving their doctorate, among those who were awarded it 1980–1991 (and were under 60 years of age).



No doubt about it – women drop out

The question about women’s possible attrition has a straight answer. The pattern in this case is very clear. For all PhD cohorts, and irrespective of whether they have had 12 or 18 years in which to do it, it is a larger share of men than of women who have been employed as professors at Swedish higher education institutes.

In number terms we find, for example, that in those cases where PhDs have had 18 years in which to become professors, the gender difference in percentage points is 3.6 at its lowest (the 1982 and 1983 degree cohorts) and 5.8 at its highest (the 1980 and 1981 degree cohorts). For the latest degree cohort, 1985, the difference is 4.1 percentage points. When we track the extent to which PhDs have become professors within a 12-year period, we find that the difference between men and women, in percentage points, varies between 1.8 at its lowest (1983 cohort) and 6.1 at its highest (1981 cohort). For the two most recent cohorts (1990 and 1991), the difference is between 3.8 and 4.0 percentage points.

In other words, the difference between men and women is notably large already 12 years after receiving their doctorates. If we complement this finding with the finding for transitions within 18 years, a very clear picture emerges: women drop out. It makes no difference if we compare women and men who received their PhDs at the beginning of the 1980s or those who did so ten years later. And in this context we should also bear in mind that, as has been described earlier, the share of women who received doctorates during this period was fairly low – albeit growing.

Twelve years after PhD – a man’s chance of becoming professor twice that of a woman

Whether or not the percentage point difference should be regarded as large or small partly depends on the level men and women are at, respectively. With

4 per cent of women in the 1991 batch (the most recent we have data for) managing to become professors within 12 years, and 8 per cent of men managing the same, the share of men making the transition is twice that of women. In other words, men's chances of becoming professor are twice women's.⁵⁵

Promotion reform and more professors

The share of PhDs employed as professors at universities within 18 years has increased over time, for both women and men. For men, the share has grown from about 15 per cent (1980 cohort) to about 19.5 per cent (1985 cohort). Of women who received their doctorate 1980, 9 per cent were employed as professor within 18 years, and about 15.5 per cent of women who received their doctorate 1985 did the same. A notable increase in the share of transitions occurs for both sexes between the 1982 and 1983 cohorts. As mentioned earlier, it is for the 1983 cohort that the effects of the promotion reform begin to show up (for transitions within 18 years). The fact that the share then continues to grow for the 1984 and 1985 cohorts could be because more and more PhDs manage to get promoted on individual qualifications alone.

In the period under study, then, developments for professors differ from developments for postdoctoral fellows. While it has become easier to achieve a professorship, it has become harder to secure a postdoctoral fellowship – which could possibly worsen the professorial prospects for the PhD batches of recent years.

For transitions within 12 years, which we can track until the 1991 degree cohort, shares fluctuate somewhat for the period as a whole. The three degree batches 1989–1991 were the only ones affected by the promotion reform, but there are several earlier batches that are at the same level or even higher than these. For many PhDs, in other words, it takes longer than 12 years to get promoted on individual qualifications alone. And those who were quick to accumulate scientific and pedagogic qualifications have perhaps already been employed in competition.

Changes to promote gender equality not sufficient

At the beginning of this section, a brief presentation was made of some changes at universities which could have had an impact on gender equality among professors. We have already noted that the promotion reform shows up clearly in increased shares of both female and male professors (at least within the 15 and 18-year periods). But neither this reform nor others have been sufficient to balance the share of women and men who pursue professorial careers. Big differences between the sexes remain.

Although the measures to promote gender equality among professors have been insufficient, we may still assume that they have had a positive effect. Wit-

55. Expressed using odds ratios, which is the measurement we have previously applied to a large extent, men's chances of a professorship relative to women's gives an odds ratio of 2.05.

hout them, the difference between men and women would probably have been even bigger. For example, a focused measure such as the Tham professorships really did bring about an increase in the number of women.^{56 57}

We are 34 women professors short...

Let us also do a small calculation. If the women who received their doctorates 1980–1985 had been employed to the same extent as the average for men and women within an 18-year period, their number would have been 160 instead of 126. A difference of 34 women, then. Bearing in mind the rather low level of PhDs among women during the 1980s, it would probably have been exceedingly valuable if at least another 34 women in the 1980–1985 PhD group had made professor. If the same share of individuals become professor, the number of male professors would drop by the equivalent of 34 individuals, from 689 to 655.⁵⁸ That difference – 655 male professors as opposed to 160 women – would then, despite its size, have been a result of gender-balanced recruitment.

Older women and younger men

Does the fact that women, on average, receive their doctorate later in life than men do have any effect on the gender difference in the transition to professor?

Let us look at transitions within 18 years again.⁵⁹ If Diagram 9 is rendered using odds ratios instead, we get the uppermost curve in Diagram 11. This also shows that the difference between the genders is at its biggest for the 1980 and 1981 degree cohorts.

When age at PhD is included in the model, men's odds ratio drops against women's for all PhD batches, albeit almost negligibly for several of them (from 1.35 to 1.28 for the 1982 PhD batch, for instance). There is no year in which the odds ratio drops so much that the professorial career is gender balanced. By contrast, developments look more positive from a gender equality perspective when age at degree is held under control, since the tendency is for continued balancing. For future analyses, capable of studying more extended time series, a model that controls for age would seem to be of some value.

56. The Tham professorships are an example of the most far-reaching form of preferential treatment (cf. Sigeman, 1997). However, this form of preferential treatment is judged to be inconsistent with EC law (European Court of Justice Case C-407/98, Abrahamsson et al. Cf. also SOU 2004:55, pp. 186–188).

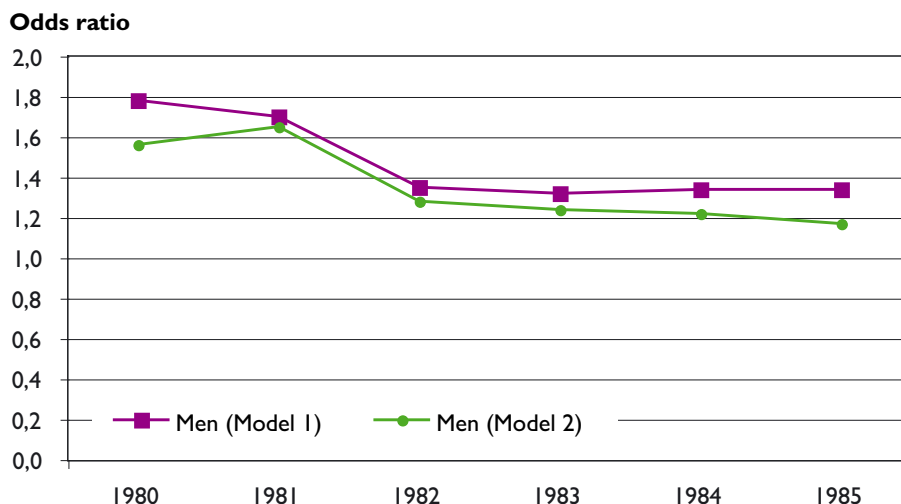
57. However, its effect on these analyses is unknown, as we have no data on when these women received their doctorates or if they received them in Sweden.

58. If women instead had become professors to the same extent as men, their number would be 168, which would imply 42 new women professors.

59. The reason there is no control for subject area of PhD is that this does not work for some models (convergence problems). However, possible differences between women and men PhDs in different subjects have been studied, and are presented under the next heading.

A further question, of course, is to what extent age should be important for achieving a professorship. The same issue has been discussed concerning postdoctoral fellows.

Diagram 11. The odds for men to be employed as professor within 18 years of their PhD, compared with the odds for women (odds ratio). Individuals who received their doctorate 1980–1985 (and were under the age of 60).



Women's odds ratio is fixed at 1 for all years.
 Model 1: Men compared to women.
 Model 2: Men compared to women, controlled for age at degree.

Does the subject area matter?

So far, no consideration has been made of the fact that men and women to some extent become PhDs in different subject areas. Is it possible to specify the general pattern for female attrition, i.e. does the degree of attrition vary between women with doctorates from different subject areas? Is there perhaps greater gender equality in some subjects than in others?

To begin with we can look at Diagram 12 and note that, in all subject areas, the share of women who become professors is lower than the share of men who do. But it is equally apparent that there is variation between PhDs from different subjects.

Since the number of individuals diminishes in subject-discriminated analyses, and women in particular can become very few in number, several degree cohorts have been combined. Transitions to employment as professor within 18 years are therefore analysed for the 1980–1985 degree cohorts taken together.

The humanities and natural sciences: fairly big differences

Considerably fewer women than men who have a doctorate in the humanities reach all the way to a professorship. Just under 13 per cent of women have succeeded in becoming professors. This is perhaps not such a low figure in itself.

But in comparison with male PhDs in the humanities, of which 22.5 per cent become professors, it looks very low of course.

Among natural scientists as well, there is a clearly bigger share of men than of women who are employed as professors. Just over 14 per cent of men become professors, but only about 9.5 per cent of women.

Engineering, agriculture and veterinary medicine: big but uncertain differences

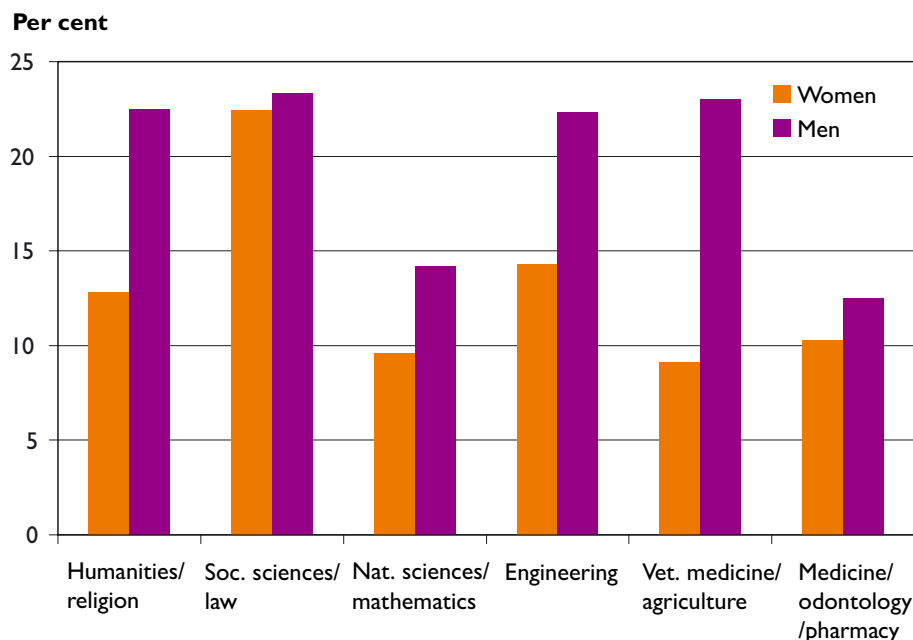
PhDs in veterinary medicine/agriculture are the least gender balanced – the difference is 14 percentage points in men’s favour. Great caution should be exercised in judging the gender difference for this subject area, however, as the women’s percentage share is based on only 22 PhDs.

Women who have a doctorate in engineering are also a small group (42 women). Of these, about 14 per cent have become professors, while among men about 22 per cent have become professors.

Social scientists and medical doctors: small differences

The smallest gender difference is among social scientists/jurists – 23.3 per cent of men have become professors within 18 years, compared to 22.4 per cent of women. Among PhDs in medicine (including odontology and pharmacy), just over 10 per cent of women have made professor, while 12.5 per cent of men have.

Diagram 12. Share of women and men who were employed as professors within 18 years of receiving their PhD, of those who became PhDs 1980–1985 in different subject areas (and were under 60).



Stable findings?

The choice of studying transitions within 18 years for the 1980–1985 cohorts was made in order for the findings to be as stable as possible. But how stable are these findings? And do things appear different if we look at transitions over other time intervals? In one analysis (the figures of which are not reported) of transitions within 15 years, where two cohorts were studied (1980–1984 and 1985–1988), the findings partly match those described above. Men’s transition share is still bigger in all cases. The gender difference among PhDs in social sciences/law increases for both the 1980–1984 and the 1985–1988 cohorts. The gender difference among PhDs in engineering is big for the 1985–1988 cohorts, but much smaller for those who received their degrees 1980–1984.⁶⁰

Natural sciences and the humanities: a leaky pipeline for women, from the undergraduate degree level to the professorial level

With reference to the complementary analyses (transitions within 15 years), it is reasonable to single out two subject areas for PhDs in which women, in all comparisons, clearly drop out of a professorial career. One area is the humanities, the other is natural sciences.

It begins as early as in the transition from undergraduate to postgraduate studies. The humanities and natural sciences are among the subjects for which recruitment to postgraduate studies is most gender biased.

We also studied the natural scientists more closely in terms of transitions to employment as postdoctoral fellow. What we found was that women made the transition to a lesser extent than men during the 1980s, and also that there is a tendency for women to lag behind men since 2000. The fact that a smaller share of women than men managed to get employment as postdoctoral fellows in the 1980s may of course be implicated in their greater difficulty, compared with men, in becoming professors later in their careers.⁶¹

The future

It is also important to remember that the academic careers of the batches of PhDs we have studied here are, to some degree at least, a result of the conditions that prevailed before today’s situation, with its recruitment targets for women professors and more evolved gender equality work at higher education institutes, for example. That is to say, the postdoctoral context for those women and men who receive doctoral degrees during the first years of the 21st century is hopefully more favourable to a gender-balanced development. At the same time we cannot, of course, be completely certain. As we saw earlier in the section on postdoctoral fellows, we do not have enough data on the PhD

60. The number of women who do PhDs in engineering is fairly small, which means that small changes to the number of women who become professors can have a seemingly disproportionate effect in percentage terms.

61. Individuals in the humanities subject area were not studied separately.

cohorts of later years to be able to see any clear direction in developments. And the recruitment targets for women professors have not been fulfilled for the most recent period either. It is also quite possible that developments differ for different subjects.

Discussion

Being a man or a woman affects a person's opportunities and life conditions in several areas. The same can be said for the social environment a person grows up in. In this study, we have found that women make the transition to postgraduate studies and pursue a postdoctoral career to a lesser extent than men do. The social background, however, plays a rather marginal role in the transition from undergraduate to postgraduate studies. There is a clear exception to this: children of parents who themselves did a postgraduate degree often follow in their parents' footsteps, embarking on postgraduate studies of their own. Other than that, it is particularly at the lower levels of the educational system that social background has an impact.

The lack of women and working class children is a problem

Women, children of working class parents, and farmers are examples of groups that are thinly represented at the academic summit of Swedish higher education institutes. These groups will consequently have a limited influence on research and teaching at Swedish universities and university colleges.

Does that lead to certain important questions not being asked, or important issues not being studied? Do the universities thereby fail to absorb some potentially very talented researchers and teachers? Would research gain in creativity if the diversity were greater? If our answer to one or more of these questions is yes, then clearly the under-representation of certain groups constitutes a quality problem for higher education and research. **The fact that certain groups** have greater difficulty making themselves heard in research is of course also a representational problem and thereby a democracy issue.

Recruitment bias, attrition and leaky pipelines

How has the skewed gender and social background makeup among, say, professors come about? It is partly due to the fact that for a long time, working class children and women, for example, have been under-represented among students on longer research-preparatory undergraduate programmes as well as among postgraduate students. This situation in turn has its own explanations, but we will not discuss them here.

What we have noted in this study is that women's limited representation at the top of the academic career ladder is also due to their leaking out on the way from undergraduate programmes to higher positions at universities. Women's low share among professors, then, is not only a result of their historical under-representation among postgraduate students and students on longer undergraduate programmes. **And so the symbol of the leaky pipeline also applies to women's career development opportunities at universities in one of the world's most gender-balanced countries, Sweden.**

We have only studied the impact of social background on the step between undergraduate to postgraduate studies. Parents' social class made no difference, generally speaking, even if we found certain tendencies for children of higher professionals to go on to postgraduate studies to a higher extent than working class children, in certain subject areas. The skewed social makeup, measured by parents' social class, is thereby largely a result of the fact that working class children and others drop out already in upper secondary education's preparatory programmes, and later on in universities' undergraduate programmes, particularly the longer and research-preparatory ones.

But we also found that children of parents with a postgraduate degree themselves moved on to postgraduate studies to a greater extent than children who had grown up in families where parents had other types of education. The group of individuals whose parents have postgraduate degrees is a small one, and is it therefore perhaps an exaggeration to say that the children of parents with other types of education drop out? It is probably a better description, rather, that the children of postgraduate parents are unusually good at remaining in the pipeline. We can assume that they, because of their parents, have unusually high education ambitions and therefore want to climb in the academic hierarchy themselves. We can also assume that parents have transferred knowledge about how they should go about it. And might perhaps the children of postgraduates also get the odd helping hand along the way?

Reliable answers to tough questions

Recruitment bias due to gender and social background in higher education and research has been partially analysed in earlier studies. The big contribution that the present study makes is that recruitment bias has been studied using methods that produce a more reliable description than what most earlier studies have managed.

The most common method for studying recruitment bias due to gender has been to compare the share of men and women in high positions (e.g. professor) with the share of men and women in lower positions. The two groups, however, do not contain exactly the same individuals. Since shares are calculated on a cross-section of individuals at two separate points in time, comparisons become unreliable. In this study, on the other hand, we have applied a longitudinal approach, i.e. we have followed *the same* women and men from one level (such as PhD) to another (such as professor). This is the most reliable analysis strategy.

We have further collected data on individuals' subject area in undergraduate and postgraduate studies, their age, and so on. In our analyses, we have then been able to take in to account (control for) the fact that women and men, and individuals from different social backgrounds, differ in a number of characteristics related to the transition tendency to postgraduate studies and postdoctoral employment. In this way, it has been possible to isolate the effect of gender and social background.

Taking all of this together, we should have reached reliable answers to the question whether recruitment bias due to gender and social background exists at universities. It is of course simpler, faster and less costly to study recruitment bias using aggregate cross-section data, and by not considering differences in subject orientation between men and women, etc. That method is initially justifiable – it allows for a fairly quick and simple highlighting of problem areas. In the long run, however, it does not untie any knots at all. Even if questions remain after this study as well, which we will discuss later, our knowledge has undeniably increased.

How does recruitment bias arise?

We have thoroughly described recruitment bias. This has in itself been an extensive part of our work. But what are the reasons for the attrition of women from academic careers? And why do the children of postgraduates go on to postgraduate studies to a greater extent than others? These questions ought gladly to be left to researchers. But let us nonetheless pause and ponder them briefly as well.

Regarding children of postgraduates, we discussed a few possible mechanisms in connection with the findings. For example, that these children presumably have unusually high education aspirations, while at the same time they are likely to have a better overview than others of the routes that can lead to a postgraduate programme. The latter is not least important in a system where the recruitment of postgraduate students can be pretty tricky and opaque in some places.

Women and men

If we pick out some individual explanations offered in the existing literature, they are about such things as that “men seek men”; that women and men are judged differently (to women’s disadvantage) in connection with appointments to higher posts and allocation of funds etc.; that posts are more often created with a man than a woman in mind; that men get greater opportunities to do research while women teach and do administrative tasks more (women encounter greater difficulties in accumulating qualifications); that women produce less research than men do; that women on average have a greater responsibility for children and family than men have; that structures are hard to beat; that women are less happy in the university world than men are; that more men than women are tutors; etc.

It would of course be commendable to organise the various explanations in some way as well. For the present, let us just reflect a little on individuals and structures. Obstacles that are outside of women themselves, for example their being judged differently from men, are structural obstacles. Achievements, attitudes and choices are individual instead. But individual and structure are also connected. If, for example, one were to find that women apply to postgraduate programmes to a lesser extent than men, then this would be an ex-

planation of women's lower level of representation at the postgraduate level in comparison with the undergraduate level. The obstacle would in this case be in women themselves. But it is also the case that far from all postgraduate places are advertised. If a male tutor who has received funding for a project hand-picks a promising young man from the undergraduate programme, then of course no women can apply for that particular postgraduate place. If this sort of thing happens a lot, a measure of applications will be misleading since women do not even have the opportunity of applying. And so it turns out that what we thought was about individual actions by women and men was in fact the result of structural obstacles.

Measures

What measures to apply in order to remedy, primarily, the attrition of women is a question for the higher education institutes themselves, and the government.

Women and men

Equality in terms of even gender distribution in higher education and research will doubtless improve little by little. The balancing that we have seen over time on longer undergraduate programmes and among postgraduate students will eventually alter the gender balance higher up in the academic hierarchy as well. An even distribution at the base is not enough, however, when women leak out on their way to the top. The pipeline needs to be sealed in some way – but how? Below is just one brief reflection on this subject.

The optimist, perhaps, holds the pious hope that change is already underway. It takes many years to get from a doctorate to employment as professor, and therefore the transitions we have measured in this study are partly the result of the work on gender equality done by higher education institutes in the past. In its latest evaluation of work on gender equality at higher education institutes, the Swedish National Agency for Higher Education (Högskoleverket) shows that a number of them really have developed their gender equality practices and principles (Högskoleverket, 2003a). Since it is too early yet to reap all the benefits of these efforts, the optimist can believe that recruitment bias will diminish in the foreseeable future.

The pessimist can quote Liisa Husu's observation that it is not always possible to measure any effect of equality reform because universities are not particularly keen on change. She writes: "The Nordic countries have been pioneers in Europe when it comes to pushing gender equality issues up the agenda, both in society in general and in academia. --- And yet the Nordic countries cannot be characterised as world leaders of gender equality in academia. This applies perhaps particularly clearly to Sweden and Norway, where relatively large resources – both funds and personnel – have been invested in gender equality reform and also in women's and gender studies. --- Paradoxically enough, Sweden and Norway cannot boast a very high degree of female representation

in academia's highest echelons, in comparison with Finland. The same is true when one compares Sweden with France, Spain, and Portugal, where gender equality reform at universities has kept a lower profile.⁶² The pessimistic view is also supported by the fact that only a third of the higher education institutions reached the targets set for the share of women among newly recruited professors in the most recent period (2001–2004). That notwithstanding, one is of course entitled to the opinion that these recruitment targets are a good measure and that they should actually serve as a bit of a gun to the head of higher education institutes.

The tendency towards ever fewer postdoctoral fellowships in relation to the number of new PhDs has been allowed to go on for some time. Will this have consequences for gender equality? One measure to promote gender equality could be that institutes prioritise recruitment posts such as postdoctoral fellow and junior lecturer. That would increase the system's transparency, and probably give higher education institutes better control of the gender equality development among teachers. Who controls it now?

Social background

The children of postgraduates were found to be over-represented among postgraduate students. Other than that, though, recruitment bias due to social background was marginal in the transition from undergraduate to postgraduate studies.

Here it is important to recall that the social makeup of the postgraduate student group is very skewed all the same, with a small share of working class children and children of parents with little education, and a very large share of children of higher professionals and parents with higher education. That means that the social makeup on the postgraduate programme is attributable, to a great extent, to individuals' achievements in lower and upper secondary school, and to choices in upper secondary school and undergraduate programmes. This study suggests that measures to counter the scarcity of working class children among PhDs should be applied at levels in the educational system below postgraduate programmes. The question is really how we are going to get more working class children and other groups which are under-represented in higher education to study to be doctors, civil engineers, and to do a Master's in the humanities or some other subject.

Future studies

This study certainly generates ideas for continued studies and research. It would be easy to fill several pages with such ideas, but we include only a selection here.

It is important that at least parts of this study be replicated. The most urgent thing to follow up is whether or not the attrition of women continues. How,

62. Husu (2005, pp.11–12).

for example, do women and men fare who have received their undergraduate degrees after 2000? Between 2003 and 2004, the share of entrants on postgraduate programmes dropped markedly. Has this had a negative effect on gender equality in the transition from the undergraduate to the postgraduate level?

At the same time as higher education institutes have cut down their admissions to postgraduate programmes, they seem to have established more postdoctoral posts over the last few years. This is of course positive, but will women and men be recruited to these posts to an equal extent? As this study has shown, it was during the period when women did well relative to men in the transition between doctorate and employment as postdoctoral fellow that a number of posts were created which were directed at the under-represented gender (i.e. women). This is no longer possible. Furthermore, the tendency we found in natural sciences was that women once again had started to lag behind, as they did in the 1980s. It is of the utmost importance to follow these developments. Junior lecturer is a qualification-building post, and such posts began to be established after 2000 – they should therefore be included in a follow-up analysis. A further, related question is about what career routes have become important instead, and about whether women navigate the twisty routes as well as men do. Is it possible that the drastic reduction of fixed career routes has undermined the positive gender equality work done at universities?

Tracking the developments among professors is of course urgent as well. Women's difficulties in reaching all the way to employment as professor were very apparent in the present study. Even if it takes a long time to become professor, and if we therefore have been measuring yesterday's events to some extent, it is crucial to follow developments for professors.

Aside from follow-ups, there are of course a number of questions remaining. Some of them may be regarded as deepening, adjusting and broadening the analyses in the present study. For example, does a foreign background affect an individual's opportunities for becoming a PhD and a professor? Is it favourable for your postdoctoral career to have a father or mother who received a postgraduate degree, and who is perhaps even employed as a teacher at a higher education institution? Has the post-2002 dual admissions system to postgraduate programmes (admission to licentiate or doctoral degree) had any gender equality consequences? On average, women are older than men when they receive their degree, and if it also takes women longer to become professors, does that not give women less time to establish their own platform and research group, for example?

Yet another type of study would deal with explanations of what the attrition of women is due to. There are already such studies, but the area is by no means exhausted. Further studies are needed, then, particularly now that we really have established that recruitment bias due to gender is a major problem. With a view to measures, it should also be valuable to weigh the various explanations against each other. Does one or more of them appear to be more important than the others?

Bibliography

Aldrich, J. H. & Nelson, F. D., (1984) Linear probability, logit and probit models. Beverly Hills och London: SAGE Publications.

Birath, B., Fritzell, A., Homman, M., Regnér, H. & Wadensjö, E., (2003) Att doktorera eller inte doktorera? – det är frågan! Stockholm: SULF. (web version: <<http://www.sulf.se>>)

Bondestam, F., (2003) Positiv särbehandling och akademien. Tjugofem år av ideologi, retorik och praktik. Uppsala: Sociologiska institutionen, Uppsala universitet. (Working Paper Series 2003/1)

Brandell, L., (1994) Kvinnor och män inom lärarkåren vid universitet och högskolor. Reprinted from: Ds 1994:79, Lärarkåren vid universitet och högskolor under 1990-talet. Stockholm: Utbildningsdepartementet.

Erikson, R., (1984) Social Class of Men, Women and Families. In: *Sociology*, vol. 18, no. 4, pp. 500–514.

Erikson, R., (2001) Why do graduates live longer? Education, occupation, family and mortality during the 1990s. In: J. O. Jonsson & C. Mills (eds.), *Cradle to Grave. Life-course change in modern Sweden*, pp. 211–227. Durham: Sociologypress.

Erikson, R. & Goldthorpe, J. H., (1992) *The Constant Flux – A Study of Class Mobility in Industrial Societies*. Oxford: Clarendon Press.

Erikson, R. & Jonsson, J. O., (1993) Ursprung och utbildning – social snedrekrytering till högre studier, huvudbetänkande av Utredningen om den sociala snedrekryteringen till högre studier. Stockholm: Fritzes. (SOU 1993:85)

Erikson, R. & Jonsson, J. O., (1994) Att mobilisera begåvningsreserven. In: *Tvärsnitt*, vol. 16, no. 3–4, pp. 122–131.

European Commission, (2000) *Science policies in the European Union. Promoting excellence through mainstreaming gender equality*. Luxembourg: European Commission.

Husu, L., (2005) Dold könsdiskriminering på akademiska arenor – osynligt, synligt, subilt. Stockholm: Högskoleverket. (Högskoleverket's report 2005:41 R)

Högskoleverket, (2000a) *Vissa jämställdhetsåtgärder inom högskolan*. Stockholm: Högskoleverket. (date 2000-05-23; reg.no. 843-499-00)

- Högskoleverket, (2000b) "Post-doc" – förutsättningar för en ny anställningsform i högskolan och en ny ordning för befordran till lektor. Stockholm: Högskoleverket. (date 2000-04-18; reg. no. 30-286-00)
- Högskoleverket, (2000c) Rekryteringsmål för andelen kvinnliga professorer. Stockholm: Högskoleverket. (date 2000-06-13; reg. no. 843-3590-99)
- Högskoleverket, (2003a) Lärosätenas arbete med jämställdhet, studentinflytande samt social och etnisk mångfald – en uppföljning av Högskoleverkets utvärdering 1999/2000. Stockholm: Högskoleverket. (Högskoleverket's report 2003:31 R)
- Högskoleverket, (2003b) Det framtida behovet av lärare vid universitet och högskolor. Stockholm: Högskoleverket. (web version, date 2003-11-14)
- Högskoleverket, (2003c) Karriär genom befordran och rekrytering – slutrapport. Stockholm: Högskoleverket. (Högskoleverket's report 2003:3 R)
- Högskoleverket, (2005) Universitet & högskolor, Högskoleverkets årsrapport 2005. Stockholm: Högskoleverket. (Högskoleverket's report 2005:26 R)
- Jonung, C. & Ståhlberg, A-C., (2003) Nationalekonomins frukter – även för kvinnor? In: Ekonomisk Debatt 2003, vol. 31, no. 3, pp. 5–20.
- Leijon, M., Alexanderson, K., Björkelund, C. & Schenck-Gustafsson, K., (1998) Vad innebär det att läkarutbildningen är inriktad på sjukdomar hos män och vad blir konsekvenserna för behandling av kvinnor? In: E. Hultcrantz (ed.), Läkare Doktor Kvinna, pp. 102–227. Lund: Studentlitteratur.
- Nonnemaker, L., (2000) Women Physicians in Academic Medicine – New Insights from Cohort Studies. In: The New England Journal of Medicine, vol. 342, no. 6, pp. 399–405.
- Regeringens proposition 1994/95:164 Jämställdhet mellan kvinnor och män inom utbildningsområdet.
- Regeringens proposition 1996/97:141 Högskolans ledning, lärare och organisation.
- Regeringens proposition 1997/98:1 Budgetpropositionen för 1998.
- Regeringens forskningspolitiska proposition 2000/01:3 Forskning och förnyelse.
- Regeringens forskningspolitiska proposition 2004/05:80 Forskning för ett bättre liv.

- Regeringens proposition 2004/05:162 Ny värld – ny högskola.
- Regeringens proposition 2005/06:1 Budgetpropositionen för 2006.
- SCB (1983) Socioekonomisk indelning (SEI). Stockholm: SCB. (MIS 1982:4)
- SCB (1991) Utbildning för kvinnor och män. Stockholm: SCB. (Siffror om högskolan 12)
- SCB (2000) SUN 2000, Svensk utbildningsnomenklatur – Standard för klassificering av svensk utbildning. Stockholm: SCB. (MIS 2000:1)
- Sigeman, T., (1997) Tjänstetillsättning vid universiteten i rättsligt perspektiv. In: Å. Frändberg, U. Göranson & T. Håstad (eds.), Festskrift till Stig Strömholm. Uppsala: Iustus Förlag AB.
- SOU 2004:27 En ny doktorsutbildning – kraftsamling för excellens och tillväxt. Stockholm: Fritzes.
- SOU 2004:55 Ett utvidgat skydd mot könsdiskriminering. Stockholm: Fritzes.
- Statistiska meddelanden, (2003) Forskarexaminerades arbetsmarknad. Enkätundersökning våren 2003 bland forskarexaminerade läsåren 1994/95, 1995/96, 1999/00 och 2000/01. Stockholm: SCB. (UF 18 SM 0301)
- Statistiska meddelanden, (2004) Universitet och högskolor. Social bakgrund bland högskolenybjörjare 2003/04 och doktorandnybjörjare 2002/03. Högskoleverket och SCB. Stockholm: SCB. (UF 20 SM 0402)
- Statistiska meddelanden, (2005a) Universitet och högskolor. Forskarstudierande och examina i forskarutbildningen 2004. Högskoleverket och SCB. Stockholm: SCB. (UF 21 SM 0501)
- Statistiska meddelanden, (2005b) Universitet och högskolor – Studenter och examina i grundutbildningen 2003/04. Högskoleverket och SCB. Stockholm: SCB. (UF 20 SM 0501)
- Statistiska meddelanden, (2005c) Universitet och högskolor – Personal vid universitet och högskolor 2004. Högskoleverket och SCB. Stockholm: SCB. (UF 23 SM 0501)
- Ståhle, B., (1996) Universiteten och forskarna – från stagnation till förnyelse. Köpenhamn: Nordiska ministerrådet.
- Wold, A. & Chrapkowska, C., (2004) Opinion piece in Dagens Nyheter 2004-03-18.

Appendix

Data, method, and variables

Data

Commissioned by the Swedish National Agency for Higher Education (Högskoleverket), Statistics Sweden (SCB) delivered a body of data that includes all individuals who completed undergraduate university programmes between 1995 and 1997, as well as all individuals who received a doctoral degree between 1980 and 2001.

SCB collected the information about these individuals from several different registers: the Universities and University Colleges Register, the Higher Education Personnel Register, the Total Population Register, and the Swedish Census (1960, 1970, 1980, 1985, and 1990). Högskoleverket then brought together the information from the various registers, by assigning a unique consecutive number to each individual. The entire body of data is de-identified, i.e. the consecutive number in the data files that SCB has sent Högskoleverket contains no information about who the individual is (civic registration number or other means of identification).

Variables

The variable *gender* (woman and man) is included in most of the analyses, but does not require any further specification. In other cases, Högskoleverket has created new variables, based on the variables in the data delivered by SCB and adapted to the analyses in this specific study.

Response variables

Transition to postgraduate programme: Dichotomous variable, i.e. one that can take on two values. Either an individual has been registered as accepted for the first time to a postgraduate programme within five years of completing an undergraduate programme, or else he or she has not.⁶³

63. For example, students who completed an undergraduate programme in 1995 are considered as having made the transition to postgraduate studies if they were admitted no later than 1999. If individuals have completed an undergraduate programme *after* being admitted to a postgraduate programme, they are also considered as having made the transition provided they completed their undergraduate programme no later than two years after being admitted to the postgraduate programme. The reasons for this kind of anachronism may be many, e.g. incorrect registrations. In many cases, it would seem to be due to a person having enough credits to be accepted, but not having taken their diploma yet. It seems reasonable to try to ensure that these individuals are also included in the analysis.

Transition to employment as postdoctoral fellow: Dichotomous variable in which an individual is either registered as postdoctoral fellow (within a certain number of years, on at least one occasion), or is not.

Transition to employment as professor: Dichotomous variable in which an individual is either registered as professor (within a certain number of years, on at least one occasion), or is not.⁶⁴

Independent variables – for analysis of transition to postgraduate studies

Parents' social class: Divided into six different social classes, with an additional seventh group which it was not possible to classify. Social classes that have been distinguished are (1) higher professionals (higher-grade professionals, higher managerial, senior civil servants and self-employed persons in academic professions), (2) lower professionals, (3) routine non-manual workers, (4) manual workers (both skilled and unskilled), (5) self-employed and employers, and (6) farmers.

The division into social classes is broadly similar to the socio-economic division which, in its most aggregated form, has been used in Sweden's official statistics since the 1980s (it is abbreviated SEI in Swedish).⁶⁵ The boundaries between social classes according to the socio-economic class scheme has a theoretical basis in what constitutes the Weberian tradition. The first division looks at whether the person is an employee or an employer (including farmers). That is to say, it is the individual's position in production which is decisive – if the occupation involves control over one's own work and the work of others, or not. In the next step, blue-collar and white-collar workers are separated among the employees. Then white-collar and blue-collar workers, respectively, are categorised according to how qualified their occupation is. Note that this final division principle is based on what the *occupation* requires in the form of qualifications, and not on the qualifications that the *individual* has acquired, such as a formal education. A small change was also made for social classes. Fishermen, who belong to the self-employed category in the SEI division, were included with the farmer class instead

Parents' social class was derived from their occupation as stated in one of five different Swedish censuses (abbreviated FoB in Swedish). Depending on when

64. Associate professors are not included (they are part of the senior lecturer personnel category instead). In 1997, however, some sort of incorrect processing occurred and associate professors were coded as professors in personnel statistics. In the construction of this variable, this has been taken into account in the following way: those individuals who had been registered as senior lecturer in 1998 were not coded as professors in 1997.

65. See SCB (1983). The class division used here differs from the most aggregated form of SEI in that self-employed/employers and farmers have been separated, while skilled and unskilled manual workers have been joined into one class (a decision that was made following a number of preliminary analyses). Other types of class schemes are also used in research and inquiries. The so-called EGP classification, for example, is common in international research (Erikson and Goldthorpe, 1992).

the person was born, different censuses were used. For example, for children born 1943–1952, data on parents' occupation was taken primarily from FoB60. If there was no information about a parent's occupation in FoB60, this information was sought in later censuses. In this way, it was possible to minimise the group of unclassifiable individuals. Parents whose social class was still not classifiable may for example have been living abroad, or been unemployed, at the time of the census. In those cases where the child has immigrated as an adult or left home prior to the census, there is no link to parents. Note also that the parents or parent that the child is living with need not be its biological parents.

One difficulty in using FoB60 and FoB70 is that these censuses do not have an SEI division comparable to that of later censuses. They do, however, contain information on parents' occupation, and Högskoleverket used this information, primarily, to assign parents in the earlier censuses a social class.⁶⁶

If there was only information about one parent's occupation or social class, this was used. In cases where parents were of different social classes, based on information about their individual occupations, the social class of the parent whose occupation was assumed to have the greatest influence on the family's living conditions was used. Under that principle, higher professionals dominate over all other social classes. They are followed, in decreasing order, by: farmers, self-employed/employers, lower professionals, routine non-manuals with some qualification, skilled manual workers, routine non-manuals without qualifications, and unskilled manual workers at the bottom (dominated by all the others).⁶⁷ After determining the social class of the upbringing family in this way, routine non-manuals with and without qualifications have been brought together in the routine non-manuals class, and skilled and unskilled manual workers have been brought together in the manual worker class.

The best thing would have been to keep skilled and unskilled workers apart. But in the group we were studying (graduates from longer undergraduate university programmes), working class children are a small group. So if we divide working class children into two different classes, this creates problems in some analyses (more "exclusive" analyses, in which we look at the transition to postgraduate studies in different subject areas, for example). A number of preliminary analyses were nevertheless made before the decision to merge the working class children into one group was made, and it turned out that the two groups move on to postgraduate studies to a very similar extent.

66. Högskoleverket very gratefully received a programme from Professor Jan O. Jonsson for a translation between the occupation codes in the earlier censuses and SEI. The programme was developed by Jonsson and Martin Hörnqvist, BA, for the analyses in the report *Utredningen om social snedrekrytering till högre studier* (SOU 1993:85).

67. See Erikson (1984). If one were to apply Erikson's dominance-order principle fully, one should also consider working hours, with full-time workers being assumed to have a greater influence over the household's social class than part-time workers. Since such information is partly missing from this body of data, the principle has not been applied.

Parents' education: Information on both the mother's and the father's level of education was taken from the censuses. Five different categories were distinguished: lower secondary education; upper secondary education (2 years or less); upper secondary education (3–4 years) or tertiary education (3 years or less, independently of length of upper secondary education); university degree (3 years or more, excl. postgraduates); and postgraduate degree.

Individuals for whom there is no information about either parent's educational level make up a sixth category. In those cases where parents' educational levels differed, the highest educational level was classified.

Subject area in undergraduate studies: Contains 19 different subject areas which in the main correspond to the first two digits in the orientation module for SUN 2000 (SCB 2000). However, there are a couple of differences. Pedagogues without teacher training have been moved from the teacher category to "Social and Behavioural Sciences", and the SUN groups personal services, transport services, environmental protection, and security services are here grouped together in the "Services" category. The subject areas are written in plain text in Table 1.

Age at time of undergraduate degree: Divided into five age groups: 25 years and younger; 26–29 years; 30–34 years; 35–39 years; and 40 years and older.

Type of university: Three categories based on which university the individual completed his or her undergraduate programme at. Most belong in the category "Older universities/university colleges", which is made up of higher education institutes that have had the right to award postgraduate degrees for a long time: Umeå University, Luleå University of Technology, Uppsala University, Stockholm University, the Karolinska Institute, the Royal Institute of Technology, Linköping University, Göteborg University, Chalmers University of Technology, Lund University, the Swedish University of Agricultural Sciences, and the Stockholm School of Economics. The category "Young universities" includes the three new universities from 1999 (Örebro, Karlstad, and Växjö) and the one that opened in 2005 (Mid Sweden University).⁶⁸ It additionally includes university colleges with at least one scientific field, and thereby the right to award postgraduate degrees, i.e. the following: Mälardalen University, Jönköping University, the University of Kalmar, Blekinge Institute of Technology, and Malmö University. Consequently, the category "No postgraduate programmes" is for individuals who have completed their undergraduate studies at a higher education institute that does not have the right to award postgraduate degrees.

68. Previously university colleges with the right to award postgraduate degrees.

Independent variables – for analysis of postdoctoral career

Age at time of PhD: divided into five age groups: 30 years and younger; 31–35 years; 36–40 years; 41–45 years; and 46 years and older.

Subject area of PhD: only used as a selection variable (and not as a variable in a model). The basis for the division are the national research subjects which are included in the postgraduate programmes register at SCB.⁶⁹ Some subjects have been merged, and the divisions are: (1) Humanities and religion; (2) Social sciences and law; (3) Natural sciences and mathematics; (4) Engineering sciences; (5) Veterinary medicine, forestry and agricultural sciences, and landscape planning; and (6) Medicine, odontology, and pharmacy.

Method

In part, the findings reported are made up of simple comparisons between percentage shares. A number of analyses are also made up of logistic regressions, which are suitable when a response variable takes on only two values (this applies to all dependent variables in this study).⁷⁰ The coefficients, which express the effect of the explanatory variables (gender, parents' education and class) on a response variable, correspond to logarithmic odds ratios. In the present study they have been converted to odds ratios, and sometimes percentage shares have also been calculated.

A more precise definition of what an odds ratio is can be illustrated with the help of a calculation example. We begin by assuming that in a group of 1 000 persons, everyone has a working class background. Of these, 130 persons are admitted to postgraduate studies. The odds for being admitted to postgraduate studies will then be equivalent to 0.15 for this group (130 admitted/870 not admitted). For 1 880 individuals who grew up in the homes of higher professionals, the odds for being admitted will be 0.25 instead (380 admitted/1 500 not admitted). The odds for persons from higher professionals' homes of being admitted divided by the odds for persons from working class homes of being admitted then produces the odds ratio 1.67 ($0.25 \div 0.15$).

The odds ratio 1.67 (for the children of higher professionals) should be compared with the odds ratio 1, which applies to persons from working class homes (the reference category). In these analyses, a reference category has been designated for each variable, and its value is thus always 1, to which all the other categories of a variable relate.

Several of the logistic regressions that have been carried out are of the multiple form, i.e. they contain at least two independent variables. Such analyses make it possible to identify the importance of a variable without interference from other variables. In this way it is possible, for example, to ascertain whether there is any difference between men and women when the two groups

69. Statistiska meddelanden (2005a).

70. See e.g. Aldrich and Nelson (1984).

do not differ in any other ways (e.g. they have the same type of undergraduate degree). Findings based on a multiple regression are considerably clearer than the “method” of comparing percentage shares from a large number of cross-tabulations.

The control variables were selected on the basis that they have a connection with the likelihood either of being admitted to postgraduate studies or of getting some form of postdoctoral employment (for example, the transition likelihood to postgraduate studies varies between individuals with different types of degrees from undergraduate studies), and on the basis that they are distributed unevenly between the categories for gender and social background (parents’ social class and education). If these two requirements are not fulfilled together, it is not meaningful to include the control variables in the analysis – they will simply have no effect on the estimates for gender and social background, even if they might be interesting to study “in themselves” (in a study looking at other issues).

Since the analyses are based on total selection (all individuals with undergraduate degrees for certain years and all individuals with PhDs for certain years), no significance testing has been done. But as always it is a question – and this also applies in significance testing – of judging whether a difference should be seen as insignificant, very big, or something in between.

List of Terms

English

Associate professor

Instructor

Junior lecturer

Postdoctoral fellow

Reader

Senior lecturer

Parents' education

- postgraduate studies
- university ≥ 3 yrs (excl. postgraduates)
- upper secondary ≥ 3 yrs/tertiary < 3 yrs
- upper secondary ≤ 2 yrs
- lower secondary

Parents' social class

- higher professionals
- lower professionals
- routine non-manual
- self-employed/employers
- farmers
- manual workers

Swedish

biträdande professor

adjunkt

biträdande lektor

forskarassistent

docent

lektor

föräldrarnas utbildning

- forskarutbildning
- högskola ≥ 3 år (ej forskarutb.)
- gymnasium ≥ 3 år/högsk. < 3 år
- gymnasium ≤ 2 år
- förgymnasial

föräldrarnas samhällsklass

- högre tjänstemän
- tjänstemän mellannivå
- lägre tjänstemän
- företagare
- lantbrukare
- arbetare

