



How gender-equal is higher education?

Women's and men's preconditions
for conducting research

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VR2106
Dnr 3.1-2020-06760
ISBN 978-91-88943-51-4

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Vetenskansrådet

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Foreword

The Swedish Research Council works on gender equality in several ways, and has been doing so for many years. According to its instructions, the Swedish Research Council shall integrate a gender equality perspective in its activities, and promote gender equality in the allocation of research funding. We work on these issues in a number of different ways, for example by conducting gender equality observations, where we scrutinise our own assessment process. We publish our annual statistics divided up by gender. The Swedish Research Council's gender equality strategy, which is updated regularly, underlines that research benefits from the participation of both women and men and the expertise and experience they contribute.

The purpose of this study is to investigate and analyse the differences between the career developments of women and men, and also to investigate how the conditions in higher education are perceived by women and men. We have also wanted to highlight the conditions in higher education from a management and employer perspective. The work is based on current research into gender equality in the academic system, and fills in gaps in the Swedish knowledge base.

We would like to say a big thank you to the study's reference group, which consisted of Hebe Gunnes, Senior Adviser at NIFU in Norway, Liisa Husu, Senior Professor at Örebro University, and Birgitta Jordansson, Senior Lecturer at the University of Gothenburg, who have assisted with valuable insights from research. The study would not have been possible without the willing assistance from all those who have responded to our questionnaires and allowed us to interview them: we are very grateful for your participation. We have also received help with statistical documentation from Ingrid Pettersson at the Swedish Higher Education Authority, and Andreas Frodell at Statistics Sweden. The study was conducted by Stina Gerdes Barriere, Lisbeth Söderqvist and Johan Fröberg, Analysts at the Swedish Research Council. Johan Fanger, Analyst, helped with the implementation of the surveys.

Stockholm, 16 June 2021

Sven Stafström

Director General, Swedish Research Council

Summary

Gender equality is a quality issue for research, as research benefits from both women and men participating and contributing their expertise and experiences. It is also a fairness issue, as women and men should have equal opportunities to conduct research and develop professional careers as researchers.¹ Against this background, the Swedish Research Council has conducted a study aimed both at investigating and analysing the differences between the career development of women and men, and also at investigating how the conditions in higher education are perceived by women and men. We have also, to some extent, wanted to highlight the conditions in higher education from a management and employer perspective. Previous research has led us to focus on issues relating to work environment, employment terms and conditions, the family/work balance, experiences of scientific publishing, and experiences of receiving various forms of support from departments.

Three subsidiary studies

The first subsidiary study consists of two questionnaires aimed at women and men who were awarded a doctorate between 2009 and 2016. This group is called “junior researchers” in the report. The purpose of the questionnaire is to cast a light on the experiences of junior researchers as employees in higher education.

The second subsidiary study has interviews with representatives of nine departments, all of which employ many junior researchers who have been awarded grants from the Swedish Research Council.

The third subsidiary study is based on registers, and describes the career development of women and men with doctoral degrees within and outside higher education. The study also includes a section describing women and men in higher education, based on public statistics.

Result

Today, several scientific fields appoint approximately the same number of women and men as professors, and within these fields gender equality at professor level will probably become reality within a 25-year period. One exception is natural and engineering sciences. Here, the number of female professors is low, which in turn is because the number available for recruitment

¹The Swedish Research Council’s gender equality strategy, Reg. No 1.2.4-2016-7099.

is low. This means that the goal of gender equality at professor level will probably still not be achieved overall.

The route to becoming a professor is not gender equal in any subject area, however. One example of this is that even when the gender distribution is equal among newly appointed professors in several scientific fields, this does not reflect the number available for recruitment. The proportion of women in the number available for recruitment is just over ten per cent higher than the proportion of newly appointed professors who are women. Even in natural and engineering sciences, where the proportion of newly appointed professors who are women is low, the proportion of women in the number available for recruitment is higher.

The study also shows that, in all scientific fields, women face more challenges than men do. One reason for this is that women to a greater extent are active in research subjects where the opportunities to gain merit in research terms are small, while men to a greater extent are active in fields offering more time for research. But also within the various research subjects, differences exist between women's and men's career development and experiences of being active in higher education. The differences are often small. At the same time, these are recurrent patterns that are often detrimental to women, and these can therefore be part of the explanation of the difference that cuts through the scientific fields, namely that it takes longer for women than for men to be appointed a professor. Below we show some results that indicate that there appears to be an accumulation of negative factors and experiences for women, which in the literature is known as the 'Matilda effect'.

- Time for research is unevenly distributed between scientific fields, and also as a consequence of gender. A higher proportion of women are active in research subjects that have few professors, and a higher proportion of teaching and lower proportion of research. To this can be added that, in all scientific fields, men state in their questionnaire answers that they spend a higher proportion of their working hours on research.
- Women report to a greater extent than men that it is difficult to be responsible for young children and simultaneously develop a career in higher education. More women than men say that they have experienced unfairness. Women also state that they to a lesser degree can influence important decisions relating to their work, and fewer women than men say that they have had opportunities to develop networks.
- Fewer women than men have access to two of the success factors that women themselves assess in the questionnaires as being among the most important for success in higher education: the opportunity to gain scientific merit, and access to a mentor. In all scientific fields, more women than men state that they do not think that the principles for organising author names on publication are fair.

In the study, we also see that there are organisational aspects in higher education that are detrimental to both women and men. These relate to conditions of employment, work environment conditions, and the difficulties that those of an under-represented gender encounter in the workplace.

- A small proportion of the junior researchers have employment that is regulated in *högskoleförordningen* (Swedish higher education ordinance) and that offers a clear career path, namely as associate senior lecturers.
- Many women and men work more than the 40 hours per week that constitute normal working hours in Sweden. Almost one quarter respond that they work between 50 and 60 hours per week, and some work even longer. The department heads in our interviews point to the high level of competition, in particular in medicine and health, and natural and engineering sciences respectively, as an explanation for the long working hours of researchers. However, few of the department heads are aware of how many hours the researchers actually work per week.
- The questionnaire answers show that the experience of being or not being part of a community in the workplace may be an effect of gender, as well as of employment category and origin. There are departments that have developed tools to increase the chances of creating an environment where all feel included and are given the same opportunities. However, most of the departments where we conducted interviews appear to be lacking both knowledge and experiences that give the departments the opportunity to address problems relating to exclusion and gender inequality.

1. Introduction

Starting points and purpose

Gender equality is a quality issue for research. Research benefits when both women and men participate and apply their expertise and experience. It is also a fairness issue – according to the Swedish Research Council's gender equality strategy, women and men should have equal opportunities to conduct research and develop professional careers as researchers.²

It was already known that women apply for research grants from the Swedish Research Council to a lesser extent than men do, in particular during the early stages of their careers.³ This report aims to increase the understanding of women's and men's preconditions to pursue careers in academia and conducting research in Swedish higher education and, by extension, the same opportunities to apply for and be awarded grants from the Swedish Research Council, which is also part of our gender equality strategy. Applying for and being awarded external research funding as a project leader is important for being able to establish oneself as a researcher, and in the long run to apply for positions and achieve secure employment in Swedish higher education.

In this study, we have therefore chosen to describe and analyse the situation for women and men who have relatively recently been awarded their doctoral degrees, and who wish to pursue research careers. This period is often described as a vulnerable time, with employment that is not covered by the regulations of the Swedish higher education ordinance, where researchers are often dependent on external research funding to pay for their own salaries. (1)

One of the study interviews included a simile of the career system in higher education, which slightly reworded can be expressed as follows: Where is the bus stop, where does the bus go to, and is there a time table? This image conjured up by this head of department is probably recognised by many, despite the higher education ordinance having a career system that can be described as going from associate senior lecturer via senior lecturer to professor. Our investigation showed that the career system in the higher education ordinance is not available to most people. Many who have the ambition to conduct research are instead forced to take up researcher employment that lacks clear and transparent development opportunities.

² Reg. No 1.2.4-2016-7099

³Swedish Research Council Annual Report 2021, p.90 and 3.1-2021-06010 (statistical documentation).

In one interview with the head of a department that received a large amount of external funding, the head described a competitive situation in roughly these words: In the old days, people worked even more (in the workplace), and the norm has probably changed, so that these days you can go home on time, to collect your children for example. But it's probably not clear to all that for those who want to continue their careers, it is probably a requirement to continue working in the evening, reading and writing articles. Those who don't do this will not succeed in the competition, but perhaps they won't understand why.

Qualitative and quantitative methods used

The analysis has been conducted using three subsidiary studies, where the first was a survey-based study aimed at women and men who had received their doctorates relatively recently (2009–2016). The purpose of this first study was to highlight the experiences of junior researchers in relation to career development and research opportunities from a gender equality perspective. The study covered two surveys; one aimed at women and men who had applied for project grants⁴ from the Swedish Research Council during their period as junior researchers. Just under 1 800 persons responded. The response rate was impacted on by the fact that relatively many had left higher education or changed higher education institutions, and therefore the questionnaire did not reach them. We were able to establish that a higher proportion of women than men answered the survey, which might indicate that the situation in higher education engages many women. The response rate was also higher among those who had been awarded grants than those who had been rejected. A partial explanation of this might be that a higher proportion of those who had been rejected had left higher education. The second survey covered a selection of questions from the first survey, and was distributed as an open internet survey aimed at doctoral degree holders who were currently active outside Swedish higher education, for the purpose of capturing views from doctoral degree holders who had chosen not to work as researchers and teachers in higher education. For details of this and the other parts of the study, please see the section on methods in Appendix 1.

The second subsidiary study consisted of interviews with representatives from the managements of nine departments, all of which employ many junior researchers who have been awarded grants from the Swedish Research Council. The nine interviews reflect the different fields of research covered by the Swedish Research Council, and covered three departments active in medicine and health, three departments in natural and engineering sciences, two departments in humanities and social sciences and one department in educational sciences. The questions asked of the department heads or their representatives largely reflect the questions in the survey, and the purpose of the interviews was

⁴ Including starting grants and consolidation grants

to investigate what opportunities exist for the departments to promote and support women and men in their development towards becoming independent researchers and teachers.

We carried out a cohort study based on available registers to follow doctoral degree holders from a number of year groups through their careers within and outside higher education. The purpose was to investigate how the academic careers of women and men developed, and how they vary over time and between fields of research. The oldest cohort included were awarded their doctoral degrees in the years 1998 and 1990, while the youngest were awarded theirs in 2010 and 2011. The youngest cohort corresponds to the oldest group included in the first subsidiary study of the investigation. To complement the cohort study, we used the same methodology to carry out a study of doctoral degrees holders who had applied for funding from the Swedish Research Council.

The study also includes supplementary statistics of higher education staff, taken from Statistics Sweden and the Swedish Higher Education Authority, to provide a more complete picture of how the careers of women and men develop, and what consequences even relatively small differences can have for the overall gender distribution, for example among professors.

Limitations of the study

The preconditions for women and for men to conduct research in higher education are impacted on by a number of different aspects and factors, far from all of which have been possible to deal with in this report. We have limited the study to concern the group of doctoral degree holders, and to study their careers after the award of the doctoral degrees. A further limitation set in relation to surveys and interviews has been to describe and highlight research-intensive environments within all fields of research, and the researchers and teachers who are active in these particular environments. In concrete terms, this means that the respondent group for the survey aimed at researchers/teachers at the beginning of their academic careers consists of applicants for the Swedish Research Council's support for research. The cohort study, on the other hand, illuminates the careers of all persons awarded a doctoral degree during the years in question.

Questions

As our starting point, we asked a number of questions, which are mostly based on previous research. Conclusions from this research can be found below under the heading "Previous research into gender inequality in higher education". Most of the questions we asked in the study can also be found there, reported in a context that might be described as 'the research frontier'. The following summarises the questions asked.

A central question asked by many, and which has also been topical for this study, is why the proportion of female professors is so low, when the proportion of women and men is equal in other employment categories and among doctoral degree holders.

What are the differences between women's and men's routes to employment as a professor? Will any differences between women and men be equalised over time?

Another question is whether more women than men leave higher education and, if so, does this explain why there are fewer women than men at professor level? The expression "the leaky pipeline" is often used for this phenomenon. A follow-up question is whether women and men leave higher education for different reasons and, if so, what are these reasons?

We also asked the question whether the small proportion of women at professor level is due to differences between the conditions in different scientific fields, or if it is due to circumstances within each field?

The Swedish Research Council's follow-ups show that women apply for research grants aimed at junior researcher to a lesser extent than men do. We asked the question why this is so?

We asked those doctoral degree holders who work in higher education whether their job was advertised in competition when they were appointed to it? The intention here was to investigate any differences between how women and men are recruited.

Publishing research results is central for researchers who wish to gain scientific merit. In surveys and interviews, we have therefore chosen to ask questions about rules or traditions for who is listed as a co-author of publications and, if so, in what order, whether research students publish together with their supervisors during and/or after receiving their doctoral degree, and what support is offered to women and men in conjunction with publication.⁵ We also investigated to what extent women and men consider that gaining scientific merit is a success factor, and whether they have access to this. We also investigated what success factors women and men consider the most important, and to what extent they themselves have access to these.

We also asked the researchers with doctoral degrees about how they perceive their work situation and work environment. Examples of the questions was whether they felt part of a community at the department, whether they had

⁵The question was worded: Have you received support from your department/corresponding when publishing (for example advice about where to publish, time set aside to finish writing an article/corresponding, or language checking)?

access to networks, and whether they had access to a more experienced colleague who supported them in developing strategies and guided them on important issues. We also asked whether they had experienced any unfairness, and – last but not least – how the combination of working in higher education and being responsible for young children worked. We also asked questions about the support that the department could provide, and how it handled its role as employer of junior researchers.

The HEIs' gender equality mandate from 2016 onwards

Since 2016, all state higher education institutions (HEIs) have had a specific mandate to work with gender mainstreaming in a programme known as 'JiHU' (Jämställdhetsintegrering i högskolor och universitet). The programme aims to strengthen the HEIs' work with gender mainstreaming, so that their operations contribute to achieving the gender equality policy goals.

Producing a plan to develop gender mainstreaming is included in the mandate. The plan shall include development needs, goals and activities, and describe how the HEI shall integrate gender equality as part of the everyday operation, for example in management and control processes. Since 2018, the mandate has also included a wording to the effect that HEIs shall state in their annual reports how gender equality is considered when allocating research funding. The Swedish Gender Equality Agency supports HEIs in their work with gender mainstreaming by offering support with the planning of the work, implementing skills-enhancing initiatives, and promoting experience exchanges between HEIs. The Government set a goal that, by 2030, half of all newly recruited professors should be women. For the period 2017–2019, the Government also set HEI-specific recruitment goals, but a follow-up in 2020 showed that many HEIs have not managed to achieve their respective goals. (2) (3)

Organisation and designations

To start with, we present a selection of the research published about gender equality in higher education that is relevant to our investigation. The three following sections present the results from the surveys, the interviews, and the register-based cohort studies respectively. The concluding discussion is preceded by a section with a selection of background statistics that put the results from the other sections into context.

In Sweden, a number of different, but similar, designations are used for fields of research. We have chosen to use the following designations (abbreviations in tables and figures): humanities (H), natural sciences (N), engineering sciences (T), medicine and health (MH), social sciences (S), and in some cases agricultural sciences (L).⁶ The Swedish Research Council joins up humanities and social sciences (HS), and natural and engineering sciences (NT). The research subject group of educational sciences (U), which is included in social sciences, is treated as a stand-alone subject area within the Swedish Research Council, and is therefore reported on separately in some contexts.

⁶ According to the Swedish Higher Education Authority's 2011 Standard for Swedish separation of fields of research (Standard för svensk indelning av forskningsämnen 2011, UKÄ).

2. Previous research into gender inequality in higher education

The conditions for women and men in higher education have been analysed in a large number of studies, which taken together indicate that it is more difficult for women than for men to reach the highest positions in higher education. Statistics confirm that, in Sweden, there are still relatively few women who are professors, and it takes slightly longer for women to reach this position.

There are many studies investigating what might be the reason for the difference in women's and men's career development in higher education. Both success factors and obstacles have been identified, and there are several analyses of how these have differing impacts on career development, due to gender. We have read these studies, which together create the horizon of understanding for this study, and have formed the starting point for its design.

Career following doctoral degree award

Do the careers of women and men with doctoral degrees develop differently in higher education?

One question that is often asked is why the proportion of female professors is so low, when the proportions of women and men are equal in other employment categories and among doctoral degree holders. One hypothesis is that this reflects a historical situation that will change, as the pool of professors is continually replenished by new generations of researchers, where the differences between women and men are smaller. This hypothesis is confirmed in part by a study that establishes that the difference in the representation of men and women at professor level has declined for later year groups of doctoral degree holders, but the study also shows that some difference still remains, even for men and women in the same subject area. (4) The latter may perhaps be said to support the research that claims that the proportion of women among professors is low, even when considering that the proportional difference between women and men is declining over time. (5) (6) (7). In the report from the Delegation for Gender Equality in Higher Education, the authors claim that the difference can possibly be explained by men and women being active in differing scientific fields, which have differing access to career development positions, and where the allocation of time between research, teaching and administrative work differs. (8) Other authors indicate that the wide-spread use of internal recruitment is disadvantageous to women, and may contribute to less good career development. (7) (9) The last few years has seen a number of reports, both from Sweden and

internationally, that highlight the vulnerability of academic careers, both for women and men. Examples are: (10) (11) (12).

In this study, we are focusing on the careers of women and men in higher education after the award of doctoral degrees, for a number of doctoral degree year groups. We will look at any differences between women's and men's routes from senior lecturer, as well as the career development positions of associate senior lecturer and research associate, to professor.

Teaching and research personnel in higher education

Employment in higher education is regulated in the Swedish higher education ordinance, (Högskoleförordningen 1993:100), through agreements between the parties on the labour market or, if otherwise is not stated, in the Swedish employment protection act (Lagen om anställningsskydd 1982:80).

The report uses the concept of 'researchers and teachers' when we refer to higher education personnel with doctoral degrees who have teaching and researching work tasks.

Employment categories regulated in Högskoleförordningen:

- Professor: Teaching employment; there is also adjunct professor, visiting professor and combined employment with a healthcare principal.
- Senior lecturer: Teaching employment; there is also combined employment with a healthcare principal. Since 2011, the HEIs can themselves decide to what extent a senior lecturer is entitled to apply for promotion to professor.
- Associate senior lecturer: Four-year career development employment as teacher, with the right to a review for consideration of permanent employment as senior lecturer. Can be achieved within five years of doctoral degree award. Has been subject to several changes, and was previously designated as 'research associate', and then had no right to a review for consideration of permanent employment.

In addition, there are the following employment categories:

- Postdoc: Two-year employment, regulated via an agreement between the parties on the labour market. Can be achieved within two years of doctoral degree award.
- Other research and teaching personnel with doctoral degrees: Designated as 'researcher employment'.

- Other research and teaching personnel without doctoral degrees:
Designated as ‘support personnel’.
- Lecturer

Do women leave higher education to a greater extent than men?

There are many studies discussing the issue whether women leave higher education to a greater extent than men; a phenomenon that is often called “the leaky pipeline”. (13) (14) A study relating to Swedish circumstances does not find any significant gender differences in this respect, while others consider that there are great differences between scientific fields. (6) (5) (15).

If such ‘leakage’ exists, is then continuous, or does it occur in the shifts between different types of employment, or career steps? Our study investigates who is leaving, whether we can determine when this occurs, and what the underlying causes are.

What role does external research support play?

The Swedish Research Council’s follow-ups show that women apply for research grants aimed at junior researcher to a lesser extent than men do. Even when the funding body is striving for a gender-equal approval rate, the consequence is that women receive less research funding than men during early career stages. This is not unique for Sweden, but has also been found in countries such as the Netherlands and USA. (16) (17)

Many research councils have support aimed specifically at junior researchers, often for the purpose of making it easier for these to establish themselves as independent researchers. The fact that such support is important for the career development of individual researchers is shown in studies, including ones done by Hallonsten and Hugander, and by Lerchenmuller and Sorenson. (18) (19)

Danell and Hjelm have investigated how women’s and men’s careers develop over time for those who have received postdoc support from Swedish funding bodies. They found no differences between genders in terms of career development to professor among those who received postdoc support, but could establish that women who did not receive such support early in their careers had less chance of later becoming employed as a professor. (6) (7)

In this study, we have investigated how careers have developed for researchers who have applied for research funding from the Swedish Research Council during their establishment phase (up to eight years after receiving a doctoral degree). Using surveys, we investigated how junior researchers perceive their situation in higher education, with emphasis on work environment, access to external research funding, mentorship, etc. The results are reflected in interviews

with representatives of the department management teams focusing on these questions.

Factors that impact on the preconditions for women and men

Who is teaching and who is doing research?

It has often been said that traditionally male domains, such as natural sciences and engineering sciences, have greater resources for research, while scientific fields where many women are active have considerably less. (8) (20) Bondestam and Grip have established that, due to this, women compete much more fiercely than men for available funds. (20) Other publications show that women receive smaller and fewer grants, and that this is due to women's positions in academia; that is to say, they often hold lower level positions. (21) We ask ourselves whether this may mean that women teach to a greater extent than men, and that men do research to a greater extent than women?

In educational sciences, which has a relatively large educational undertaking in relation to the available research resources, studies show that the resources that are available for research mainly go to men, while the women work at the departments that primarily handle teaching. (22) (23) The question is whether a similar pattern exists in other scientific fields? At the same time, teaching can provide a valuable contribution to the funding of the employment, which raises the question of who gets access to teaching time? Besides securing salaries, the opportunity to teach is important for gaining merit, and for many it is also a central part of being active in higher education. (24) Based on public statistics, we investigated whether there are differences between how women's and men's working hours are used in terms of research and teaching at HEIs. We also investigated how men and women are divided up across different employment categories, in order to highlight women's and men's respective positions in higher education.

How are women and men recruited to higher education?

We asked doctoral degrees holders who work in higher education whether their job was advertised in competition when they were appointed to it. The intention here was to investigate any differences between how women and men are recruited to higher education. There are studies indicating that discrimination does not occur when positions are filled using formal routes. (25) Informal recruitment appears to favour men, however. In one study, the researchers could conclude that women and men who had been employed as research associates were equally likely to reach professor level, but for the group of women and men who had not had such employment, there were greater differences in career development, to the disadvantage of women. The authors also point out that

social networks often are homosocial, and that these networks may play a role when access to resources are allocated between women and men. For example, resources are not infrequently allocated by a research leader, who staffs a research team in a non-transparent manner. (7)

According to a study for 2021, many researchers in Swedish higher education have employment that is neither regulated in the Higher Education Ordinance, nor included in the employment schedules for the HEI. For this group of researchers, the career paths are unclear, and, for the departments, this means that many of them develop into ‘researcher hotels’. We asked a number of department heads what their department thinks about this development, and how they handle their role as employers of junior researchers. (1)

Do both women and men have good conditions?

In our study, we asked women and men how they perceive their work environment. One motive for doing so was that there are studies investigating how academic organisations discriminate against women in everyday life. This might relate to things such as not being invited to speak at a conference or seminar, not being cited, not being asked to be part of a research team or a committee, or, as a doctoral student, not being offered to teach courses in the department. (26) (27)

Differences between scientific fields should not be underestimated, as academia is not a unified arena with a unified culture. For this reason, we need better understanding of what factors in the various scientific cultures create gender inequality, and why a situation changes, or does not change, one group of researchers writes. (15) Several interesting studies have been published with this perspective; that is to say, researchers describing a specific scientific culture and laying bare the structures that produce and reproduce gender inequality. Among them can be mentioned Stina Powell’s study of the Swedish University of Agricultural Sciences in Uppsala (SLU), Johanna Kantola’s study of a political sciences department in Finland and studies of educational sciences departments in Sweden. (22) (23) (27) (28) It emerges from Powell’s analysis that problems with a gender unequal employment structure with few women who are professors is explained by SLU as an effect of factors controlled by individuals, not by the organisation. The fact that few women hold the highest positions is thereby explained as women not wanting a career after having formed families, but also that they have low self-esteem or poor self-confidence, and that they do not have sufficient merit. Kantola’s study highlights the difficulties for a person of the under-represented gender, in this case women, to work in an environment that is dominated by the other gender, in this case men.

The above-mentioned studies of a political sciences department in Finland and several educational sciences departments in Sweden raise questions about various subjects, including women’s and men’s differing forms of networks, but

also individuals' feelings of not belonging to a community, or to the circle that has access to development opportunities. In studies of educational sciences departments, this is associated with the networks. It emerges that women often have broad, horizontal networks instead of vertical ones. The vertical networks can provide increased opportunities to continue doing research for a person with a doctoral degree, which the horizontal networks do not do to the same extent. The study indicates that many women feel disregarded, outside influential networks, and without access to the right resources in their careers. This might explain why some women do not compete for influence over, or display resistance to, the most prestigious networks, according to the authors. One pattern that has been identified is that women, in comparison with men, adopt a considerably more 'wait and see' attitude towards a research career.

The results of the studies mentioned justify the questions we ask in the surveys relating to the access to networks that doctoral degrees holders have, and what forms of networks these respondents have (or did have in the event they have left higher education). We also asked to what extent respondents feel, or did feel, that they are/were part of a community at the department, and whether they received support from a more experienced colleague, that is to say a mentor. Another question asked was whether the respondents are working in an environment dominated by one gender, or in an environment where there is a balance between women and men, at both lower and higher levels. The purpose was to investigate whether there is any connection between the individual's feeling of being part of a community on the one hand, and an even or uneven gender distribution in the workplace on the other hand. We also asked if respondents have, or do not have, access to a mentor providing support for developing strategies and guidance on important matters.

Why do doctoral degree holders leave higher education?

According to a Norwegian study, employment terms and conditions, such as short-term employment, are an important reason why individuals with doctoral degrees move on to other work two to six years after their degree award.

According to the study, many doctoral degree holders also receive a higher salary outside higher education, in particular natural scientists and mathematicians, where the differences are the greatest.

The Norwegian study also shows that men and women in higher education work 44 hours per week, while normal working hours in Norway are 37.5 hours per week. This is reflected in the fact that, according to the study, those who do other work are more satisfied with the balance between work and leisure. (29) We therefore asked questions about working hours, and whether the respondents had considered leaving higher education. Similar survey questions were asked of those who work outside academia.

Do negative effects arise for those who have children?

We asked employees in higher education and doctoral degree holders who had left higher education how the combination of work and responsibility for younger children works, or worked, for them. The starting point was that there are studies claiming a negative connection exists between researchers' careers on the one hand, and parental responsibility on the other hand. There are also studies that do not show any negative connection.

One complication is that many international studies have been carried out in countries where the societal context is different from the one we see in Sweden, and it can therefore be difficult to assess to what extent the results are transferrable between different countries. Below follows a description of some texts that discuss the issue of whether it works well to combine responsibility for young children with work as a researcher.

In an international study, a research team is working on productivity differences related to differing "levels of parental responsibility". The authors refer to the modern parenthood that implies that responsibility for children is divided equally between the parents, or alternatively that other forms of child care exist, and this is the justification for discussing differing levels of parental responsibility. The study shows that the level of parental responsibility is a variable that can explain productivity differences, where a higher level of responsibility is linked to lower productivity. Productivity is measured both as number of articles, and also as highly cited articles within the field in question and year. A qualitative investigation complements the quantitative analysis. From this, it can be established that even in families that consider themselves as sharing responsibility equally, women do actually make a greater input compared to men, which contributes to the difference in productivity. (30)

In a report from Switzerland, produced by the Swiss National Science Foundation, the authors discuss how researchers are affected in their careers through having children. (13) The authors consider that for researchers to fulfil the requirements for excellence, unlimited commitment is required. Such a requirement favours individuals without children, with a greater negative effect on women in general, as women more often have the main responsibility for children, and more often work part-time.

There are studies that claim that women with children are deselected at recruitment for positions (in this case 'tenure track'), while this does not appear to impact on men with children. Moreover, they also claim that women deselect themselves from academia, as they encounter obstacles related to parenthood. (25)

What role do publication traditions play?

The number of publications a researcher publishes, and how these are recognised, cited, by other researchers is of central importance in several of the processes that affect researchers' chances of having a career. In more or less formalised and expressed terms, it forms an important feature in the assessment of merit, for example in recruitment, and also forms part of many models for allocating direct government funding. Publication-based measures are, in short, a 'currency' for scientific merit and performance.

In the surveys and interviews, we have therefore chosen to ask questions about rules or traditions for who is listed as co-authors of publications and, if so, in what order, whether research students publish together with their supervisors during and/or after receiving their doctoral degree, and what support is offered in conjunction with publication.

Publication rates, sometimes called "publication intensity", vary between researchers for several reasons. It might be due to the subject area, how far the author has come in their career, both in terms of career age and type of employment, but gender has also turned out to be important. Determining which of these factors is or are crucial is difficult, but several studies have shown that in several areas, women publish less than men in the same employment category, at the same career age, and in the same scientific field. As an example, Rørstad and Aksnes show that women's publication volume in such a comparison is between 70 and 80 per cent of men's. (31) Other studies have shown that in life sciences, such differences can explain a large part (60 per cent) of the differences in development from postdoc to independent researcher, and, if consideration is also taken of the extent to which the published research is recognised, a further large part of the differences are explained. (32) (33)

There are also results in literature that indicate that early success in scientific publishing is important for establishing oneself as a researcher and later produce research that is recognised. (34) The opposite, becoming successful at a greater career age and being a 'late bloomer', also appears to be becoming ever more difficult. The importance of collaboration between junior researchers and more experienced ones is highlighted by Broström, for example, who shows that there is a link between the success of supervisors and that of research students/-postdocs. (35) If the supervisor is productive, the junior researchers are as well. It has therefore been interesting to look at whether women and men have the same opportunities to publish with senior researchers, and in particular with their supervisors.

Gender is of importance for the publication rate, even when taking into account that it is higher the higher up in the hierarchy the individuals are: professors publish at a greater rate than postdocs, for example. This is particularly clear in the scientific fields where publications are the result of research collaboration.

(36) The difference between women and men that can be observed at overall level in terms of international research collaboration that results in publications is mostly about women and men being active in different scientific fields. The real differences are between the fields. Within each field, the differences between women and men are small and not statistically significant for the Norwegian researchers included in the study.

3. Women's and men's perception of higher education

This section is based on data from two surveys. One was aimed at persons who had applied for at least one project grant or starting grant from the Swedish Research Council during the period up to eight years after receiving their doctoral degrees, and an open internet survey aimed at persons who had left higher education straight away after receiving their doctoral degrees, or after a period as postdoctoral researchers.⁷ Both surveys were limited to cover persons awarded a doctoral degree between the years 2009 and 2016. Information on the number of respondents, response rate and selection may be found in Appendix 1: Method.

We describe mainly the results from the survey aimed at employees in higher education and, unless otherwise is stated, this is the survey that the description relates to.

Employment conditions and access to research time

Of the persons working in higher education, 72 per cent said that they have permanent employment. The group with the highest number of career years (doctoral degrees 2009 to 2012) are more often permanently employed (79 per cent) than the group with doctoral degrees from 2013 to 2016 (59 per cent.).

Those who have teaching positions or combined teaching and research positions are significantly more often permanently employed (80 percent for women and 73 per cent for men) than those who whose work consists purely of research (45 per cent). When the different fields of research are separated, it emerges that in medicine and health, women are more often permanently employed than men. We can also see that educational sciences, which is teaching-intensive, is fairly unique, given that extremely few individuals are without permanent employment, and this applies to both women and men.

It is more common for women who have purely research positions to be permanently employed, at 48 per cent, compared to 40 per cent of men.

The majority have employment that was advertised in competition

The majority of the respondents (79 per cent) state that their current job was appointed in open competition. A minority (15 per cent) say no, and this

⁷ See the method section for details of the surveys.

includes a slightly higher proportion of women. The remainder state that they do not know.

There are differences between fields of research. Medicine and health has the lowest percentage of respondents who consider that their job was appointed in open competition (75 per cent), while educational sciences has the highest percentage (87 per cent). The differences between fields of research is probably due to the differences in division into employment categories. The individuals employed as researchers state to a lesser extent that their jobs were advertised openly than other employment categories.

The majority combine research and teaching

The majority of women and men combine research and teaching (79 per cent). There are, however, variations between the different fields of research. Natural and engineering sciences, and medicine and health have the highest percentages of doctoral degree holders who combine the two tasks. In educational sciences, slightly more persons state that they only teach, compared to other fields of research. The majority of the respondents want to continue combining research and teaching; slightly more men than women. A smaller group would prefer to focus only on research; slightly more women than men. Very few state that they are interested in only teaching. The differences between fields of research are small.

Research time is unevenly distributed between fields of research

In medicine and health, a large proportion of the respondents state that they spend as much as 81 to 100 per cent of their working hours on research. In natural and engineering sciences, many state that 61 to 80 per cent of their working hours are spent on research. In both cases, the differences between women and men are small.⁸

In humanities and social sciences, women and men spend a smaller proportion of their working hours on research compared to the two above-mentioned fields, and here we can also see a difference between women and men. A larger proportion of the women state that they spend 41 to 60 per cent of their working hours on research, while a larger proportion of the men can be found in the interval 61 to 80 per cent. There are few researchers in these fields of research who spend more than 80 per cent on research, but in the small group that does, there are more men than women.

The lowest proportion of research time can be found among persons working in educational sciences, where the largest group state that they do research during 21 to 40 per cent of their working hours. Very few do research at the same high

⁸ Here, the respondents' reports of their working hours differ from the general picture shown in Figures 14 and 15

level as in medicine and health, that is to say between 81 and 100 per cent. In educational sciences, differences between genders are small.

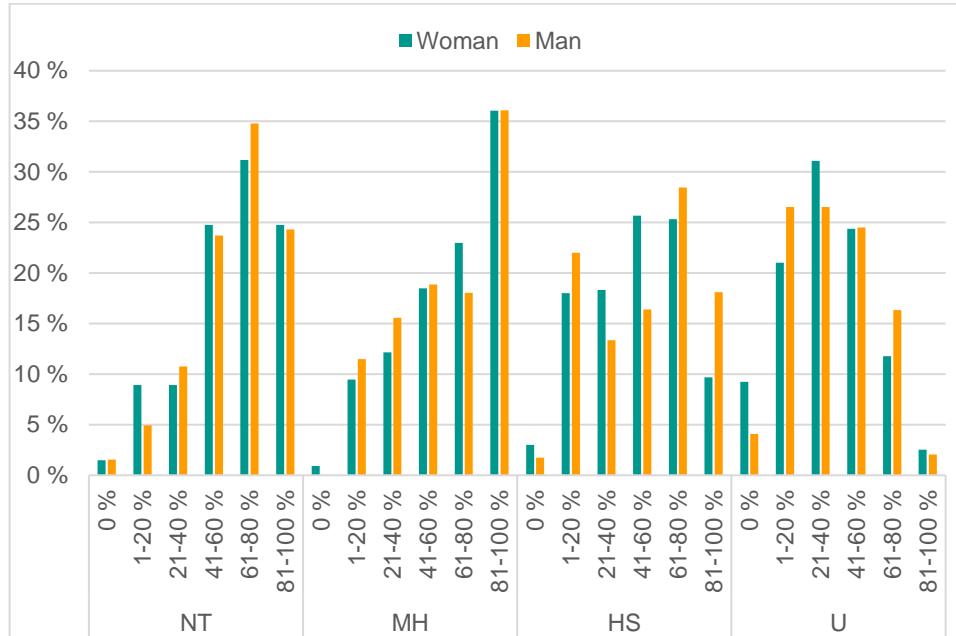


Figure 1 Distribution of research time for women and men in the different fields of research.

External grants give research time

Medicine and health is the subject area where we note the greatest difference between women and men in terms of how research time is funded, and this is also the area where research time is paid for by external funding to a greater extent than other fields of research. 62 per cent of women and 53 per cent of men state that their research time is funded in this way, while 17 per cent of women and 18 per cent of men state that their research time is part of their employment, which is the lowest level for all fields of research. 21 per cent of women and 29 per cent of men state that it is a combination of external funding and part of the employment.

In humanities and social sciences too, it is common for research time to be funded externally, and here too a higher proportion of women state their research time is funded in this way; 53 per cent compared to 48 per cent for men. A higher proportion of women than men state that research time is included in their employment; 27 per cent compared to 21 per cent for women. In natural and engineering sciences, it is common for research time to be externally funded – 47 per cent of the respondents state so – while a small proportion – less than 20 per cent – state that research time is included in their employment. Others state a combination of external grants and research time included in the employment. There are no differences between genders. In educational sciences, only 30 per

cent state that research time is externally funded. The differences between genders are small. In educational sciences, more respondents state that they receive grants via an internal application procedure, which is unusual in other areas.

External research grants are unevenly distributed by subject

No major differences are shown between the numbers of women and men who state that they have received research grants in the capacity as main applicants. However, the numbers vary between fields of research. In medicine and health and in natural and engineering sciences, a majority of the respondents have received an external grant (87 per cent and 83 per cent respectively). The proportion for humanities and social sciences is 74 per cent. Educational sciences has a comparatively low proportion of external grants awarded for the group that responded to the survey (53 per cent).

External research grants are awarded to both women and men

The survey answers show that women have on average received slightly lower grant amounts than men when they have applied for and been awarded external research grants.

We see that slightly more women than men have received larger grants (more than 2 million SEK) in humanities and social sciences, and medicine and health respectively, while a small proportion of women (10 per cent) compared to men (40 per cent) have received comparable amounts in educational sciences.

In humanities and social sciences, women are more often than men participating researchers in other researchers' projects (68 per cent and 55 per cent respectively). Women are participating researchers more often than men also in natural and engineering sciences, and in medicine and health, but here the differences between women and men were smaller.

Men have more time for research

A higher proportion of men who fund their research time using external funding also spend a higher proportion of their working hours on research, compared to women. 67 per cent of men and 58 per cent of women who only receive external funding spend more than 60 per cent of their working hours doing research. A similar pattern can be established for the group that funds its research time from a combination of sources. Here, 53 per cent of men and 33 per cent of women spend more than 60 per cent of their working hours doing research. Even when the research is funded solely within the framework of employment, men are able to spend a larger proportion of their working hours doing research than women can. Of the men who only have research time within their employment, 34 per cent can spend 60 per cent of their working hours doing research, compared to 25 per cent of the women.

We can establish that the group that have more than 60 per cent research time are more often funded externally, while the group that have less than 20 per cent research time more often do the research within the framework of their employment. Those who have a combination of funding forms conduct research during approximately half of their working hours.

Time is also one of the factors that most respondents bring up in the free text sections of the survey as one of the most import preconditions for achieving success as a researcher.

The figure shows how research time is funded, and how large a proportion of working hours that women and men spend on research.



Figure 2 Distribution of research time depending on how it is funded, women and men.

Working conditions and work environment

Just under one quarter work 50 to 60 hours per week

The time worked that the respondents have reported in the survey shows, with a few exceptions, only small differences between women and men. The majority work between 40 and 50 hours per week. Relatively few women and men work part-time, that is to say fewer than 40 hours per week. There are also few who work more than 60 hours per week.

Many women and men work significantly more than the 40 hours per week that constitute normal working hours in Sweden, and almost one quarter state that they work between 50 and 60 hours per week. The difference between women and men is considerable in educational sciences, where 27 per cent of women, compared to 16 per cent of men, state that they work between 50 and 60 hours per week. In other fields of research, there are no major differences between women and men.

In medicine and health, it is slightly more common than in other fields of research for both women and men – but more often men – to work more than 60 hours per week.

In the group that has left higher education, the pattern is similar: the majority worked 40 to 50 hours per week while employed in higher education, while a small group worked even longer hours. The latter group applies more often to men than to women, and this applies for all fields of research.

Many want to leave higher education, and many want to stay

The survey asked the question whether respondents have considered leaving their work in higher education due to failings in the work environment. Around half of those responding to the survey are considering leaving higher education due to problems in the work environment; women more often than men (53 per cent and 44 per cent respectively). The greatest difference between genders is in educational sciences, where 49 per cent of women are considering leaving, compared to 20 per cent of men. In other fields of research, the difference is smaller, around 8 to 10 per cent, but with a higher proportion for women throughout.

The survey also asked whether respondents have considered leaving their work in higher education due to “other factors, such as uncertainty of access to external funding”. 66 per cent responded “yes” to this question. The differences between women and men are small.

At the same time, a majority of both women and men say that they want to continue working with research and teaching in higher education, which might be interpreted as work in higher education still being attractive, despite difficulties linked to work environment and funding.

In the group of doctoral degree holders who have left higher education, we note a difference between women and men. A higher proportion of women than men state problems in the social environment and obstacles relating to parenthood as reasons for why they sought to leave higher education. A larger proportion of women, in particular in medicine and health and in natural and engineering sciences, state that they left to obtain more secure employment, while a larger proportion of men state that they wanted to find other work with higher salaries

and/or more interesting tasks. The second most common answer to the question why the respondent left higher education is that there were neither opportunities for obtaining employment nor access to funding for research. This is also a frequent answer among those who are considering leaving higher education in the group of higher education employees.

Few state that lack of encouragement and feedback would be reasons for leaving higher education, and this applies both to those who remain in higher education and those who have left. In the group that has left higher education, we did, however, note that this response alternative was chosen by more men than women in humanities and social sciences. The opposite applied in natural and engineering sciences; here, more women than men responded that lack of encouragement and feedback were reasons to leave higher education.

Relatively few see mobility is a requirement

Few women and men see international mobility as a requirement. The smallest proportion is in educational sciences (20 per cent), and in humanities and social sciences (21 per cent). Medicine and health is also relatively low (25 per cent), while natural and engineering sciences was the highest (34 per cent). Differences between the answers of women and men are small throughout, with the exception of educational sciences, where men see international mobility as a requirement more often than women (29 per cent for men, 17 per cent for women).

Despite few perceiving international mobility to be a requirement, the responses show that a large proportion of the respondents actually have been internationally mobile. No less than 75 per cent of men and 67 per cent of women state that they have been internationally mobile. The differences between fields of research are small.

In the group that had left higher education, a considerably greater proportion, but equally large for both women and men (50 per cent) state that there was an expectation that they would be internationally mobile. When asked whether they themselves had fulfilled this expectation, around 50 per cent of women and 55 per cent of men state that this is the case. There are no large differences between fields of research.

Power systems can impact on the feeling of belonging

According to our data, the feeling of being or not being part of a community in the workplace may be an effect of gender, as well as of employment category and origin. If the individual is employed as a senior lecturer or professor, and has a Swedish doctoral degree, the probability increases that they will feel part of a community, irrespective of whether the individual is a woman or man.

For groups lower down in the hierarchy we see greater differences between women's and men's feelings of being part of the community; for example, a small proportion (38 per cent) of women employed as postdocs state that they feel part of a community, while just over 60 per cent of men with the same type of employment respond that they feel part of a community.

We note that men more often state that they feel part of a community in the workplace "to some extent". This is not quite as positive as the response alternative "yes", which is more often given by women.

An interesting pattern is that both women and men more often feel that they are not part of a community when the majority of employees is of a different gender than their own. Women consequently feel that they are part of a community in the workplace when there are many women, or when there is an even gender distribution (69 per cent for both alternatives). When men form the majority in the workplace, the proportion of women who answer "yes" to the question of whether they feel part of a community in the workplace falls to 52 per cent. The proportion of positive answers from men is highest (62 per cent) in workplaces where the majority of employees are men. The lowest proportion of positive answers from men (55 per cent) relates to workplaces that have equal numbers of women and men, but differ little from answers relating to workplaces dominated by women (57 per cent). Men with foreign doctoral degrees in environments where women are in the majority have least often answered that they feel part of a community at the department.

Of the group that left higher education, as much as 80 per cent – of both women and men – answer that they felt part of a community during their time in higher education ("yes" or "to some extent"). Many state that the faculty consisted of equal numbers of women and men, but that men dominated among professors and research leaders, according to both women and men. Women working in natural sciences and engineering sciences state that an overwhelming majority of professors and research leaders were men at the departments the women worked at.

More women than men have experienced unfair treatment

Overall, more women (65 per cent) than men (48 per cent) answer that they have experienced unfairness, such as not being invited to events, not being seen, heard, read, or referenced, or that someone else was given or took the credit for work that the respondent was responsible for.

The proportion of women reporting unfairness is largest in humanities and social sciences. 71 per cent of the women in these fields of research state that they have experienced unfairness, followed by natural and engineering sciences (66 per cent), medicine and health (61 per cent) and educational sciences (58 per cent.).

It appears that men who work in scientific fields where there are many men experience less unfairness compared to men working in fields where there are many women. The proportion of men who have experienced unfair treatment is largest among those working in educational sciences (57 per cent), followed by humanities and social sciences (50 per cent), medicine and health (48 per cent) and natural and engineering sciences (44 per cent).

When we compare the answers about perceived unfairness with the answers relating to gender balance at professor/research leader level, it emerges that in environments where men form the majority at professor/research leader level, women experience unfairness considerably more often than men. 47 per cent of men and 71 per cent of women state that they have experienced unfairness in these environments. In environments where women dominate at professor/research leader level, men experience unfairness more often than women, but the differences are not as large. 62 per cent of men state that they have experienced unfairness, while women are slightly lower at 57 per cent. In environments where the genders are balanced at professor/research leader level, more women (54 per cent) answer that they have experienced unfairness, while 46 per cent of men state that they have had such experiences.

In the group that has left higher education, a higher proportion of women than of men state that they have experienced unfairness, most often in natural and engineering sciences, followed by humanities and social sciences (including educational sciences). Via the free text answers, we received information about experienced or observed harassment of various kinds, in particular from persons who had left higher education. Among these, sexual harassment was highlighted, which has also been recognised in other contexts.⁹

Men can more often influence decisions relating to their own work

Women feel, to a lesser extent than men, that they can influence important decisions relating to their work. Women also answer more often that they can influence the decisions “to some extent”, while men more often answer that they can influence the decisions. This is affected neither by the cohort to which they belong, nor which subject area. The same pattern applies for the group that has left higher education.

Difficult to combine parenthood with work in higher education

Around half of the women and men who have children feel that it is difficult combining parenthood with work in higher education, while the other half think that it works well.¹⁰ Women’s and men’s answers do not differ significantly when we analyse higher education as a whole. The differences emerge when we analyse at subject area level, and to some extent also when we compare years of

⁹ See for example the research study on sexual harassment in academia | Karolinska Institutet.

¹⁰ Just over 70 per cent of the respondents state that they have children.

doctoral degree award. The group that received their doctoral degrees between 2009 and 2012 have more often answered that combining work and parenthood works well, compared to the group that received their doctorates during the period 2013 to 2016. In the former cohort, 21 per cent had temporary employment, compared to the latter group, where around 41 per cent had temporary employment, which might contribute to explaining the differences.

Both women and men who are working in higher education feel that combining work and parenthood works less well when the majority of professors and research leaders are men. In total, 56 per cent of women and men state that combining work and parenthood works less well, or even badly, when men hold the majority of the leading positions. When women dominate the leading positions, 47 per cent feel that it works less well, or even badly, to combine work and parenthood, and when the professors and research leaders are equally distributed among women and men, 45 per cent answer in the negative.

Combining work and parenthood seems to work least well for women who are active in natural and engineering sciences. Only 31 per cent answered that combining having children with work in higher education worked well. Men working in the same subject area have a more positive view; 49 per cent state that it has worked well for them.

Among those who have left higher education, there is a small tendency for women in natural and engineering sciences in particular to have deselected higher education in order to obtain a better balance between work and private life. The free text answers of several respondents, in particular women who have left higher education, develop the difficulties of combining doing research with being a parent. Of this group, 20 per cent also answer that they refrained from having children while working in higher education, and that this was related to work.

Women and men active in educational sciences express more often than colleagues active in other fields of research that combining work and parenthood works well; this is the answer of 55 per cent of women and 59 per cent of men. In medicine and health, more women than men state that it works well (55 per cent and 50 per cent respectively), while the opposite applies for humanities and social sciences, where women state less often than men that it works well (43 per cent and 51 per cent respectively).

The majority of women and men (58 per cent), and slightly more men thereof, state that the department or the research team has “definitely” or “to some extent” been affected by the respondent having had a child. More women than men answered “yes, definitely” to this question, but more women also answered “no”.

Many with young children work full time

The majority of the respondents active in higher education work full time while being responsible for young children. Women feel more often than men that the choice of having children has affected their work situation negatively. Among the women and men who worked full time, just under half answered that it worked well (45 per cent and 50 per cent respectively). This is a contrast compared to those who work outside academia. In this group, 85 per cent of women and 90 per cent of men answer that combining work and parenthood works well.

Among those working part time in higher education (40 per cent of women and 30 per cent of men), a higher proportion of the men answered that it worked well, at 56 per cent, compared to 45 per cent of the women. In other words, working part time does not change the experience of women; there are still few who think combining work with responsibility for young children works well.

Of the group that had left higher education and today work in other organisations/industries, part-time work is less common than in higher education. Just under 30 per cent of the women worked part time when they had young children; for men, this was just under 20 per cent. More women than men working outside higher education answered that they would have preferred to work part time (30 per cent, compared to 20 per cent for men). The same applies for the group working in higher education, but the differences between women and men are small.

Success factors

Scientific merit, mentors and luck

Women and men are relatively unanimous in their assessment of what constitutes success factors in higher education: scientific merit is absolutely the most important success factor, followed by access to networks. Small, but interesting differences are the slightly greater importance that men assign to personal characteristics, and that women more often think that it is important to have a mentor. 58 per cent of women state that it is important to have a mentor, compared to 39 per cent of men.

Fewer women than men have access to two of the success factors that women themselves consider to be among the most important for success in higher education: the opportunity to gain scientific merit, and access to a mentor. When it comes to scientific merit, just over 15 percentage points divide women and men, to men's advantage. When it comes to mentors, the difference is smaller at 6 percentage points, but again to men's advantage. When it comes to access to mentors, a connection can be seen with the gender balance among professors and research leaders. When women form the majority, or when the gender

distribution is even among research leaders/professors, around 30 per cent of both women and men state that they have access to mentors. In environments where men hold the majority of the leading positions, a lower proportion of women (23 per cent) compared to men (36 per cent) state that they have access to mentors.

Of the group that has left higher education, relatively few individuals, both women and men, but fewer women, state that they had the opportunity to gain merit via scientific publishing. More men than women state that they had access to a mentor; the difference amounts to 15 percentage points.

Among those working in higher education, women and men feel to around the same extent that they have the personal characteristics that are required for success, apart from the ability to cooperate, where women to a greater extent than men think that they have this characteristic (73 per cent compared to 61 per cent). Among those who have left higher education, both women and men consider that they have this ability to about the same extent.

One success factor that was not included in the response alternatives, but that several highlight in the free text answers, is luck. It is not just about luck in terms of getting approval for an application for research funding. It can also be about the timing being right when employment positions are advertised, or the researcher having made early and lucky choices relating to focus in the scientific field, or even the composition or functioning of the faculty. Several also highlight the importance of playing the game that is required to achieve success. Those who are strategic when making various choices achieve success. This can, for example, be about being careful not to take on tasks that do not “pay”, such as carrying out what is sometimes summarised as ‘academic housekeeping’. Not least is it important to have access to the time that we established above, and is unequally divided up between different scientific fields.

The majority have networks

Nearly all, 87 per cent of women and 91 per cent of men, state that they have been able to develop networks. Most reply that both colleagues on the same academic level as themselves, and persons in superior positions, are part of these networks (that is to say: the networks are both horizontal and vertical), while one quarter answer that only colleagues on the same level as themselves are part of the network (horizontal networks). A few respond that their networks are primarily vertical. In the group that have left higher education, we note that fewer consider that they had access to networks in higher education, and this applies to both women and men. Those who still had networks state that these included both persons higher up in the hierarchies, and colleagues with similar employment and work tasks. The differences between women and men are small.

Support for publication

The variation between fields of research is large when it comes to women and men receiving support from their departments for publishing. The pattern is that all fields of research state a slightly lower proportion of women who have received such support compared to men. This applies both for the group of persons who are active in higher education today, and for the group that has left higher education.¹¹

Educational sciences has significantly higher proportions of both women and men who state that they have received support with publication compared to other fields of research, at the same time as the greatest difference between women and men can be found there. 48 per cent of women and 57 per cent of men state that they have received some form of support from their departments. In other fields of research, the difference is around 5 percentage points between women and men, to men's advantage.

Both women and men have published with their supervisor

In natural and engineering sciences, and medicine and health respectively, more than 90 per cent have published articles together with their supervisors during their time as research students. The same pattern can be found in the group that has left higher education, but the proportion is slightly smaller, 80 per cent. The differences between women and men are small in each subject area, with the exception of educational sciences, where more men than women who are currently active in higher education have published together with their supervisors. In humanities and social sciences, between 30 and 40 per cent have published articles together with their supervisors.

Both women and men receive support to apply for research grants

A majority of the respondents (57 per cent) said that they had received some form of support from their HEI to help them apply for external funding. There are no major differences between genders, nor between fields of research. Around 15 per cent had been obstructed from applying for a grant, the same percentage for women and men.

Of the group that had left higher education, a larger proportion of women (around 50 per cent) than men (around 40 per cent) state that they had been encouraged to apply for research grants; and this applies for all fields of research. Here too, a smaller proportion state that they had been refused permission to apply for research grants. The difference between women and men is small.

¹¹The question was worded: Have you received support from your department/responding when publishing (for example advice about where to publish, time set aside to finish writing an article/responding, or language checking)?

Women are more often critical of how the author order is applied

In all fields of research, more women than men active in higher education say that they do not think that the principles applied for how author names shall be ranked on publications work well and are fair. The differences between women's and men's perceptions of this are greatest in humanities and social sciences, where 10 percentage points divide the genders, and in educational sciences, where the gap is 14 percentage points.

In the group that has left higher education, the difference between women and men is small. It is worth noting that many women and men with doctoral degrees in humanities and social sciences answer "don't know" to the question of whether the principles applied for how author names shall be ranked on publication work well and are fair.

4. Department heads' perceptions of women's and men's preconditions for conducting research

This section summarises the nine interviews carried out with representatives of departments in all fields of research. Please see the method section for details of the implementation of the interview study. The results have been grouped thematically around central questions. We refer throughout to “department head”, even if persons with other functions also participated at the same interview occasion.

Critical period after postdoctoral employment

At several departments, primarily in natural sciences, engineering sciences and basic medical sciences, a postdoctoral period at another HEI, primarily abroad, is a necessity, in the opinion of the majority of the department heads interviewed. The extent to which individuals then return to the original HEI varies between HEIs.

One department head considers that there are differences between genders in terms of going abroad for a postdoctoral period. The department head believes that women are less internationally mobile, as they prioritise private life ahead of their careers, which the department head regretted. Our interpretation of the department culture, as expressed in the interview, was that in the competitive situation that prevails for employment and research grants, researchers must prioritise their work and their careers more than their private lives, if they wish to continue working as researchers.

The period after the conclusion of a postdoctoral period is described by several department heads as a critical period. It is an intensive phase, where junior researchers must gain teaching merits, gain merit in research terms, and establish themselves as independent researchers in order to be awarded research grants. There are fewer permanent positions than there are researchers, as one department head expressed it, and competition is fierce.

Associate senior lecturership – unachievable for many

The typical career path after the postdoctoral period appears to go via researcher employment at the research-intensive departments where the department heads we interviewed work. Junior researchers are expected to continuously apply for external research funding. Many departments talk of two – sometimes three – different career paths, where the ‘tenure track’ of associate senior lecturer –

senior lecturer – professor was described by one department head as a “classic super-career”.¹² It emerges from the interviews that this career path is not open to most, as the number of associate senior lecturerships in general is small.

Instead, the usual path is various researcher employments, often funded within the framework for other researchers’ external grants, until the researcher is awarded a research grant as project leader. Once the researcher has been awarded an external research grant, they often get researcher employment where the salary is funded by their own grant.

There is thus a difference between researcher employment and the teacher employment positions of associate senior lecturer, senior lecturer and professor, in particular as there is no opportunity for promotion from employment as a researcher. One department in fact spelt it out as a ‘dead end’. A few HEIs have incorporated researcher employment as a career path in their employment systems, but most have not done so.¹³

The department head of at least one department regrets that they were unable to employ those who had received starting grants from the Swedish Research Council as associate senior lecturers, as usually more years have passed since they were awarded their doctorates than the five years that apply for being able to be considered for such employment. Another department head underlines that five years is too short a time for a researcher to be able to gain sufficient merit for an associate senior lectureship. The same department, where women are a minority, underlines the importance of associate senior lecturerships for women, as they are transparent and predictable in relation to the terms and conditions that apply for being considered for promotion to senior lecturer.

A third career path that is sometimes mentioned in the interviews is that persons who are important for the operation in various ways are employed as technical or administrative personnel. This is more common in fields that involve a lot of experimental activities and infrastructure that require knowledgeable personnel to operate, but is also used in other areas. The strong dependency on external funding and the difficulty of not being able to offer a clear career path are often highlighted, and are a reason why many researchers leave higher education, in the view of several department heads. They do, however, establish that there is no immediate difference between women and men in this respect. One department was working on a strategic plan for the department, to provide better opportunities for junior researchers to plan their careers. At several interviews,

¹² There is no direct Swedish translation of the concept of ‘tenure track’, but it can be explained as a career path consisting of (one) time-limited employment(s), where the employee is continually evaluated, and where the career path eventually leads to tenure, that is to say, permanent employment. (SOU2016:29)

¹³ The latter information is taken from Mats Ericson: *Unga forskare utan karta går vilse i karriären* in Universitetsläraren 2021/3

the department head mentioned the difficulty of navigating the Swedish system for junior researchers who had come here from other countries.

Slightly inconsistently, it seems to be relatively rare for departments to be in a position where they need to terminate somebody's employment due to lack of funding. Perhaps researchers leave higher education at an earlier stage through active choices, rather than waiting until the lack of funding becomes acute?

Some departments used informal sponsorship systems, where a researcher who temporarily lacked external funding could be funded via a colleague's grant. A relevant question in this context is whether the latter assumes information networks that some, but not all, have access to.

For departments that teach, it is sometimes a possible solution for junior researchers to work as locum lecturers, which can be a double-edged sword. On the one hand, the teaching gives merits that can be useful, but on the other hand several describe teaching as time-consuming, and that it risks making it difficult for the individual to write new applications for research grants.

None of the department heads interviewed could see any difference between women and men in terms of attitude towards the employment forms and circumstances that apply. On the other hand, several of them underlined that it is a very competitive operation, and that those who begin a research career are well aware of the conditions that prevail.

Physicians and other healthcare employees

In medicine and health, the department heads interviewed describe how the career paths and career opportunities for physicians do not follow a higher education career, as physicians who have gained a doctoral degree are primarily employed in health and medical care, but that they retain a connection to their department. Here, the ALF funding¹⁴ is described as important for enabling junior researcher to gain merit for continued research, and later to apply for funding from external funding bodies, such as the Swedish Research Council. Later on, there are opportunities for researching physicians to apply for a joint teaching post, with options to combine employment in higher education as a senior lecturer or professor with clinical work. This is described as an attractive career goal by several department heads. The department head we interviewed could not see any difference in attitude between women and men.

There are few opportunities for doctoral degree holders with medium-length healthcare education, such as nurses, to conduct research. This is described by one department head as a gender equality problem, as this group with little access to research resources primarily consists of women. Following a doctoral

¹⁴ The ALF agreement regulates the amount of government funds that is paid to the regions for collaborating in the education of physicians, carrying out clinical research and developing health and medical care.

degree, there are two choices: either to return to clinical work, which provides limited opportunities for research, or employment in higher education, which primarily focuses on teaching. There should be employment that enables a combination of clinical work and research for this professional category too, the department head considers.

At two male-dominated departments in natural and engineering sciences, the department heads stated that they experienced a ‘leakage’ of women during the course of their research careers. At one of the HEIs, they had tried to conduct a follow-up study to investigate the underlying causes of this, but for various reasons it had not been possible to complete the study. At other HEIs, interviews were also carried out with persons leaving higher education, but these had not led to any action.

Preparedness to counteract skewed recruitment exists in some places

The interviews with the department heads showed that when they recruit persons to be members of a research team, there is sometimes someone already working at the department who is considered suitable for the task. There is no information for how these processes impact on women and men at the departments in question, but previous studies have found that informal processes often benefit men.

A couple of departments pointed out that international recruitment may impact negatively on gender balance, as more men apply for positions internationally. Others consider that there are not fewer women than men who apply when positions are advertised internationally. The differences can probably be explained as being due to different scientific fields being involved, with differing gender balances.

One department in a scientific field with few women emphasised that they have set structures to ensure that women applicants are not deselected in the recruitment processes as a result of prejudice. This is done at faculty level. In the first step, when justification for the recruitment is made, the question always asked is whether there are women who can apply. The reviewers are also informed that gender must not influence the assessment, and that when the merits are otherwise equal, the under-represented gender shall be prioritised. Teaching is an important merit for senior lecturerships, as many new students are enrolled for the courses every year. One way of increasing the number of women applicants is to seek out individuals, and encourage them to make an application, the department head says. Even so, few women still apply for the position. Sometimes they then discuss whether to re-advertise the position.

Working conditions and work environment

Many work long hours

In many cases, and perhaps particularly in medicine and health and in natural and engineering sciences, the interviews indicate that many researchers work long hours. According to the department heads, this is because research is competitive.

Some think that the norms have changed, and that researchers today do not work as hard as before: Working hours have been normalised in research, one department head thought, who did not see any great difference between women and men. At the same time, the department head problematised the reduced input: they asked whether it is possible to be competitive internationally for those who work 40 hours per week.

Few department heads know how many hours researchers work, but one emphasised that the department had developed a culture where it is normal to take parental leave and holidays. One of the department heads referred to an employee survey, which showed that the majority work 40 hours per week, but was unsure whether the employees had answered truthfully. The sub-text is that the department head believed that many worked more than they wanted to admit to. During employee reviews, it is standard to bring up this issue, and the department head warns researchers during the review of the possible consequences of working too much. The personnel department also uses its channels to warn about this, according to the department head.

Employee reviews and networks

It emerged from the interviews that the departments in question conduct regular employee reviews, where the individual's development is discussed and followed up.

Several department heads stated in the interviews that they consider networks to be important, but only one said that there is some form of system for introducing junior researchers to the networks of senior researchers. In other cases, department heads refer to membership of the HEI's or the faculty's internal network for junior researchers with doctoral degrees.

One department head claimed to be aware that men have had greater opportunities to become part of the networks, but that male professors, on the other hand, have been keen to specifically introduce women to their networks. Two of the departments had female networks, aimed at making it possible for women to support each other in their careers.

Many provide support when applying for external funding

In the interviews, several department heads state that they support researchers to enable them to apply for external funding, but the departments have more or less detailed ways of doing so, and one expressed, as a reminder to themselves, that this could or should be systematised to a greater degree. Some stated that their department provides both administrative support and support from senior researchers who read the application. Some give increased research time to those whose applications have been given high marks, but have not been awarded funding. Some use faculty funds to keep an externally funded researcher employed for a period, despite the grant being spent, so that they can write a new application. One or two departments provide no support at all. We cannot state, from the information provided by the department heads, whether there are general differences between the support given to women and the support given to men.

Gender equality – is it always about women?

At another department, gender equality seems to be considered as an issue of women's representation, not of under-represented gender. At this particular department, women have been dominant at professor level since a few years back, and are so today to an even greater extent following an initiative by the HEI: The vice-chancellor offered the departments to advertise funding for visiting professorships, primarily for the purpose of increasing internationalisation, but if the under-represented gender was recruited, the vice-chancellor would pay all, or the majority of, the costs. The department recruited four persons for the visiting professorships, of which three are women. This means that women's dominance among professors increased yet further at the department.

Departments lack tools for working on gender equality

The interviews with the department heads show that there are those who have developed tools for creating an environment where both women and men feel included and have the same opportunities. At the same time, several appear to feel that they are lacking the right tools.

At one department, which generally gave the impression of having had good experiences of working with gender equality, the junior researchers said that they lacked female role models at professor level; a view that the department head sympathised with. The solution was that the department used faculty funding and, following the usual expert review of applicants for a senior lectureship, employed two of the highest ranked, who were both women (the advertisement was initially for one senior lectureship, not two). The department expects these two to be promoted to professor in the near future, and is also providing support to make this possible.

There are also departments that have identified a gender equality problem, but feel that they are lacking tools to work with the issue. One department head described themselves as “at a loss”. Various conceivable solutions were mentioned during the interview, but the worry that other researchers could perceive support for an under-represented group as unfair was such a major obstacle that the department head stayed passive. One principle that the faculty uses was mentioned, however, namely that senior positions are not advertised when there are not potential applications of both genders.

One department head told us that women are listed as first names on publications, and that the department encourages women to apply for promotion to docent/associate professor and professor, as the department head has the idea that women with the right competence for unknown reasons wait longer than men with their applications.

Difficult combining research with having children

The interview with one of the department heads confirmed the responses we received in our surveys, which show that combining work and parenthood works less well for women who are active in natural and engineering sciences. One department head said that several women had been off sick with symptoms of stress. It is clear that the department head considers that the problem is not about any possible failings on the part of the individuals, but about the departmental and subject area culture, where everyone works hard to compete in what is felt to be a tough competitive situation. Another interview in the same subject area did not express any similar difficulties, which might be due to there not being similar problems there, or that the problem exists but has not been recognised.

In other fields of research the situation is not so problematic, according to the interviews, but at the same time, several say that women and men work long hours every week during the same period as they form families and have children. Here, we can surmise an attitude that says the problem can only be solved by the individuals themselves, as the department must adapt to the prevailing culture, and this is, once again, a competitive situation. Some department heads claimed to know that doctoral degree holders had left the department in conjunction with having children, which can perhaps be classified as a form of individual solution to the problem.

The fact that staff members need to collect children from pre-school is legitimate, and several departments time meetings so that all, including those with small children, can take part. Many department heads choose to mention this in particular as an expression of a form of consideration for those who have children. Some do not adapt meeting times to suit collection from pre-school, but say that it is accepted that those who need to collect children do not take part in the meeting. At the same time, one department head in natural and engineering sciences said, slightly regretfully, that those who do not understand

that they need to work into the evenings with reading and writing articles will not succeed in the competition.

Scientific publication

Are transparent rules used for author order?

We do not have any information from the interviews with the department heads that indicate there are differences between women and men in relation to co-publication with supervisors during third cycle education; a form of publication that can favour future careers according to previous studies. In some cases, there are mandatory regulations that ensure equal terms for all: one department stated that it is a requirement from the third cycle higher education board that one of the supervisors must be included in the articles in order for these to be used in a thesis. In other cases it is considered to be part of third cycle education: you learn a lot from publishing together with a senior researcher, but it is not mandatory, and they do not follow up who uses this opportunity.

How the rules relating to author order are applied varies between departments, as they in part represent different fields of research. One interview referred to the journals' regulations, another referred to the Vancouver rules. The latter were formulated to develop the issue of scientific authorship, and a quick search on the internet show that several HEIs have information on their websites about the Vancouver rules, even if they were not mentioned during the interview.¹⁵

Conflicts relating to publication do occur

Four of the nine department heads we interviewed state that conflicts in conjunction with publication do occur, and one of them state that conflicts are frequent, often relating to publications where several HEIs are involved. The conflicts have had negative consequences, in particular for junior researchers. The respondents mention effects such as collaborations and careers ending, for example when an external research team publish the results of a research collaboration, but do not include the name of a junior researcher as author, despite them having participated in the work.

The majority of the department heads we interviewed, however, state that there are no conflicts relating to publication, or that in any case they are not aware of any. The differences may be due to the publication culture (some publication cultures can more often entail conflict than others), or that conflicts exist, but do not become known to the department management. One department head thinks that conflicts relating to publication often do not become known, as the researchers are afraid of reprisals. Another reason why conflicts relating to publication do not become known to the department management may be that

the conflicts are solved by the research leaders, one respondent said. One department head pointed out that a course in ethics is part of third cycle education, and includes this aspect, but they also stated that this theme is not discussed at department level, which probably can contribute to conflicts remaining unknown.

5. Women's and men's careers are fairly similar – within fields of research

This chapter describes the results of a study where we followed four cohorts of doctoral degree holders and investigated their employment for each year after their doctoral degree award. First, we highlight the proportion that left higher education straight after their doctoral degree award. Thereafter we investigate the extent to which women and men leave higher education after having begun an academic career. In the next step, we describe how academic careers develop for women and men in the different fields of research. We thereafter look more closely at what happens after employment as research associate/associate senior lecturer, and after employment as senior lecturer, as well as before the employment as professor, to investigate whether there are any differences between women and men.

Finally, the chapter includes a corresponding analysis of employment of cohorts of researchers who have applied for funding from the Swedish Research Council during the first few years after their doctoral degree award. We compare women and men, and also whether there are any differences between those whose applications were either approved or rejected.

The cohorts studied cover persons who were awarded their doctoral degrees in the years 1998–1999 (designated 9899), the years 2002–2003 (designated 0203), the years 2006–2007 (designated 0607), and 2010–2011 (designated 1011). For a more detailed description of the cohorts, please see the method section in the appendix.

Women and men who leave higher education

A higher proportion of women than men begin a career in higher education

The majority of all persons awarded a doctoral degree leave Swedish higher education after the award, and continue their professional careers in other sectors of society, or in other countries. A higher proportion of men than women leave higher education straight after their doctoral degrees, and on average 33 per cent of the women in a cohort are active in higher education for two years after their doctoral degrees, compared to 28 per cent of the men.

In natural sciences, in engineering sciences and in medicine and health, only just over 20 per cent of the doctoral degree holders continue straight on to a career in higher education. Those in medicine and health who have physician education

continue to an even smaller extent in higher education than persons in the subject area in general. The vast majority of them are instead employed in health and medical care, but many conduct research in collaboration with higher education. Among those with healthcare education, a slightly higher proportion, just over 30 per cent, continue in higher education. In social sciences and in humanities, around half of the doctoral degree holders have employment in higher education two years after their doctoral degrees.

In several fields of research, such as natural sciences, engineering sciences, for persons with physician education in medicine, and in humanities, there is no major difference between women and men. In social sciences, a higher proportion of women continue in higher education compared to men; the difference is almost ten per cent, and applies for all cohorts. In medicine, among those with first cycle qualifications in basic medical sciences, a slightly higher proportion of women with doctoral degrees also continue to employment in higher education.

Swedish higher education has seen an increasing number of immigrant doctoral students during their years of study. In the oldest cohort, immigrant doctoral students constituted 14 per cent of all doctoral degree holders, while in the youngest cohort they represented 23 per cent. The majority of the immigrant doctoral students are men, which is partly due to the fact that they are primarily found in fields of research that have a high proportion of men. For example, immigrant doctoral students represented 29 per cent of all doctoral students in natural sciences, and 33 per cent in engineering sciences in the 1011 cohort. The gender distribution among immigrant doctoral students in these two fields of research reflects largely that among Swedish doctoral students (see Table 5 in the method appendix). The immigrant doctoral students leave Swedish higher education to a greater extent than Swedish doctoral students do. On average for all four cohorts, 86 per cent of the immigrant doctoral students, with equal numbers for women and men, left Swedish higher education two years after their doctoral degree awards. If the figures are analysed for only Swedish doctoral students, a slightly higher proportion remain in higher education, but the overall pattern that a higher proportion of women than men work in higher education two years after their doctoral degree awards remains, as do the differences between women and men that have been described above.

Do researchers and teachers leave higher education after starting research careers?

The general trend is that the proportion of a cohort that is active in higher education first increases slightly during the first few years after the doctoral degree award, and then starts to decrease. The figure below shows, for each cohort studied, the proportion of women and men that are active in higher education compared to outside higher education for the years the cohort could be followed. The proportion of persons active in higher education appears to

decrease slightly more among women than among men.¹⁶ At the same time, a higher proportion of women are active in higher education to begin with.

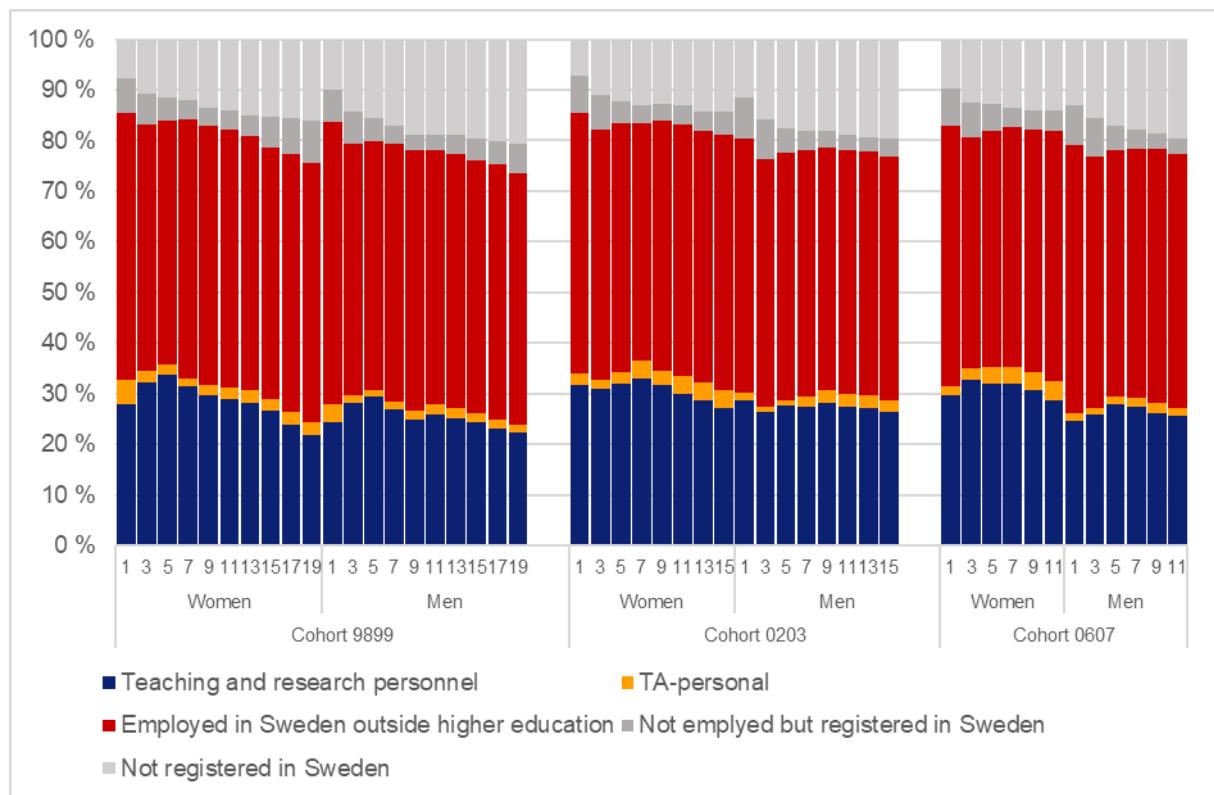


Figure 3 Occupation of female and male doctoral degree holders, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish Research Council.

Higher education personnel varies with the economic cycle

For several of the cohorts, the proportion of doctoral degree holders who are employed in higher education first increases, and then begins to decrease. We interpret the initial increase as returning postdocs, and possibly persons on parental leave who return to work. The reduction in the number of employees in higher education occurs at a differing number of years after the doctoral degree award, and coincides with periods of good economic outlook in society and lower unemployment levels. The economic cycle appears to influence whether doctoral degree holders choose to return to higher education, for example after a postdoc visit abroad, and also the choice of leaving higher education for activities in other societal sectors.

¹⁶ This is supported by the conclusions in (39), which establish that mobility from higher education to other societal sectors is low among higher education personnel with doctoral degrees, but that a slightly higher proportion of women than men leave higher education.

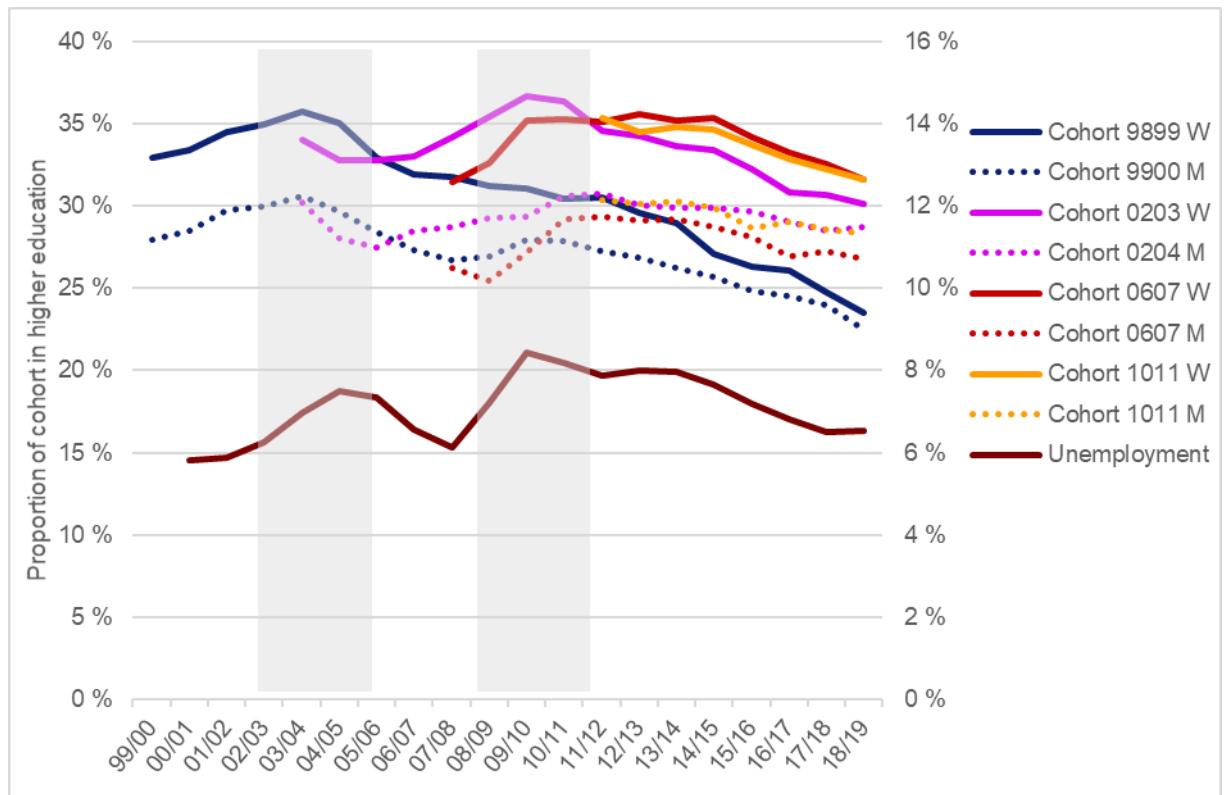


Figure 4 Percentage of a cohort that is employed in higher education in two-year intervals (left axis) and percentage unemployment in Sweden (right axis). The grey fields denote periods with increased unemployment. Source: Statistics Sweden, calculations: The Swedish Research Council.

High unemployment during the years following the IT crash (2000–2005) is reflected in the 9899 cohort, as an increased proportion were active in higher education up until around 2004/2005, when the proportion begins to decrease, at the same time as unemployment is falling. Later on, we can see clear signs of the financial crisis in 2008 and the subsequent recession with unemployment as a consequence, in all the three cohorts 9899, 0203 and 0607. The 1011 cohort received their doctoral degrees at the same time as the economy recovered, and this can be seen in a continuous net outflow from higher education. The changes are the same for women and men.

Women leave higher education to a slightly greater extent than men, partly due to old-age retirement

As we established, both women and men leave higher education after having started a research career. In the two oldest cohorts, it is clear that women leave to a greater extent than men. However, women are on average two years older than men when they are awarded their doctoral degrees, and therefore reach retirement age sooner than men do. This can be seen in the 9899 cohort, as the proportion of women who are active in other societal sectors does not increase at

a corresponding rate. A large proportion of the women who leave higher education in this cohort have therefore probably retired. In the 0203 cohort, a higher proportion of women than men are also leaving higher education. Here too, the majority of this outflow can be explained by women having a higher biological age when awarded their doctoral degrees, and therefore retiring after fewer years in higher education compared to men. Even when taking this into account, there is still a slightly higher proportion of women than men who were awarded doctoral degrees in 2002 and 2003 who have left higher education for activities in other societal sectors.

For the 0607 and 1011 cohorts, old age retirement does not contribute to the outflow from higher education. For the 0607 cohort, there is no significant difference between genders in terms of how many leave higher education, while for the 1011 cohort, there is a slightly higher outflow of women than men.

Women and men leave higher education to the same extent in several fields of research

What we have established above, that a larger proportion of female doctoral degree holders than male doctoral degree holders start a career in higher education, and then gradually leave to a slightly greater extent, varies between cohorts, as we have seen, but there is also a difference between fields of research. A higher proportion of women than men leave higher education in social sciences and natural sciences. Within the latter field, a higher proportion of women also have technical and administrative employment compared to men. In engineering sciences, a higher proportion of men leave higher education. The pattern is the same, both for the doctoral degree holders who came to Sweden for the purpose of getting a doctoral degree, and for Swedish doctoral students. It can therefore be excluded that this should apply primarily to immigrant doctoral students who return abroad. No differences between genders can be established for humanities.

In medicine and health, there is a very large difference in how careers develop after doctoral degree awards, depending on the type of first cycle education the person has. Among those with first cycle education focused on basic medical sciences, a higher proportion of women than men leave higher education after having started a career in academia than among those who have complete professional courses in health and medical care. This applies for all the doctoral degree holder cohorts we studied. Of this group, a relatively high proportion has no occupation in Sweden, and the proportion that cannot be found in the population register increases over time. We interpret this as meaning that many of the researchers focusing on basic medical sciences are internationally mobile, and leave Sweden either permanently or during shorter periods. A higher proportion of men than women have left Sweden, and this also applies when taking immigrant doctoral students into account.

Those with physician education are to a great extent employed in health and medical care, often with some form of link to higher education. A small increase over time can be noted for employees in higher education with physician education. This is because the teaching positions senior lecturer and professor are available as combination employment between higher education and healthcare. Earlier on in their careers, it is common for researching physicians to have their main employment in healthcare. We have not noted any significant difference between women and men.

For persons with healthcare education, around 30 to 40 per cent are employed in higher education in the two oldest cohorts, and then increases to around 50 per cent for the two younger cohorts. It is difficult to draw any firm conclusions about the differences between women and men, as the number of men is small. It can, however, be established that women appear to leave higher education in order to work in other sectors, and also to retire, in particular the oldest cohort. Appendix 2 has supplementary figures, divided up per subject area.

Slightly more women leave higher education after employment as senior lecturer

The study has also looked in depth at where those go who leave an associate senior lecturership, or a senior lecturership. Using register data, we investigate what employment persons had the year after they ended their employment as associate senior lecturer (or research associate) and senior lecturer respectively. The intention here was to investigate whether there are any clear differences between women and men.

Of those who begin career development employment as a research associate/associate senior lecturer, around 25 per cent leave higher education. There is no difference between women and men. Those who have been employed as senior lecturer also mainly continue in higher education, but we can see a slightly larger proportion of women than men who leave higher education. See the figures below. The difference between genders appears primarily in social sciences and in medicine and health (for persons with first cycle higher education in basic medical sciences) and in natural sciences.

Careers of women and men in higher education

The cohort study shows that the careers of women and men in higher education develop relatively similarly. There is one difference that cuts through fields of research and cohorts, however, and that is that it takes longer for women than for men to become employed as professors. We cannot say for sure that an equal share of the women in a cohort as the men in that cohort will become employed as professors.

The figure below shows how the academic careers developed for those in the 9899 cohort who are employed in higher education. This is the cohort that we have been able to follow the longest time, 20 years. Appendix 2 includes figures that describe all the cohorts and fields of research.

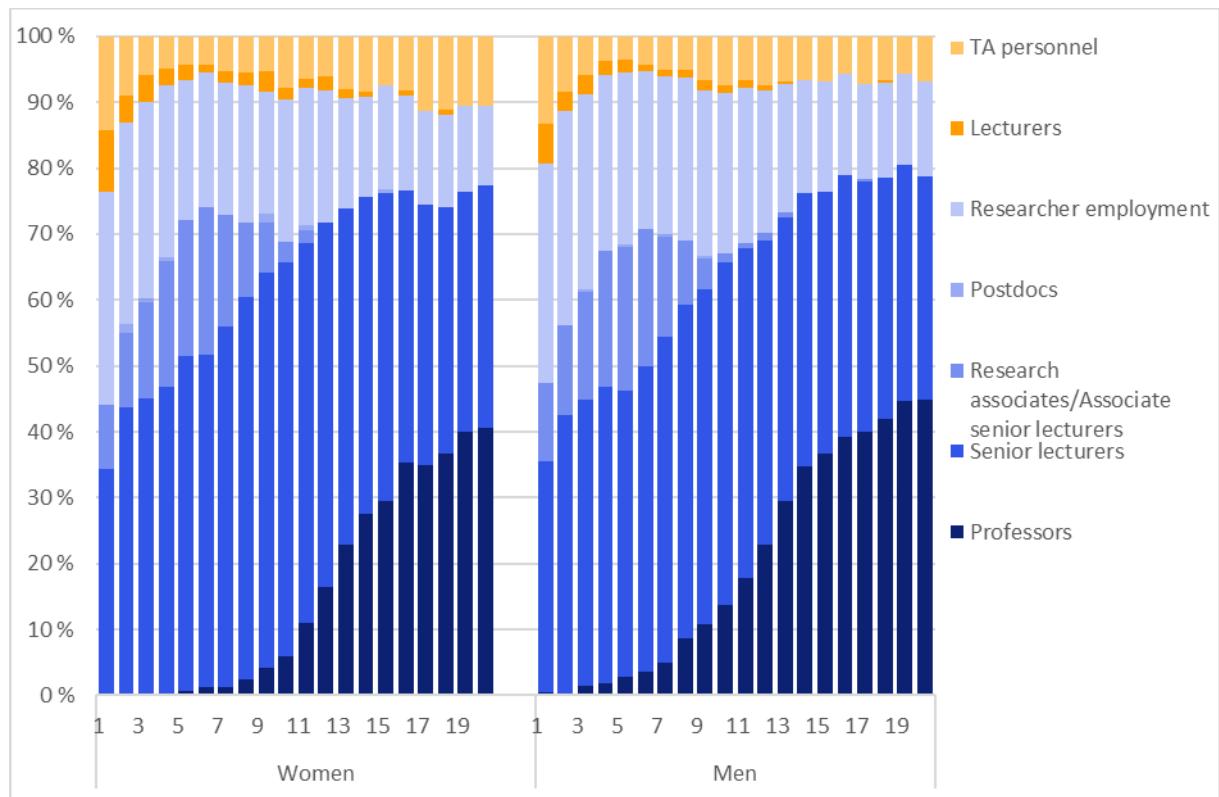


Figure 5 Cohort 9899, relative distribution of employment categories for each year after doctoral degree award for persons employed in higher education. Women (left) and men (right). This figure includes persons with a foreign doctoral degree.

Source: Statistics Sweden.

The most common employment categories during the first few years after doctoral degree awards are senior lecturer and research appointments. The proportion of research appointments then fell slowly with increased career age, while the proportion employed as senior lecturers increased, up to around ten years after doctoral degree award. At that time, the employment form ‘postdoctor’ did not exist. The career development position at that time was called ‘research associate’, and a fairly low proportion of the cohort had this type of employment. Around 20 per cent of women and 25 per cent of men were employed as research associates, which occurred around five to six years after their doctoral degree awards. The difference between genders arose primarily through the employment form being used to differing extents in different fields of research, at the same time as the distribution of women and men differs between fields of research. Natural and engineering sciences had many career development employees, and in these areas the proportion of women is low,

while there are fewer career development employees in humanities and social sciences, both areas with a higher proportion of women.

The proportion of women with doctoral degrees who have such employment with technical or administrative tasks is slightly higher than the proportion of men. Towards the end of the period studied, around 20 years after the doctoral degree award, this accounts for around ten per cent of women and around six per cent of men.

The proportion of professors increases gradually, but slower for women than for men. Twelve years after the doctoral degree award, around 16 per cent of women are employed as professors, while 23 per cent of the men have reached this position. Twenty years after the doctoral degree award, the difference is slightly smaller: 40 per cent of women and 45 per cent of men are employed as professors.

Women's and men's careers in the different fields of research

An overarching conclusion from the cohort study is that the differences in terms of how a researcher's/teacher's career develops in higher education are greater between fields of research than the differences between women and men within the different fields of research. One difference between genders that prevails within most fields of research, however, is that a lower proportion of women are employed as professors at a given time after their doctoral degree awards. The study provides no definite answer to whether women catch up later during their research careers, or if the lower proportion of women in higher education who are employed as professors remains throughout their careers. It is only the oldest cohort, 9899, that we have been able to follow for a long enough time for the proportion of the cohort that is employed as professors to begin to even out. In social sciences, the number of professors who are women also begins to decrease, due to old age retirement. The total number of women in the cohort who were employed as professors 20 years after their doctoral degree awards amounted to 145, while the total number of men was 297. It is therefore important to remember that, even if the proportion of women and men who are employed as professors are relatively similar, the number of women in the cohort who are professors is less than half the number of men who are.

Appendix 2 has supplementary figures showing how women's and men's careers in higher education have developed in the different fields of research.

It takes longer for women to become professors

Despite a higher proportion of women than men in a doctoral degree cohort continue to work in higher education, a lower proportion of women than men are employed as professors. It also turns out that it takes longer to become a professor for the later doctoral degree cohorts, for both women and men.

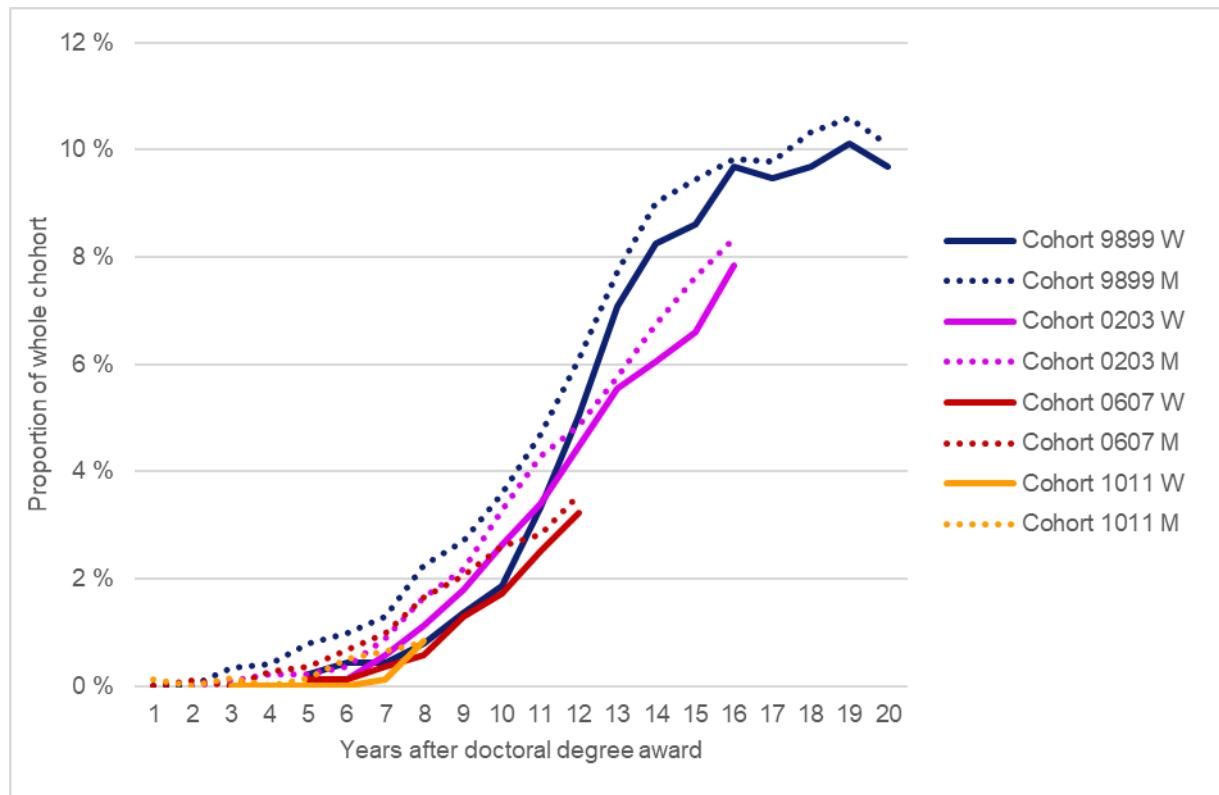


Figure 6 Proportion of women and men in the four cohorts who are employed as professors for each year after their doctoral degree awards. Source: Statistics Sweden, calculations: The Swedish Research Council.

Career paths in higher education

We have already established that the differences between women and men are small, but that in most fields of research, a lower proportion of women are employed as professors. It is therefore interesting to investigate whether there are any significant differences between women and men in their routes to this employment.

In this section, we look at the employment the year after a person has had career development employment as a research associate or associate senior lecturer, and what employment the person has the year after employment as a senior lecturer. Finally, we look at whether there are differences between the employment women and men had the year before they were employed as professors. The data covers the doctoral degree award years 1997–2008.

After career development employment

The figure below shows the employment the year after the person had career development employment for all the yearly cohorts studied in total, divided up

by subject area. Approximately the same proportion of women and men continued to employment as senior lecturers and researchers. The size of this proportion varies between fields of research, however.

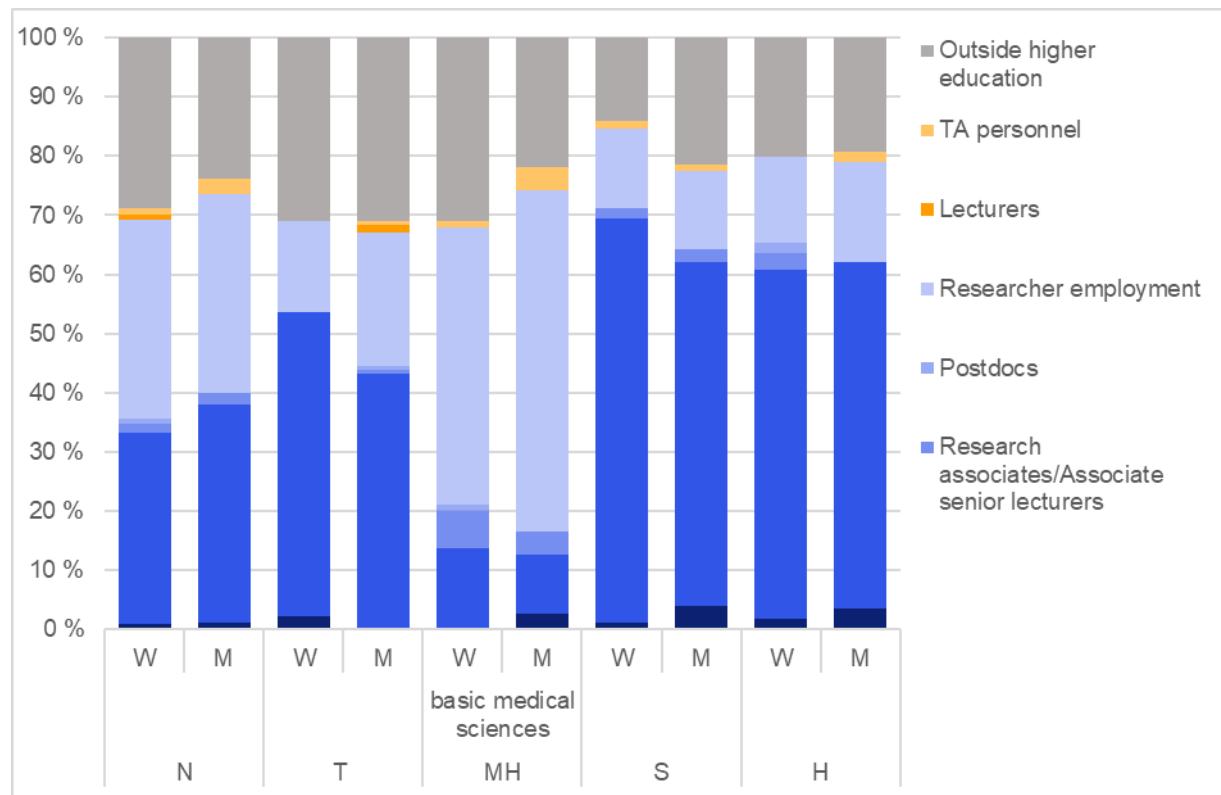


Figure 7 Employment after research associate/associate senior lecturer. Source: Statistics Sweden, calculations: The Swedish Research Council.

Among those who continued working in higher education, senior lecturer was the most common career path within humanities, social sciences and engineering sciences. In natural sciences, around half of those who stayed in higher education continued on to a senior lecturership, while the other half continued to researcher employment. In medicine (for persons with first cycle higher education in basic medical sciences), it is considerably more common to continue to employment as a researcher.¹⁷ The differences between men and women within fields of research are small.

After employment as senior lecturer

As employment as a senior lecturer is held for a longer period, we are reporting the result here divided up into doctoral degree cohorts 1997–2000, 2001–2004, and 2005–2008.

¹⁷ For the group of persons with healthcare education or physician education, the number persons with career development employment is too small to be included in the analysis.

For all cohorts, a slightly higher proportion of men than women continued on to employment as professors. The difference amounts of a few percentage points.

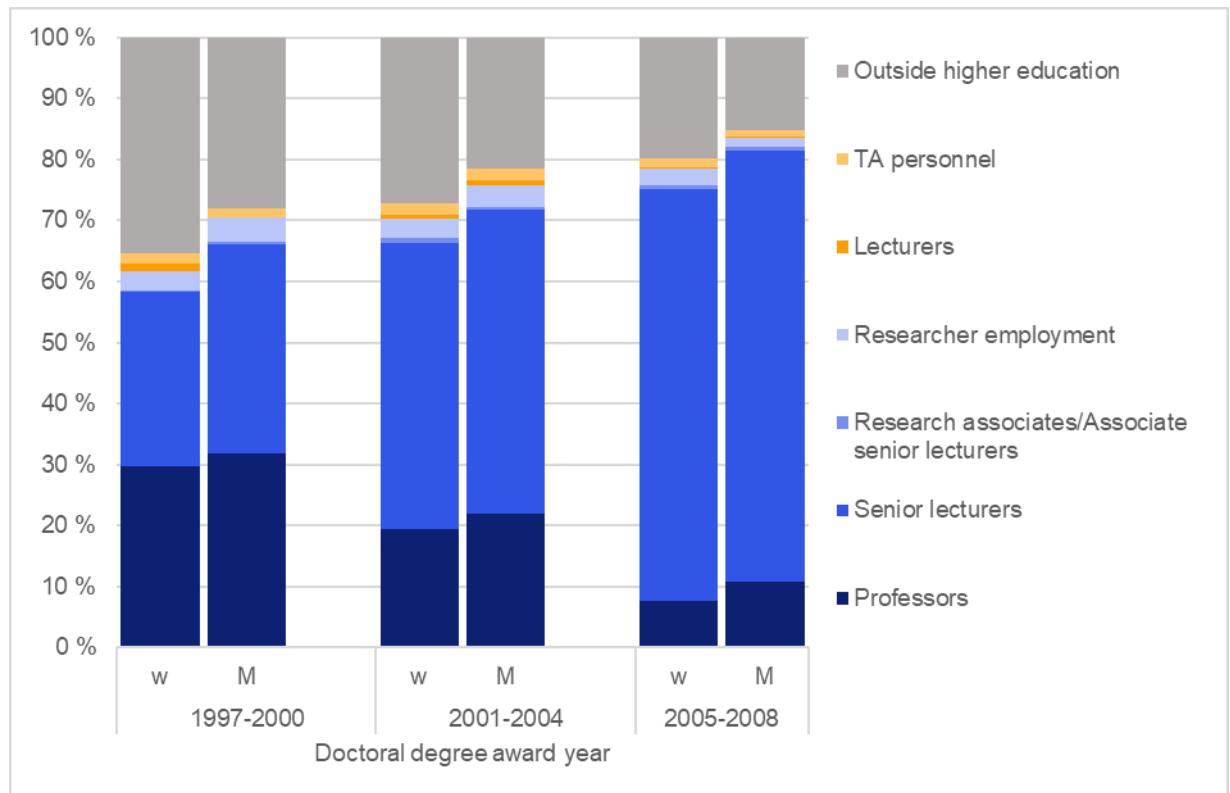


Figure 8 Employment the year after senior lecturership for three doctoral degree cohorts. Source: Statistics Sweden, calculations: The Swedish Research Council..

Just over 30 per cent of those who were employed as senior lecturer in the doctoral degree cohort 1997–2000 continued within one year to employment as professors during the just under 20 years the cohort was followed. The most common outcome, for 29 cent of women and 34 per cent of men, was however that they continued to be employed as senior lecturers during the year last studied.¹⁸ Of those who moved to other employment in higher education, only a few continued on to other positions than professor. For the 2001–2004 cohort, just over 20 per cent of the senior lecturers have become employed as professors, with a slightly lower proportion of women than men. Almost half continued to be employed as senior lecturers at the end of the study, which for this cohort means around 15 years after their doctoral degree award. For the 2005–2008 cohort, less than 10 per cent had become employed as professors, here too with a slightly lower proportion of women than men. Around 70 per cent were employed as senior lecturers at the end of the study, which for this cohort means around 11 years (9 to 13 years) after their doctoral degree award,

¹⁸2018 or 2019.

but again a lower proportion of women than men. Few had left their employment as senior lecturer in order to retire (not shown in a figure).

Before employment as professor

In this section, we look at the employment women and men had the year before they were appointed professors. The figure shows this divided up by subject area for all professors with doctoral degrees awarded between 1997 and 2008, in total 2 700 individuals, of which 38 per cent women and 62 per cent men.

The most common recruitment route for professors is via a senior lecturership, and it is more common for women (75 per cent) to have had employment as a senior lecturer the year before they become professors than for men (67 per cent).

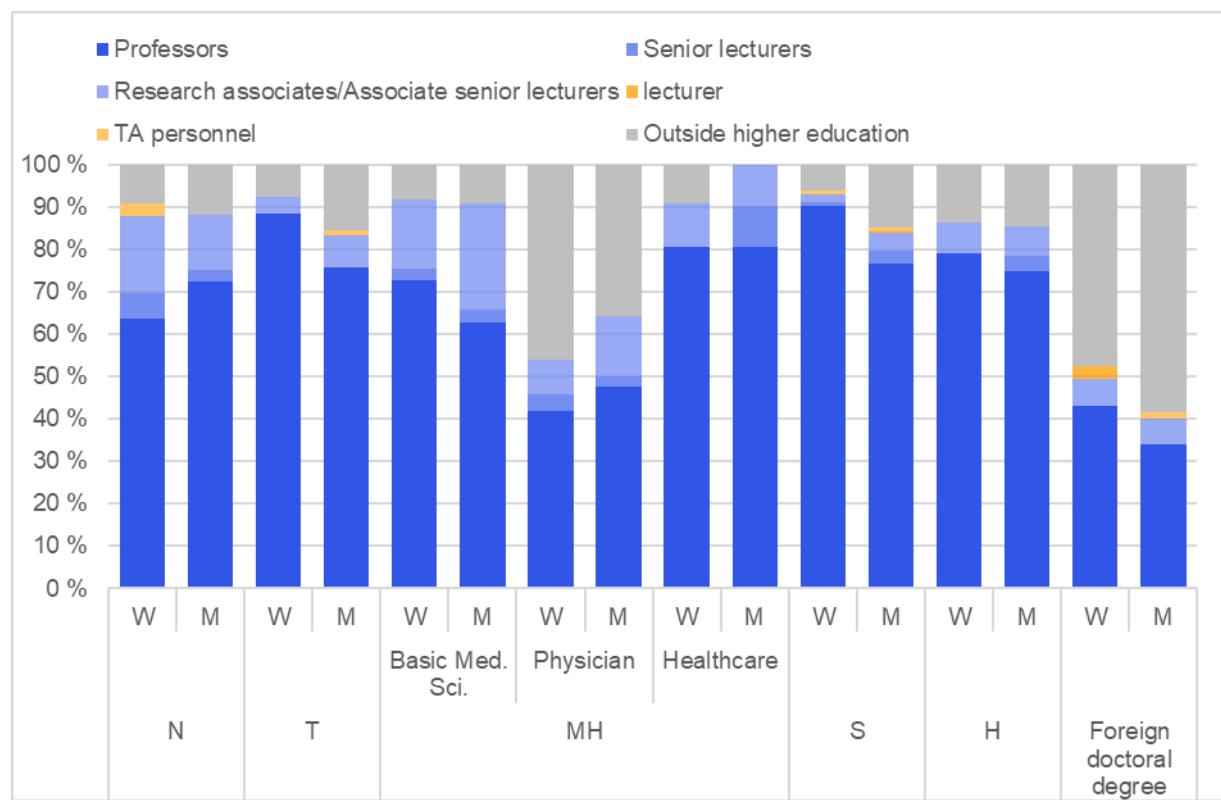


Figure 9 Employment before professorship for women and men with doctoral degrees between 1997 and 2008. Source: Statistics Sweden, calculations: The Swedish Research Council.

In natural sciences, a slightly higher proportion of men than women were employed as senior lecturers the year before they became employed as professors.

In other fields of research, it is slightly more common for women to be employed as senior lecturers than for men, with the exception of persons with physician education in medicine and health. The highest proportion of the professors who were employed as senior lecturers the year before they became professors can be found in social sciences, at 82 per cent. There, it was more common among women (90 per cent) than among men (77 per cent). In engineering sciences, it is also very common, with 89 per cent of women and 76 per cent of men. Among the professors with foreign doctoral degrees, it was more common for women to be established in Swedish higher education before becoming professors (53 per cent for women and 41 per cent for men).

Careers in higher education for researchers who apply for funding from the Swedish Research Council

This section investigates the extent to which the development between different employment categories differs for those who apply for research funding from the Swedish Research Council compared to persons in the sector as a whole, and whether there are differences between women and men.

To find an answer to this, the cohort material described in the earlier parts of the section was supplemented with similar information for groups of persons who had applied for funding from the Swedish Research Council as junior researchers. The sample is described in detail in the method appendix, but consists briefly of persons who were awarded doctoral degrees during the period 2005 to 2016, and who applied for starting grants and/or project grants up to eight years after their doctoral degrees, during the years 2010 to 2019. Here we will look more closely at two cohorts of doctoral degree holders, 2005–2008 and 2009–2012, and seek differences within these based on gender, research subject area, and whether they were given support or not. The 2009–2012 cohort consists of a part of those who received the questionnaire aimed at junior researchers in higher education.

Applicants to the Swedish Research Council remain in higher education to a greater extent

To begin with, we can establish that the group that applied for grants from the Swedish Research Council as junior researchers (within eight years of their doctoral degree award) more often continue to work in higher education than applies for the sector as a whole. For the first year after doctoral degree awards, the proportion is approximately the same. 30 per cent are then in Swedish higher education; a slightly higher proportion for women, and slightly lower for men.

One reason why few are employed in higher education during the first years may be that a large proportion of those who plan to pursue an academic career carry out an international postdoc visit. These persons are either not included in the population register, or are included in the population register but not as working.

It is more common to do a postdoc visit in medicine and health and in natural and engineering sciences than in other fields of research. In the fields of research mentioned, it is also slightly more common for men to do so, and because men are in the majority, in particular in natural and engineering sciences, the totality looks as if a higher proportion of men than women appear to take temporary leave from higher education because of a postdoc visit.

Over the next following years, the proportion found in various employments in Swedish higher education increases significantly, and five years after the doctoral degree award, almost 70 per cent of those who applied for funding from the Swedish Research Council can be found there. The figures are the same for women and men. In the cohorts that consist of all who work in the sector, we saw that the proportion of persons employed in higher education decreased, to differing extents and at differing speeds, depending on which cohort we studied. Here, there is a difference, in that those who apply for funding from the Swedish Research Council stay in higher education to a greater extent. Here too, the figures are the same for women and men.

Differences between genders are small

The approval rate for applications for research support from the Swedish Research Council varies for different support forms and fields of research, but is often within the 10 to 20 per cent interval. In the data excerpt from Statistics Sweden, we have chosen to define those who have at some time been awarded support during the first eight years as a “approved”, and consequently those who have not been awarded grants as being in the “rejected” group. If we compare these two groups, and look at women and men in each cohort separately, we can yet again establish that the differences between genders are relatively small, but that approval or refusal is of great importance (see Figure 10 and Figure 11). Of the “approved” group, just over 85 per cent can be found in higher education 7–8 years after their doctoral degree awards, when the proportion is the highest. The proportion in higher education therefore continues to increase for this group over a longer period. This can be assumed to be a result of them continuing to accrue merit to be successful in applications. Another difference is that the proportion that has been away from higher education at the beginning of the period – probably on an international postdoc visit – is higher among those approved for support than among those whose applications were rejected.

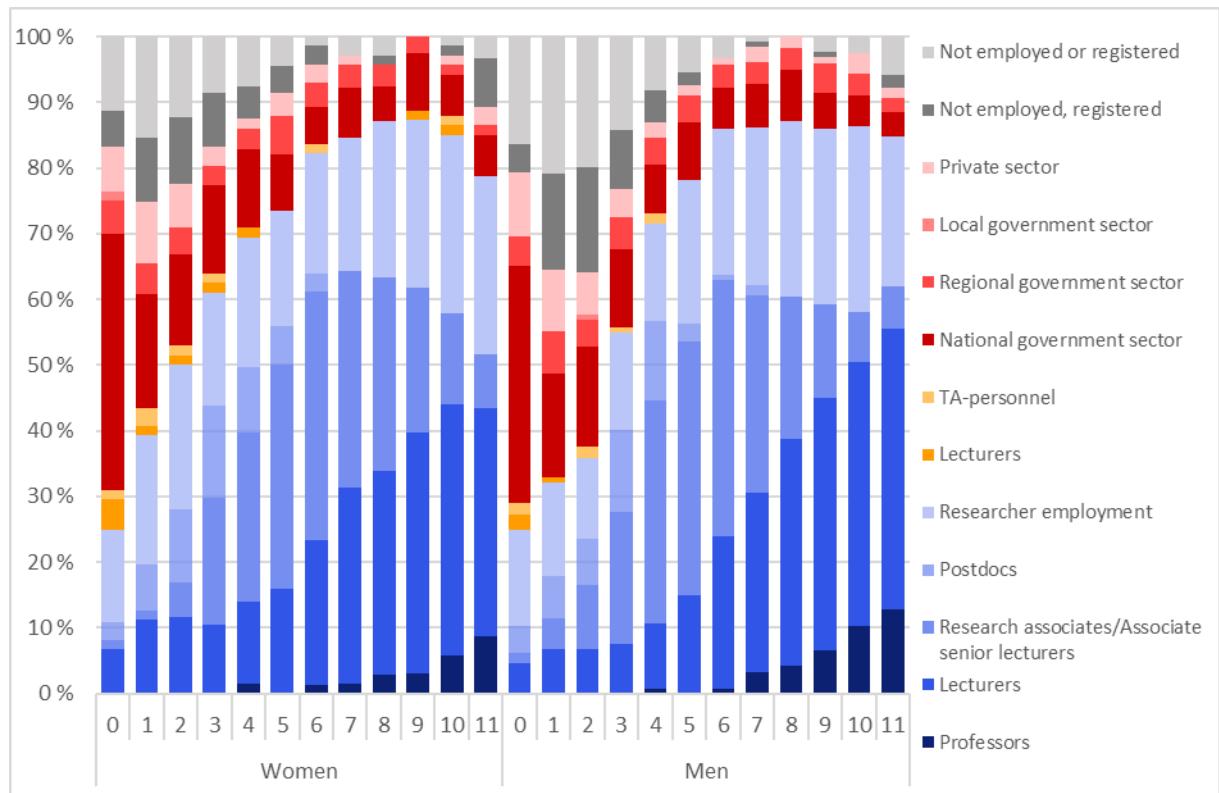


Figure 10 Employment categories for cohort doctoral degree holders 2005–2008 who were awarded funding from the Swedish Research Council up to 8 years after their doctoral degree award, over the following 10 years. Source: Statistics Sweden, calculations: The Swedish Research Council.

One effect of the low approval rate is that the groups of “approved” and of “rejected” differ in size; the relationships is around 1:4. This means that those who have been rejected are largely similar to the cohort as a whole, even if the proportion that has left higher education is decreasing faster than in general. It also seems that more persons in this group are striving to stay in higher education, even if this entails employment with usually little opportunity for research, such as lecturers or technical/administrative (“TA”) personnel, who form a small, yet clear, proportion of this group.

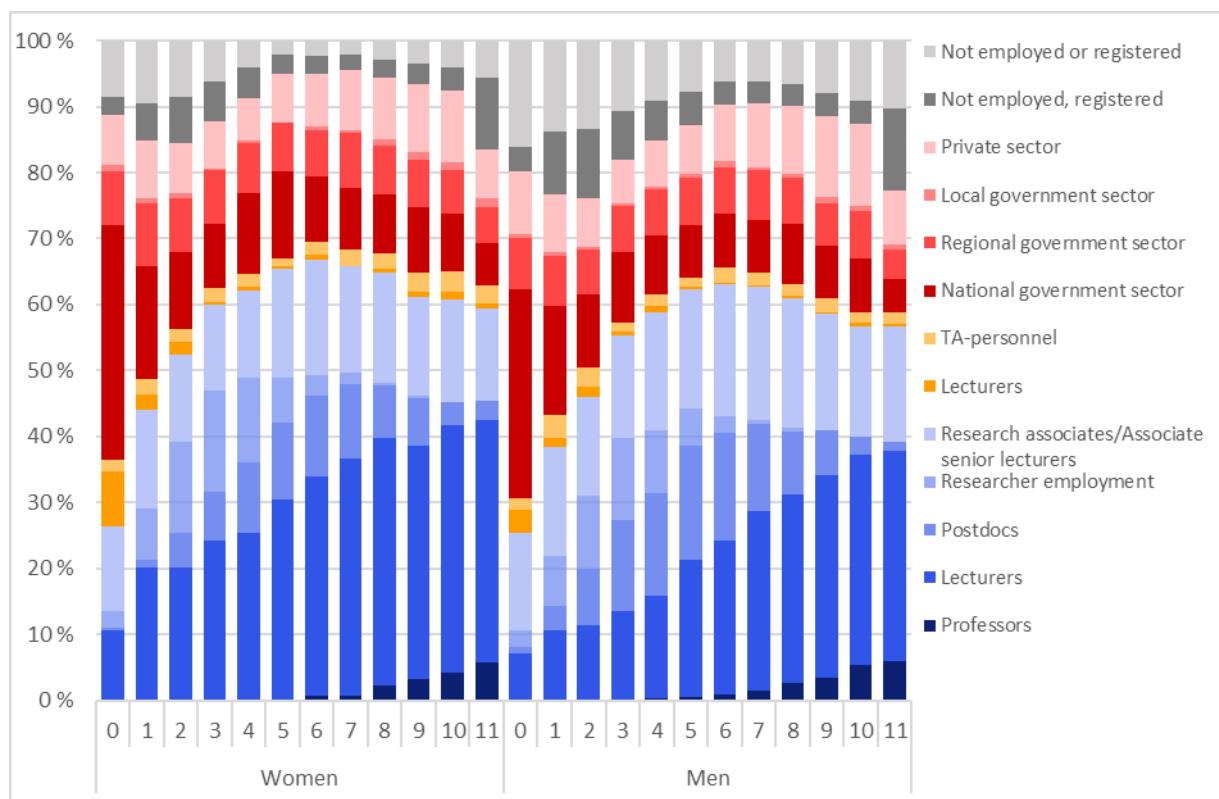


Figure 11 Employment categories for the cohort doctoral degree holders 2005–2008 whose application to the Swedish Research Council was rejected up to 8 years after their doctoral degree award, over the following ten years. Source: Statistics Sweden, calculations: The Swedish Research Council.

As shown in the figures above, there are some differences between women and men in terms of which employment categories dominate, and when. There is also a difference between those who have been awarded support, and those whose applications were rejected. The largest differences are for senior lecturers and professors. Men who have been awarded funding become both senior lecturers and professors to a greater extent than the corresponding group of women. Of those who have not been awarded funding from the Swedish Research Council, women are senior lecturer more often than men.

Variations between fields of research

There are some variations between different fields of research, but the general pattern is the same. More continue within higher education than in the doctoral degree holder cohorts generally, in particular among those who have been awarded support. We highlight here a few examples of what characterises different fields of research. In humanities and social sciences, a larger proportion of those who have been rejected hold senior lectureships, while those who have been awarded support have researcher employment. Here, there is probably a link between whether they mainly teach or carry out research in their

employment. In medicine and health, those who have been rejected are primarily employed in the regions, while the proportion who remain in higher education is considerably smaller than in the group that were awarded grants. Those who were awarded grants can be found in higher education, but in relatively low numbers as senior lecturers or professors. In natural and engineering sciences, there is a clear difference, in that a higher proportion of the men than the women are senior lecturers or professors.

We can also see that many researchers who received research grants from the Swedish Research Council have also held associate senior lecturerships. In medicine and in natural and engineering sciences, more than 40 per cent of those awarded grants from the Swedish Research Council have had such employment. This employment form is therefore accessible to a greater extent to those who receive the Swedish Research Council's starting grants, or if the opposite applies, those who have such employment have a greater chance of being successful in the Swedish Research Council's calls.

In humanities and social sciences, the picture differs in part. Among higher education personnel in these fields of research, senior lecturership is by far the most common employment form, even straight after doctoral degree award. For researchers with research grants from the Swedish Research Council in educational sciences, social sciences och humanities¹⁹, few have employment as associate senior lecturer – around 20 per cent of each cohort. Instead, many are employed as senior lecturers after a few years. We cannot see any significant differences between women and men. The investigation therefore shows that there are not any major differences between women and men who have applied for and been awarded grants; instead, the differences are found between fields of research. It does show, however, that all fields have a significant proportion of researcher employment forms. These are more common for those who have been awarded a grant from the Swedish Research Council than for those who have been rejected.

Finally, we can establish from the material that even if there is little difference between the percentages of women and men remain in higher education in the cohorts investigated, there are differences between fields of research, and between those who have been successful or unsuccessful when applying for funding from the Swedish Research Council. In medicine and health, and in natural and engineering sciences, there appears to be a breakpoint after four to five years. Before this, the proportion in higher education increases in a similar way for those who have been rejected and those who have been awarded funding. Thereafter, the proportion that can be found in higher education continues to increase for those who have been awarded funding, and reaches 80

¹⁹ To enable comparison with all higher education personnel in the cohort investigation, we do not report figures for educational sciences separately.

to 90 per cent after ten years, while the proportion is constant for those who were rejected, or slightly declining, and is at 50 to 60 per cent at the same point in time. In humanities and social sciences, there is little difference between those whose application to the Swedish Research Council was approved or rejected; after ten years, around 80 per cent can be found in higher education. And, as mentioned earlier, the figures are on the whole the same for women and men.

6. Background statistics

In this section, we provide a background to women's and men's positions and activities in higher education based on statistics, for the purpose of making interpreting and understanding the results of the three subsidiary studies easier.

Women and men in higher education

Women and men in different employment categories

The number of personnel employed in higher education has increased significantly over the last twenty years, and the largest increase is among women. In 2001, women made up 27 per cent and men 73 per cent of the research and teaching personnel with doctoral degrees, and in 2019, the proportion of women had increased to 42 per cent.²⁰ Women who work in higher education are on average more junior in career terms than men are.²¹ The employment structure is therefore different for women and men, with the greatest difference being that a lower percentage of women are employed as professors, compared to men. This is a well-known challenge for gender equality in Swedish higher education.

The figure below shows that gender distribution between doctoral students was equal both in 2009 and 2019, while the proportion of women among postdocs has decreased slightly. The proportion of women has increased in all other employment categories, and the increase is greatest among professors. In 2019, the distribution between professors was 30 per cent women and 70 per cent men.

²⁰ 2019, full-time equivalents, Swedish Higher Education Authority.

²¹ See for example Forskningsbarometern/Research Barometer 2019.

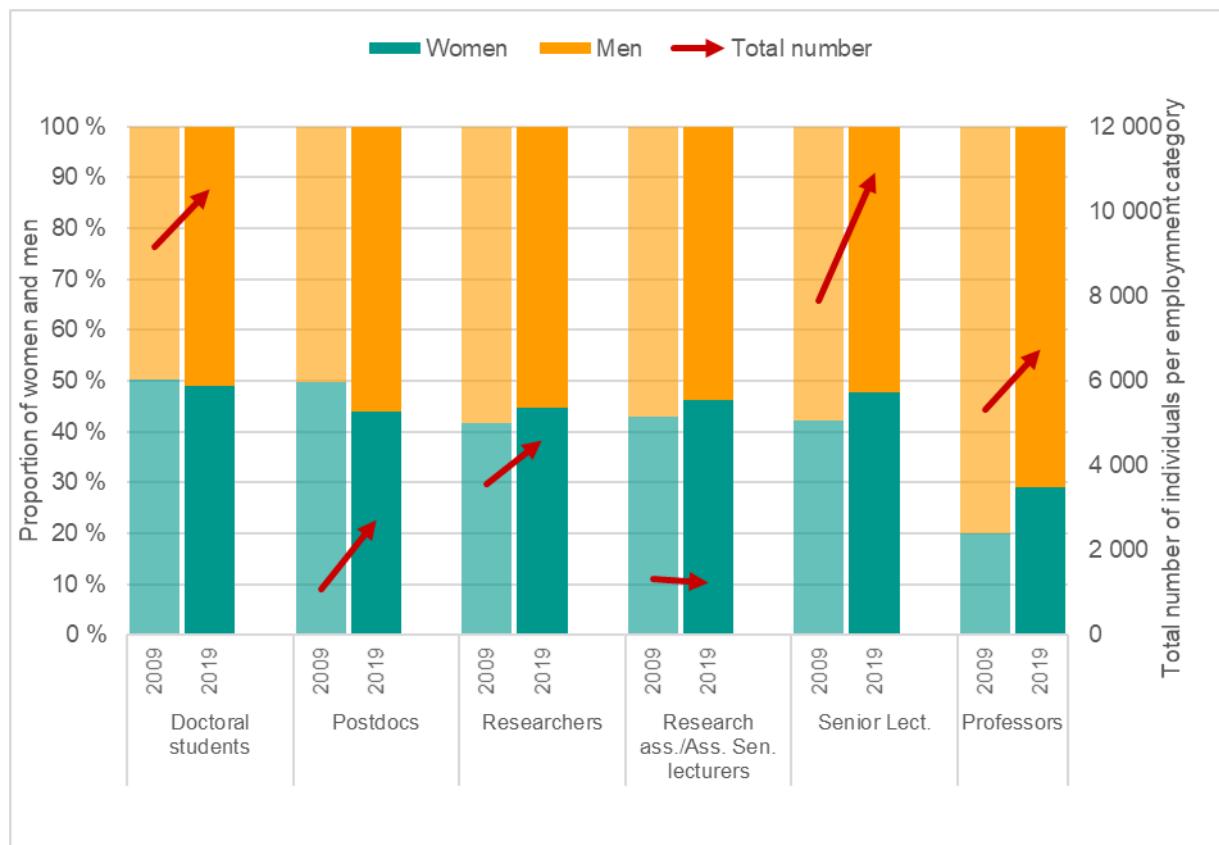


Figure 12 Proportion of women and men in different employment categories, 2009 and 2019 (left axis). The right axis shows the total number of individuals, and the arrows illustrate the change between years. Source: Swedish Higher Education Authority.

Women and men in the various fields of research

Women and men are unevenly distributed between fields of research. The figure below shows that the researching and teaching personnel with doctoral degrees (researchers and teachers) in medicine and health consisted of 52 per cent women and 48 per cent men. In social sciences, humanities and agricultural sciences, the proportion of women is between 50 and 45 per cent. The lowest percentage of women and the highest percentage of men is found in engineering sciences, where women represent 25 per cent and men 75 per cent of researchers and teachers. In natural sciences, the proportions are 27 per cent and 73 per cent respectively.

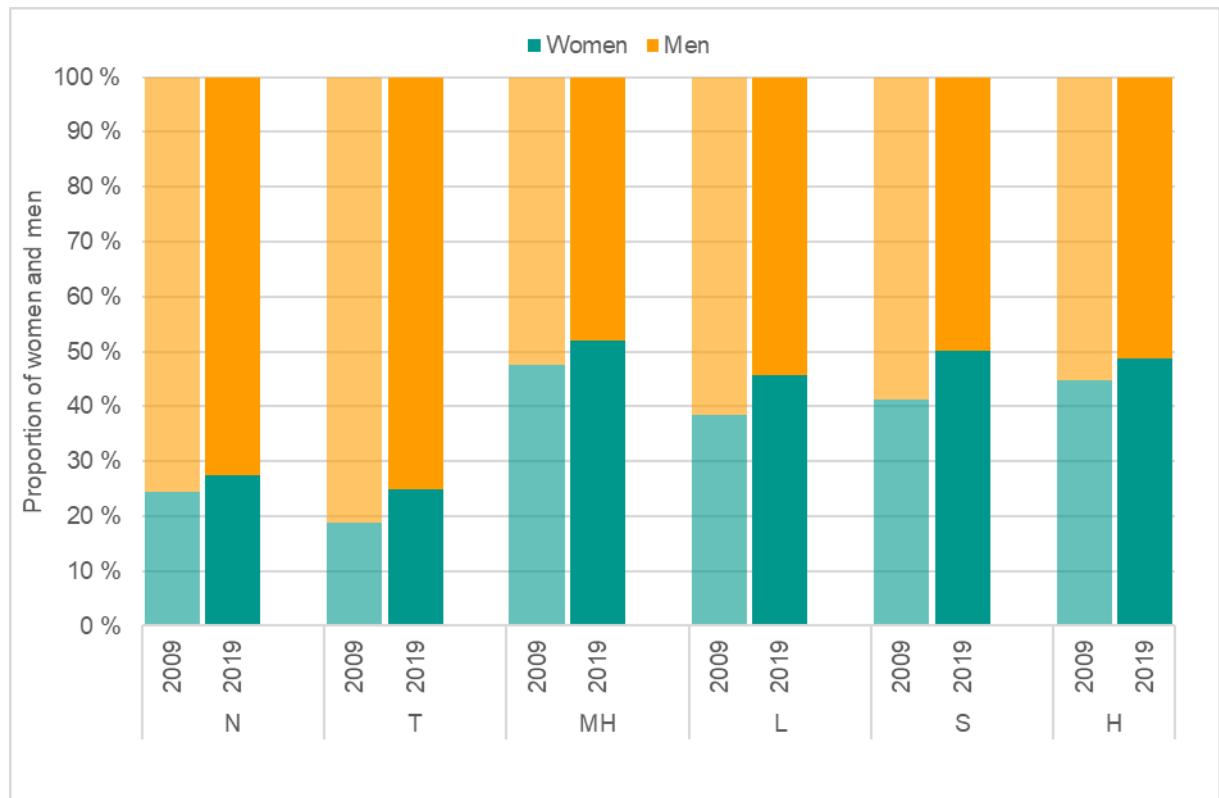


Figure 13 Proportion of women and men in different fields of research, 2009 and 2019 (left axis), and total number of individuals (right axis). Source: Swedish Higher Education Authority.

In all fields of research, the proportions of women and men have evened out over the last ten-year period.

Women's and men's activities in higher education

Just under half of all time spent on research and development (R&D) in higher education is done by personnel with doctoral degrees. The remaining R&D is done by doctoral students, and by personnel who do not have doctoral degrees, such as research engineers, research assistants and similar. This personnel is part of the categories other researching and teaching personnel, or technical and administrative personnel.

Women carry out 41 per cent and men 59 per cent of the R&D work year equivalent carried out by personnel with doctoral degrees. The corresponding distribution of the work year equivalents spent on teaching first cycle higher education courses is 45 per cent for women and 55 per cent for men. Women therefore carry out more teaching than R&D activities overall, compared to men. The figure below shows how women's and men's working hours are divided up between different work tasks within the five largest fields of research. The right

axis shows the number of R&D work year equivalents that are carried out by women and by men respectively in the different fields of research.²²

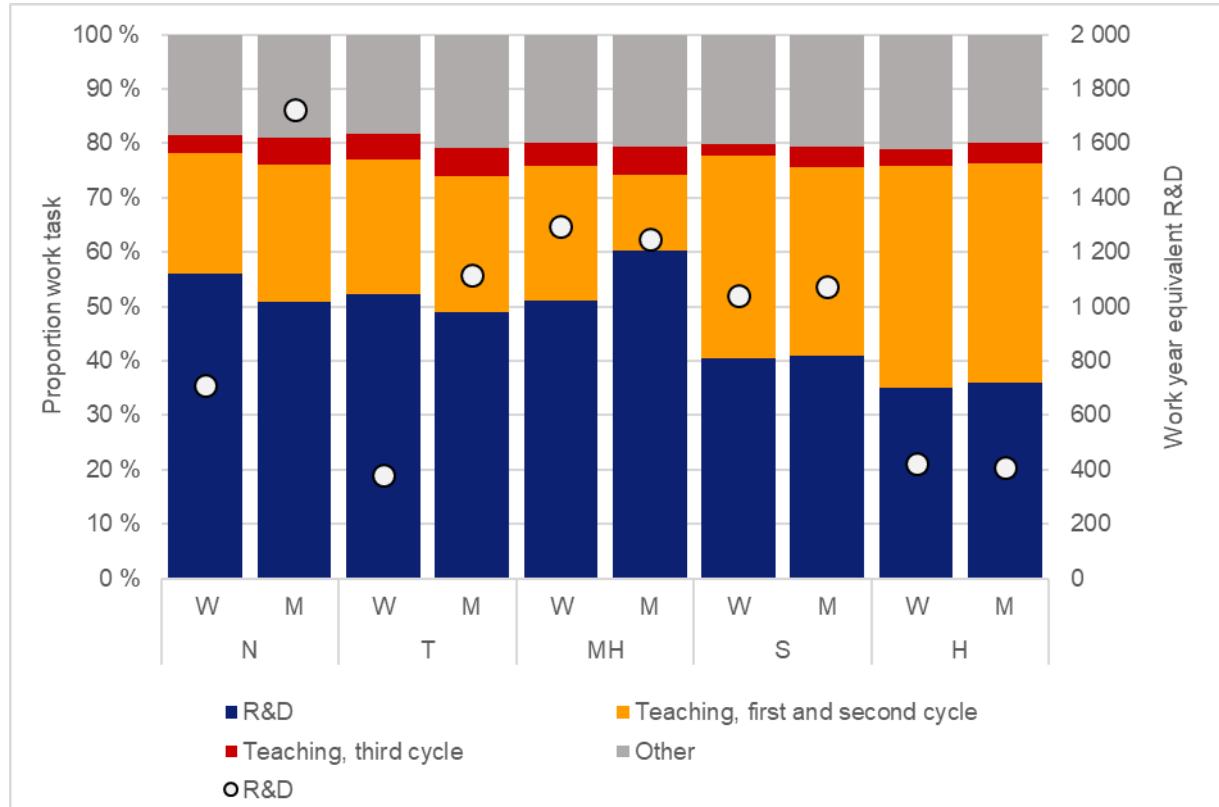


Figure 14: Distribution of work tasks for women and men in the five largest fields of research (left axis, per cent), and number of work year equivalents in R&D activities (right axis, number). 2019. Source: Statistics Sweden

We can establish that time is spent in more or less the same way by women and men in all fields of research except medicine and health, where men spend more time on R&D and less on teaching first cycle higher education courses than women do. The overall picture that men carry out a larger proportion of R&D than women follows from how women and men are distributed between the fields of research. Humanities and social sciences have almost as many women as men in the personnel who are doctoral degree holders, which together with equal proportions of time spent on R&D leads to the number of R&D work year equivalents being the same. The fact that the number of women in medicine and health is greater than that of men means that the number of R&D work year equivalents becomes the same, despite the fact that women on average spend less time on R&D than men. The opposite relationship applies in natural and engineering sciences, where there are considerably more men than women, which – despite an almost equivalent distribution of working hours – leads to

²² Agricultural sciences has not been included for reasons of space.

considerably more R&D work year equivalents being carried out by men than by women.

The figure below focuses on teaching at first cycle higher education level. Here, we focus on the group that spends the highest proportion of working hours on teaching at first cycle level, namely the senior lecturers. The figure shows that the proportion of time spent on R&D for senior lecturers varies between fields of research. The lowest proportion of R&D and highest proportion of teaching at first cycle level is among senior lecturers in humanities, and the highest proportion of R&D and lowest proportion of teaching is among senior lecturers in engineering sciences. In these fields, and in social sciences and natural sciences, there is no difference, however, between how women and men who are senior lecturers spend their working hours. The difference between women and men in terms of time for research and teaching respectively arises because there are more women who are employed as senior lecturers in humanities, where senior lecturers on average spend more of their working hours teaching, than in engineering sciences, where senior lecturers on average spend less of their working hours teaching. In medicine and health, however, there is a difference both in the number of teaching work year equivalents and in how women and men who are senior lecturers spend their working hours. Women spend a higher proportion of their time teaching than men, and considerably more teaching work year equivalents are carried out by women than by men. This is in all probability because health sciences has both a large number of senior lecturers, and a considerably higher proportion of women than men.

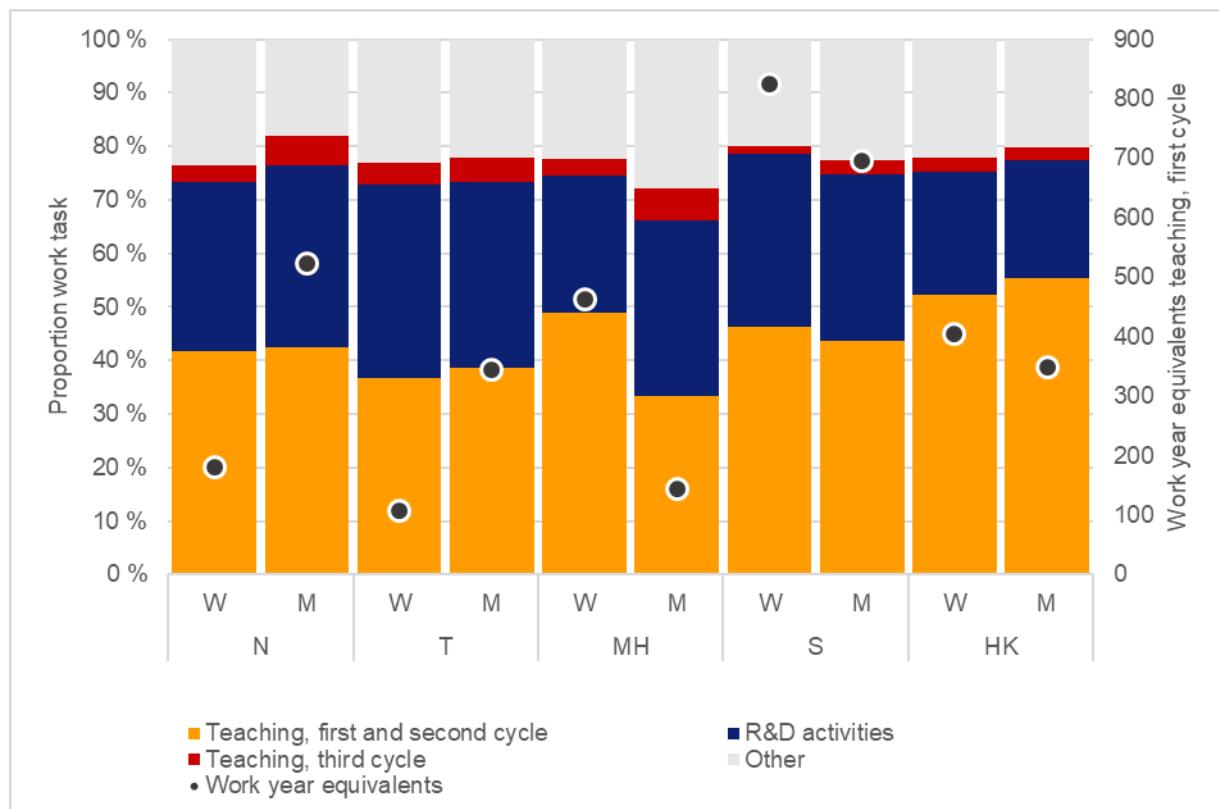


Figure 15 Distribution of work tasks (left axis, per cent), and number of work year equivalents in teaching at first cycle higher education level (right axis, number) for senior lecturers, divided up into women and men and also fields of research. 2019.

Source: Statistics Sweden.

Proportion of women and proportion of professors

The figure below shows the proportion of professors and proportion of women among researchers and teachers for all research subject groups.²³ The figure includes data of the subject groups that have the higher and lowest proportions of women, and correspondingly for the proportion of professors within each subject area. In social sciences, educational sciences has the highest proportion of women among researchers and teachers.²⁴ Simultaneously, it is the subject group in social sciences that has the lowest proportion of professors. The same pattern can be seen in the subject group languages and literature in humanities, and in biology in natural sciences.

²³ For subject groups with more than 100 researchers and teachers, and more than ten professors in 2019. Source: Swedish Higher Education Authority

²⁴<https://www.scb.se/dokumentation/klassifikationer-och-standarder/standard-for-svensk-indelning-av-forskningsamnen/>

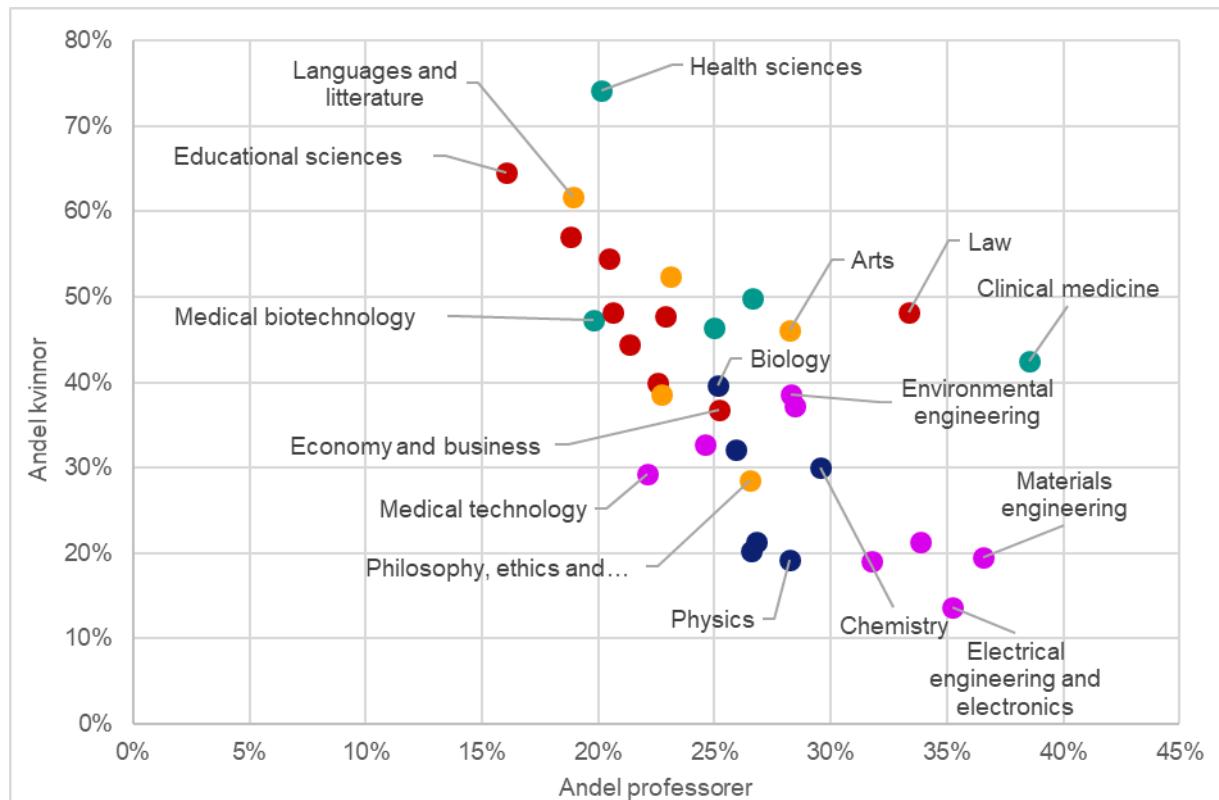


Figure 16 Proportion of professors among researchers and teachers (x axis) compared to women among researchers and teachers, (y axis) for research subject groups with more than 100 researchers and teachers, 2019. Red represents social sciences, turquoise medicine and health, dark blue natural sciences, yellow humanities, and magenta engineering sciences. Source: Swedish Higher Education Authority.

From the figure, we can establish that many of the subject groups with a high proportion of women also have a low proportion of professors.

The lower portion of the figure shows subject groups with a low proportion of women, most of them in the area of engineering sciences. Most of these are characterised by a high proportion of professors. The largest proportion of professors in this subject area is found in materials engineering, where women form 20 per cent of the research and teaching staff. The smallest proportion of professors is in educational sciences.

Clinical medicine is characterised by a large proportion of researchers and teachers being employed as professors. This is because many conduct research on a part-time basis, and have their main employment in health and medical care. This means that they are not included in the statistics for higher education personnel, despite many being active researchers with strong links to higher education. Only a small group have ‘combined positions’, where clinical work is

combined with employment as a senior lecturer or professor at an HEI, and therefore included in the statistics.

Newly appointed professors

Age at appointment as professor

The biological age at the time of employment as professor is of particular importance for the chances of achieving equal gender distribution among professors.

Public statistics show that it is clear that the proportion of professors who are women is lower than the total proportion of women who are researchers and teachers in all fields of research. One contributory reasons for this, in addition to the explanation given above, is that women spend fewer years as professors, given that they are on average two years older when they are appointed as such.

Based on data from Statistics Sweden (see method appendix), we can establish that the average age fell between the years 2012/2013 and 2016/2017; a trend that was broken in 2018/2019, when newly appointed professors once again were older. This is probably linked to the fact that the number of professors did not increase over the last two years.

If we look at median age instead, this is one or two years below the average age for each two-year period, and the difference is greatest for men. A contributory factor for this is that the twenty-fifth percentile, that is the age at which one quarter of the group has been appointed professor, is lower for men throughout. There are therefore more men who get appointed professor at a lower age than women.

The average age for those who become professors also differs according to subject area. The oldest are both women and men in medicine and health (54 years and 53 years respectively), while the youngest are in natural sciences (49 years and 48 years respectively). Engineering sciences stands out by being the only area where women are younger than men when appointed professors (49 years and 50 years respectively). The difference is largest in humanities and social sciences, where women on average are 52 years, and men 50 years.²⁵

²⁵ The ages stated are averages of two-year averages for the periods 2012/2013 to 2017/2018; the earlier two-year averages have not been included, as the subject classification for these is more uncertain.

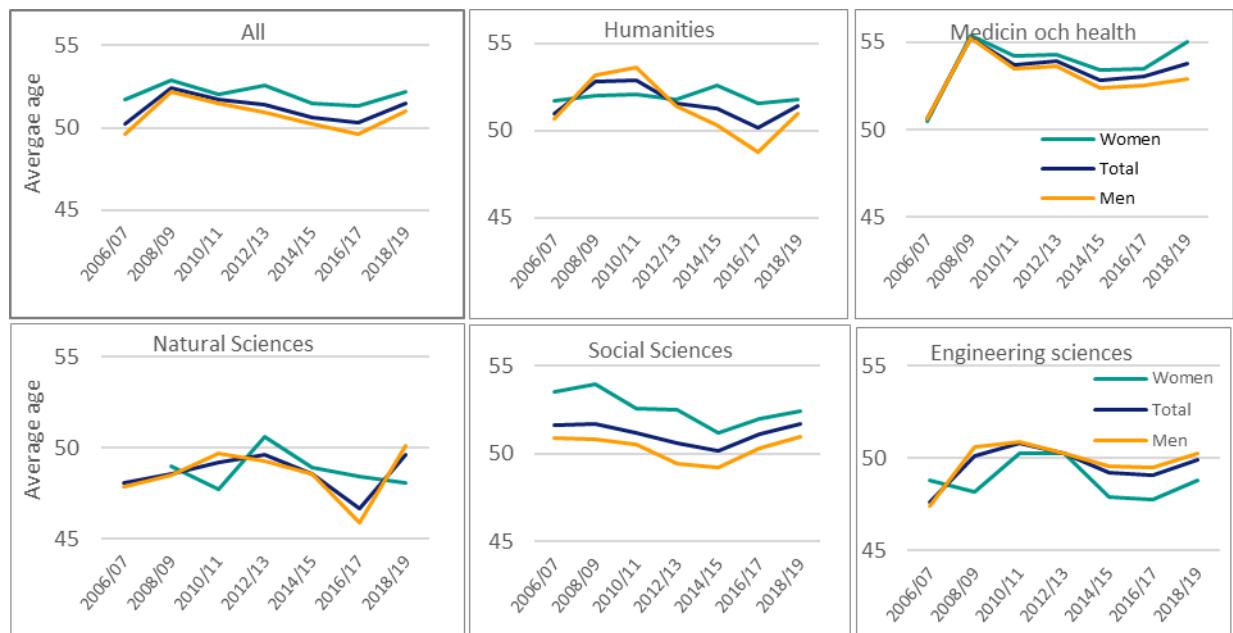


Figure 17. Average age on appointment as professor for the first time, for two-year periods from 2006 to 2019.²⁶ Source: Statistics Sweden, own calculations.

Proportion of women and men among newly appointed professors

The data from Statistics Sweden shows that the proportion of women appointed as professor has increased in all fields of research except natural and engineering sciences. Women constitute between 45 and 50 per cent of the newly appointed professors in 2018/2019 in humanities, social sciences and in medicine and health. In natural and engineering sciences, the proportion of women among the newly appointed professors has only increased slightly over the period, and in 2018/2019 was around 25 per cent.

²⁶ Please note that there is a break in the time series, as the subject classification was changed in 2011/2012, which has been dealt with through mapping from the earlier to the later subject classification.

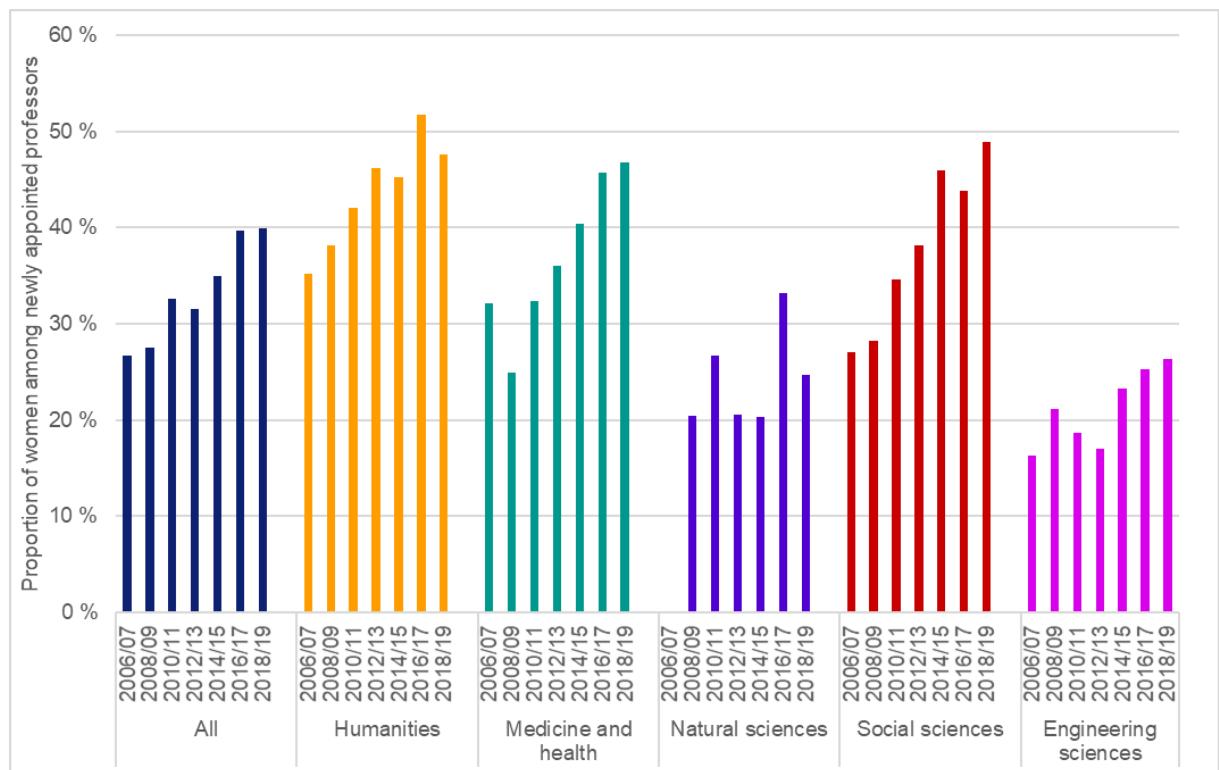


Figure 18 Proportion of women among newly appointed professors per two-year period, 2006 to 2019. Source: Statistics Sweden, Source: Statistics Sweden, own calculations.

7. Discussion and conclusions

In this section, we discuss the questions formulated using the literature in Chapter 2 as the basis, and the results from the various subsidiary investigations of the study.

Unclear career paths in higher education for both women and men

The most prominent result of the cohort study is that there does not appear to be any typical career path in higher education. The study shows interesting circumstances for both women and men, which have a bearing on the results from the survey and interview studies.

Few have the privilege of associate senior lecturership

We see that many are employed as senior lecturers already during the first few years after obtaining their doctoral degrees, but the second most common employment straight after a doctoral degree is employment as a researcher, which is a form not regulated in the Swedish higher education ordinance. In 2008, the position of postdoc was established, through an agreement between the parties to the labour market. This is a two-year position intended for those who have a relatively new doctoral degree, and is primarily used in natural sciences, engineering sciences, and medicine. It is not possible to extend the employment; instead it terminates after two years.

Only a small proportion of those who begin an academic career in higher education continue on to the time-limited teaching position of “associate senior lecturer” (previous research associate), aimed at making it easier to gain merit for a continued career in higher education. The intended career path associate senior lecturer – senior lecturer – professor is therefore not accessible to the vast majority in higher education.²⁷ The challenges of using the employment form emerges from the interviews (see further below).

We can see from the cohort studies that many women and men who received research grants from the Swedish Research Council have also held associate senior lecturerships. In medicine, natural sciences and engineering sciences, more than 40 per cent of those awarded a grant from the Swedish Research

²⁷ Govt. Bill (1996/97:141) Högskolans ledning, lärare och organisation (“Higher education management, teachers and organisation”) At the time, the career development position was known as “research associate” and did not give entitlement to having merits assessed for promotion.

Council have had such employment. Those who have had such employment therefore appear to have a greater chance of being successful in the Swedish Research Council's calls.

The register-based investigation therefore shows that there are not any major differences between women and men who have applied for and been awarded grants in higher education. The differences can instead be found between the fields of research he researchers are active in. The investigation also shows that all fields of research have a significant proportion of personnel with researcher employment. The employment form is more common among those who have been awarded a grant from the Swedish Research Council than for those who have been rejected.

Researcher positions are formally advertised openly

Researcher employees state to a lesser extent than colleagues in other employment categories that their jobs were advertised openly. For some, this probably means that they have their own external grants, through which they have been able to get employment, and for natural reasons there is no open advertisement then. In other cases, the appointments may have been made within the framework for a research leader's team, that is to say employment that should have been advertised.

The majority of the doctoral degree holders in our survey did, however, answer that the employment they have today was publicly advertised when they were appointed. According to the interviews with department heads, this does not necessarily mean that the employment was open to all applicants. It is not uncommon for there being someone being considered, for example when research leaders are filling the positions in a research team. For this reason, it is difficult to confirm the studies that conclude that there is no discrimination when positions are appointed in formal ways, as "formally correct" in reality does not always mean that the position in fact was open for all applicants. Our study therefore confirms to some extent the studies that show that recruitment of researchers is done in a non-transparent way.

External grants a double-edged sword for junior researchers

All department heads interviewed describe an environment that is strongly dependent on external funding, and where a research grant as project leader is an important milestone in the careers of junior researchers. As previously mentioned, the survey investigation shows that research time is funded by external grants to a great extent. The survey also shows that there is a significant difference between women and men in terms of getting time to do research. A higher proportion of men, irrespective of how the research time is funded, can spend a larger proportion of their working hours doing research.

The dependency on external grants is a double-edged sword for junior researchers. On the one hand, the funding is the foundation for being able to establish oneself as a research team leader, and to have a career in academia. On the other hand, the external grant does not provide employment that is regulated in the Swedish higher education ordinance, or offer any clear career path, such as associate senior lecturerships do. Instead, researcher employment is used, which in nearly all cases does not offer any chance of promotion to professor. One department in fact described researcher employment as a ‘dead end’. Many department heads provide a picture of a system with a high degree of external funding. This highlights a structural problems that affects both women and men at the beginning of their research careers.

We can also establish that this applies to women and to men, and that they appear to have the same conditions when it comes to becoming employed in higher education. It emerges from a report from the OECD that junior researchers, irrespective of gender, are used in academia as a ‘research precariat’, without secure employment conditions.

Everything else is the same – is the cost higher for women?

We see that the route that researchers take, from doctoral degree to professor level, entails more challenges for women than for men. The differences between women’s and men’s career development and experiences of being active in higher education are often small, but they are recurrent, and usually to the disadvantage of women. This is reminiscent of what in international literature is known as “accumulative disadvantage”, or “the Matilda effect”. The concept was coined in the 1990s, and illustrates that discriminatory practices follow the same accumulative process as those captured in the concept of “the Matthew effect” but opposite: The Matilda effect means that many, albeit small, negative events or ‘non-events’ accumulate at the beginning of a career. These can result in major effects on career development at a later career stage.²⁸ (37)

Difficult belonging to an under-represented gender

The survey shows that the feeling of community is tangibly affected by the gender composition of the department’s personnel and management, as well as by the individual’s academic position and origin. Being of the same gender as the majority, and being at senior lecturer or professor level appear to be favourable to the feeling of being part of a community. The opposite applies for women who are postdocs, and for men who are of foreign origin and are postdocs.

²⁸ The Matthew effect is similar, but refers to an accumulation of positive events and experiences that benefit the career of an individual.

Many in higher education, both women and men, feel that at some time or times they have been unfairly treated.²⁹ The experience follows a similar pattern as for the feeling of community: Women feel more often that they have been unfairly treated at some time or times when men dominate the department. Men feel that they have been unfairly treated in environments where women form the majority. At the interviews with department heads, it emerged that there is awareness that women in male-dominated environments can feel isolated, and in some cases there were specific networks for women. It did not emerge from the interviews that any of the departments had initiatives aimed at other groups, such as extra support for international postdocs, or for men in female-dominated environments.

Women ask for networks and mentors

One aspect that previous studies has found to be important is women's lack of access to networks. According to our study, the majority – 87 per cent of women and 91 per cent of men – have been able to develop networks. Most reply that both colleagues on the same academic level as themselves, and persons in superior positions, are part of these networks (that is to say: the networks are both horizontal and vertical), while one quarter answer that only colleagues on the same level as themselves are part of the network (horizontal networks). In the group that have left higher education, we note that fewer consider that they had access to networks in higher education. This applies to both women and men. Those who still had networks state that these included both persons higher up in the hierarchies, and colleagues with similar employment and tasks. The differences between women and men are small.

Several department heads stated in the interviews that they consider networks to be important, but only one said that the department has some form of system for introducing junior researchers to the networks of senior researchers. Several department heads referred to the doctoral students' own networks. Here, the department heads may be missing an important function of the networks, namely that a useful network should include not only individuals at the same level in the hierarchy, but also those who are established and higher up in the hierarchy.

The issue of networks is closely allied to access to mentors, which can be seen as part of a vertical network. In the survey, a considerably larger proportion of women than of men underline that access to a mentor is an important success factor in higher education. A slightly lower proportion of women than men state that they have access to a mentor, which primarily is the case in environments where men form the majority of research leaders and professors. The fact that women state more often than men the need to have access to a mentor, in particular in male-dominated environments, can possibly be interpreted as an

²⁹ The question was worded as follows: Have you experienced unfairness, such as not being invited to events, not being seen, heard, read, or referenced, or that someone else was given or took the honour for a work you were responsible for?

expression for men already having access to informal mentorship. Here, it might be justified to take special initiatives for junior researchers of an under-represented gender; an issue that many department heads appear to consider as alien. Several considered that they must give support to all junior researchers, irrespective of gender or other categories, but there were also those who were aware that women in their scientific field are under-represented and that this requires special initiatives.

Women are more critical to the application of publication practices

Both interviews and surveys confirm that publication is seen as an important success factor. It affects the chances of receiving external funding, and is a central part of the assessment of merit when employment positions are filled. According to the survey answers, both women and men have largely the same opportunities to publish together with their supervisors, within the areas where co-publication is common. This should contribute to similar opportunities to develop as authors early, which according to previous research is important for research careers. In the interviews we conducted, the department heads express that everybody gets support with publication, but the survey answers indicate that women more often than men feel that they are not receiving such support. Studies show that women publish to a lesser extent than men in several fields of research at the same career ages and in the same employment category. From the interviews, we also see that conflicts sometimes arise relating to the author order of co-authored publications. According to the survey answers, women are more critical of how the principles or the practice that exists for this is implemented.

Taken together, this indicates that there is a need to develop support in conjunction with publication, so as to give women and men the same preconditions. Here, there is also reason to consider how women and men partake of the support in reality, and also to ensure that the practice that is used for author order is applied in the same way for both genders.

Tough combining children and careers in higher education

When it comes to the issue of whether it is possible to combine a career in higher education with responsibility for young children, we see that differences between the genders are prominent when we analyse the survey answers divided up into different fields of research. A pattern emerges here where in particular women active in natural and engineering sciences find the combination of children and career to be difficult. But it should be added that men in the same fields of research also say that it is difficult to combine their work with having children, albeit to a lesser extent than women.

Women's and men's answers do not differ in any definitive way when we analyse higher education as a whole. Around half (45–50 per cent) think that combining work with having young children works well, while the other half

think it works more or less badly. This is a striking contrast compared to those who had responsibility for young children while they worked outside academia. In this group, 85 per cent of women and 90 per cent of men answer that combining work and parenthood works well.

Both women and men who are working in higher education feel more often that combining work and parenthood works less well when the majority of professors and research leaders are men.

The study cannot be said to confirm the research that shows that women deselect themselves from academia when they encounter obstacles related to parenthood. Among those who have left higher education in our study, a small group of women in natural and engineering sciences in particular state that they have moved to other work in order to obtain a better balance between work and private life, but the majority leave for other reasons. We would, however, like to emphasise that we had few respondents in the survey aimed at persons who had left higher education, and that the question therefore must be said to remain interesting for further study.

Both women and men leave higher education

Difficult to determine whether women leave to a greater extent

One purpose of this study is to investigate the extent to which women and men leave higher education, and whether women leave higher education to a greater extent than men. It seemed fairly simple to design a study that would give an answer to this, namely by following a cohort of doctoral degree holders during their continued careers. The study did not produce any clear-cut answers. We can see that a slightly higher proportion of women start an academic career after their doctoral degree awards, and also that a slightly higher proportion of women leave higher education compared to men. The differences are small, however, and among the older cohorts were in part due to old age retirement, as women are on average slightly older when they receive their doctoral degrees than men are. The general state of the economy also appears to affect the extent to which both women and men choose to continue an academic career, or choose to leave for other sectors of society. Based on this material, we can therefore not confirm that women more than men leave higher education as a whole (this is usually known as “the leaky pipeline”), but neither can we say that there is no ‘leakage’.

This being said, in some fields of research, it does appear that a higher proportion of women leave higher education after having started an academic career. The fields of research that have a slightly higher outflow of women than men are social sciences, natural sciences, and basic medical sciences. Many women with healthcare education in medicine and health also leave higher education, but we cannot say for sure whether it is a higher proportion of women

than men, as there are so few men with this first cycle education from the start. In engineering sciences, a higher proportion of men than women appear to leave higher education.

The department heads draw a picture where women do not leave higher education after ending their postdoc visits to any greater extent than men. We can neither confirm nor contradict the department heads' picture. This is because the cohort study does not show a clear outflow of women during this period. The design of the study does not make it possible to study the dynamic course of events of people who enter and leave higher education, but can only provide an answer relating to the persons who are employed in higher education during a particular year.

In the cohort study, we focused on men and women in later career stages, and can establish that a certain proportion leave higher education after the end of career development employment as research associate or associate senior lecturer, but no difference can be seen between women and men. On the other hand, a larger proportion of women than men leave higher education after employment as senior lecturers. In general, senior lecturers in higher education are permanently employed.³⁰

A picture emerges from scientific literature about gender equality in higher education that men who have not received grants aimed at junior researchers still often succeed in their academic careers more often than women in the same situation do. Our study does not confirm this picture. Our study indicates that women whose grant applications have been rejected continue their academic careers to as great an extent as men do.

Long working days and insecure employment

Above we have established that our cohort study do not answer the question whether women leave higher education to a greater extent than men. However, we can see from one of the surveys that a large number of respondents, both women and men, are considering leaving higher education, and the reasons why are also given. The surveys had a response alternative for those who had such plans, formulated as the respondent "due to other factors, such as uncertainty of access to external funding" was considering leaving higher education. This alternative was chosen by the majority (66 per cent) of those who answered "yes" to the question. The differences between women and men are small here, and we can therefore not see any general greater tendency for women than men to plan to leave higher education for this particular reason. On the other than, it does emerge that women, more often than men, are considering leaving higher

³⁰ UKÄ rapport Trygghet och attraktivitet - en forskarkarriär för framtiden, SOU 2016:29; <https://www.uka.se/download/18.6abf8dcb16e3a9b78d95001/1574164235440/statistisk-analys-2019-11-19-manga-tidsbegrensat-anstallda-i-hogskolan.pdf>

education due to problems in the work environment (53 per cent against 44 per cent).

In the survey responses from the group that has left higher education, a higher proportion of women than men state that problems in the social environment and obstacles relating to parenthood are reasons why they left higher education. In medicine, natural sciences and engineering sciences, women use negatively charged reasons for their choices (such as wanting more secure employment), while men state more positively charged reasons (such as higher salary and more interesting work tasks). It is known from previous studies that temporary employment has a negative impact on the attitude towards remaining in higher education, and many junior researchers active in higher education have such employment according to the surveys. Here we can therefore possibly begin to see a “leakage” of female researchers that higher education has “lost” to other work, due to employment that is insecure, and also failings in the social environment. Another “leakage” in terms of female representation was identified by department heads working in male-dominated environments in higher education; in both cases departments in natural sciences and engineering sciences.

At the same time, a majority of both women and men active in higher education say that they want to continue working with research and teaching, which might be interpreted as it still being attractive to work as researchers and teachers, but that some obstacles and difficulties are present. Of those who have left higher education, 55–60 per cent state that they would have liked to stay, in particular women with doctoral degrees in natural sciences and engineering sciences, and men in medicine and health (both around 70 per cent).

At the interviews with department heads, it was established that many leave higher education straight after their doctoral degree awards, and that these had been aiming for work in other societal sectors right from the start. This was not seen as a problem, but rather as an obvious fact.

Why are so many professors men?

A conclusion from the cohort study is that women's and men's careers develop in a relatively similar way, but that on average it takes a year or so longer for a woman to become employed as a professor. Data from the Research Barometer (Swedish Research Council, upcoming) shows that the gender distribution among higher education personnel with doctoral degrees from the last 15–20 years is even. Despite this, the proportion of professors who are women is increasing slowly.

Better, but not good, balance among newly appointed professors

A central issue in the discussion of the proportion of female professors is the relationship between newly appointed professors and the group from which they are taken, the recruitment pool.

We can see that the gender distribution among newly appointed professors is even within the fields of research social sciences, humanities, and medicine and health, but women form the majority of the recruitment pool.³¹ The proportion of newly appointed professors therefore does not reflect the proportion of women in the group that forms the pool for recruitment of professors. In natural and engineering sciences, the difference is smaller between newly appointed professors and the recruitment pool. A possible explanation for the slow increase is that women, to a greater extent than men, are active in subject groups where a lower proportion of the personnel consists of professors. One example is educational sciences, which is the subject group in social sciences that employs the higher proportion of women, and also has the lowest proportion of professors among the personnel with doctoral degrees. A corresponding example is biology in natural sciences.

The primary explanation for the large proportion of men among professors can be found in the underlying data for the Research Barometer (Swedish Research Council, upcoming). A large proportion of the professors, 57 per cent, have a doctoral degree that is more than 20 years old. In these doctoral degree cohorts, the proportion of women who are professors is 24 per cent, compared to nearly 40 per cent among the professors with a doctoral degree that is less than 20 years old.

We can therefore establish that time will solve part of the problem of the small proportion of professors who are women, but not all of it. In our study, we have been able to establish two contributory factors for this.

The gender inequality exists between fields of research

Women are appointed professors on average two years later in life than men are. On the assumption that women and men retire at the same age, this means that women spend fewer years as professors than men do, in total. One further contributory factor discussed in the section above – that women more often than men are active in areas that have a lower proportion of professors.

³¹ The proportion of women among newly appointed professors in these areas is 45 to 50 per cent, while the proportion of women among the personnel with doctoral degrees in 2001–2010 is 58 per cent in medicine and health, around 55 per cent in social sciences, and 53 per cent in humanities. In natural and engineering sciences, women make up 25 per cent of the newly appointed professors, while the proportion of women in higher education personnel during the period in question is 30 per cent and 28 per cent respectively. Data from the Research Barometer 2021 (upcoming).

According to the survey answers, women have a lower proportion of research time compared to men. Often, it is external grants that allow research time, and these are distributed to both women and men, but they are not distributed evenly across fields of research. This might contribute to fewer women being able to do research, and that it takes longer time for women to gain enough merit to be appointed professors. One important explanation is that women and men are active in different scientific fields. This confirms previously expressed hypotheses, where it is claimed that traditionally male domains, such as natural sciences and engineering sciences, have greater resources for research, while scientific fields where many women are active have considerably less.

The free text answers in the surveys also indicate that time is important for those who want to be successful researchers. Many respondents to the surveys state that they have limited amounts of time for research and for writing applications. We also know, from the Statistics Sweden figures, that women carry out proportionally more teaching at first cycle level in relation to doing research than men do.

The foregoing gives an indication why we are seeing a smaller proportion of applications to the Swedish Research Council from women than men in relation to the composition of higher education personnel, in particular among junior researchers and teachers. A higher proportion of women than men are active in scientific fields and employment categories that have a higher proportion of teaching and lower proportion of research. The consequence of this is that there are fewer women who have the opportunity to gain enough merit to successfully apply for external research grants. Our survey responses also show that female researchers on average receive slightly lower grant amounts than men. We also see that women in three of the four scientific fields are slightly more often or often, listed as participating researchers (not project leaders).

To be continued

How shall all of us who share the same system continue from here? With this report, we want to start a discussion, but not point out the direction. We would, however, like to leave a few reflections to contribute to the continued discussion.

- Is it possible to divide up research resources in a gender-equal way across all fields of research?
- Can departments get access to resources for identifying and working against gender inequality, excluding practices and unfair allocation, and in this way create a good work environment for all?
- Can we achieve a system change that creates better employment conditions in higher education, which would benefit both women and men?
- Can research funding bodies make demands on departments when external grants are awarded, such as having a plan for the grant recipient's continued

work when the grant runs out, for women and men at the beginning of their careers?

- Can research funding bodies adapt their grants to better harmonise with the employment form associate senior lecturer?

The questions are many, and the answers may in some cases vary depending on subject area. We look forward towards continuing to follow the development in Swedish higher education, and continuing the dialogue with actors in the sector about possible ways forward to improving gender equality in Swedish higher education!

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Appendix 1: Method

This section describes the various sources used in the study. It comprises two surveys, one aimed at a group of researchers who applied for funding from the Swedish Research Council, and one at a group that left higher education after their doctoral degree award, plus interviews with representatives of a selection of departments at higher education institutions. Another source is register data for cohorts of doctoral degree holders for the higher education sector in general, and cohorts based on researchers who applied for funding from the Swedish Research Council. Finally, supplementary statistics are also described.

Sweden uses similar, but slightly differing, designations of fields of research in different contexts. This report uses the following designations (abbreviations in tables and figures): humanities (H), natural sciences (N), engineering sciences (T), medicine and health (MH), and social sciences (S). Some figures and tables also use agricultural sciences (L) for the sake of completeness. In some cases, some of the fields of research have also been joined up into humanities and social sciences (HS), and natural and engineering sciences (NT). The research subject group of educational sciences (U), which is included in social sciences, is treated as a stand-alone subject area within the Swedish Research Council, and is therefore reported on separately in some contexts.³²

Surveys

To obtain an idea of how different factors can impact on career development and work environment for junior researchers, two surveys were conducted of junior researchers. One survey was aimed at junior researchers who applied for funding from the Swedish Research Council during the first eight years after their doctoral degree award. The majority of these are still active at higher education institutions, in Sweden or abroad. A second survey was aimed at junior researchers who left higher education. The purpose of the survey was to enable a description of any differences between those who remain in higher education, and those who left. Both surveys were produced in a Swedish and an English version, and consisted of questions with set response alternatives, plus an option

³² According to the research subject classification *Standard för svensk indelning av forskningsämnen 2011* (SCB and UKÄ, 2016), the proper designations for the fields of research are: humanities and arts; agriculture, horticulture, forestry, fishery; medicine and health sciences; natural sciences; engineering sciences; and social sciences. The Swedish Research Council has the following scientific councils and committees: the Scientific Council for Humanities and Social Sciences, the Scientific Council for Medicine and Health, the Scientific Council for Natural and Engineering Sciences and the Committee for Educational Sciences.

to supplement these in free text. The sample and implementation of the two surveys is described below in greater detail.

Survey aimed at junior researchers who had applied for funding from the Swedish Research Council

One survey was aimed at a sample of the junior researchers who had applied for funding from the Swedish Research Council during the period 2010 to 2019. The survey was sent to the applicants who fulfilled the following conditions, and who are hereafter designated as “junior researchers”.

- Doctoral degree awarded during the period 2009 to 2016 in Sweden or abroad.
- Applied for a grant aimed at junior researchers³³ and/or project grants³⁴ at a career age³⁵ of eight years or less during the period 2010 to 2019.
- The administrating organisation in the application was a higher education institution.
- We had access to an email address.

The following categories were used to describe the respondents:

- Doctoral degree cohort: 2009–2012 or 2013–2016.
- Subject area: humanities and social sciences, medicine and health, natural and engineering sciences, or educational sciences, depending on which scientific council/committee had made the decision on the application.
- Decision: Approved (if at least one application was approved), or Rejected (if no application was approved).
- Year of application: For applicants in the Rejected group: last year they had been rejected. For applicants in the Approved group: first year an application has been approved.
- Gender: woman or man

The survey was sent to 4 734 individuals in total.³⁶ Using the survey tool, we could establish that 815 of these did not receive the survey, probably due to non-current email addresses. Of the remaining 3 920, 1 795 responded, which gives a total response rate of 46 per cent.

³³ Grant forms aimed at junior researchers are available in natural and engineering sciences and in medicine and health, and include: Grant for employment as research associate; Starting grant – junior researcher; International career grant; Project grant junior researcher.

³⁴ All grant forms relating to project grants were included, that is: Project grant; Undirected project grant; Project grant with focus.

³⁵ Career age was calculated based on year of doctoral degree and year of application, that is:
career age = year of application – year of doctoral degree award.

³⁶ The survey was administered using the tool Survey & Report.

Table 1. Number of respondents³⁷ and response frequency (in per cent), divided up by subject area and doctoral cohort, and by rejected and approved women and men.

	Rejected				Approved				Total	
	Women	Men		Women	Men		Men			
HS	467	55%	479	43%	111	73%	114	50%	1 171	51%
2009–2012	273	55%	279	43%	71	68%	67	45%	690	50%
2013–2016	194	54%	200	43%	40	83%	47	57%	481	52%
MH	402	50%	327	34%	89	73%	84	48%	902	46%
2009–2012	277	47%	222	36%	70	70%	58	47%	627	46%
2013–2016	125	55%	105	30%	19	84%	26	50%	275	47%
NT	330	42%	796	27%	123	69%	289	58%	1 538	39%
2009–2012	223	37%	494	26%	92	71%	220	56%	1 029	39%
2013–2016	107	52%	302	27%	31	65%	69	64%	509	40%
U	159	58%	83	43%	41	73%	26	54%	309	56%
2009–2012	102	60%	41	44%	24	63%	17	47%	184	55%
2013–2016	57	54%	42	43%	17	88%	9	67%	125	56%
Total	1 358	51%	1 685	33%	364	72%	513	54%	3 920	46%
2009–2012	875	49%	1 036	33%	257	69%	362	52%	2 530	45%
2013–2016	483	54%	649	34%	107	79%	151	60%	1 390	47%

As shown in Table 1, the response rate was generally higher among women than among men, and higher among those who had been awarded funding than among those who had been rejected for funding. The response rate was also higher from respondents in humanities and social sciences, and highest of all in educational sciences, while it was lower in medicine and health and in particular in natural and engineering sciences. The lowest response rate was among men in natural and engineering sciences who had been rejected for funding, followed by women in the same subject area who had been rejected. In natural sciences in particular, there is a higher proportion of immigrant doctoral students and persons with foreign doctoral degrees, and more of them are therefore leaving Sweden in order to continue working abroad, which might impact on the response rate. As the survey was conducted in both Swedish and English, language difficulties should not have been a reason, however. Experience shows that women often have a greater propensity than men to respond to surveys relating to gender equality, as is the case here.

The later doctoral degree cohort is generally smaller among the respondents. There may be several reasons for this; for example those whose doctoral degrees are newer in this cohort have had fewer years in which to apply for grants. In several of the groups, however, the response rate is higher for the later doctoral degree cohort. Among the applicants to the Swedish Research Council are

³⁷ The original respondents minus those who did not receive the survey according to the survey tool.

persons with Swedish doctoral degrees, and persons with foreign doctoral degrees.

A comparison of the number of individuals in the two doctoral degree cohorts of applicants to the Swedish Research Council with the total number of doctoral degrees awarded in Sweden during the corresponding periods shows that the possible respondents form just over 20 per cent of the women who were awarded doctoral degrees in the first cohort, and just under 25 per cent of the men who were awarded doctoral degrees in the same cohort. The respondents are mainly in higher education, so the survey must therefore be assumed to have reached a considerably higher proportion of those who are active in higher education. The proportion of a doctoral degree cohort that has received the survey and had the opportunity to respond varies between fields of research. The highest proportion is in humanities and social sciences, and lowest in medicine and health, which reflects the fact that a higher proportion of doctoral degree holders in the former subject area continue in higher education than in medicine and health and in natural and engineering sciences. The pattern described above is also true for the latter cohort, with the difference that the proportions were almost half the size.

Except for the background questions, the survey questions relate to areas that have been identified in literature as important for work environment and career development for women and men in higher education. They concern areas such as family formation, gaining merit, publication, what they consider to be important success factors, employment conditions, recruitment and funding, in terms of both resource allocation and external grants.

One challenge was to construct the survey in such a way that active researchers employed in health and medical care could respond adequately to it. This turned out to be a major challenge, which we did not entirely manage to achieve. Respondents in healthcare were therefore encouraged to follow a special instruction when answering the survey.

Survey aimed at junior researchers who have left higher education

A selection of questions from the first survey was summarised in a second survey, aimed at persons who have left higher education, either straight after their doctoral degree awards, or after having been active there for a period, and who had not applied for a grant from the Swedish Research Council. Working out how to reach these was a methodological challenge.

The alternative selected was an internet survey, made accessible via a link on the Swedish Research Council's website, which was disseminated in various ways, such as via the Swedish Research Council's regular newsletter, via social media such as LinkedIn and Facebook, and via the Swedish Research Council's personnel. We also contacted higher education institutions, who disseminated the link via newsletters to their alumni networks and others.

This survey began with questions that limited the respondents to the same doctoral degree award years as the first survey, and that also ensured that the respondents were employed outside higher education – in Sweden or abroad. A total of 370 individuals responded to the survey, of which 296 were of the correct doctoral degree award years and employed outside higher education.

Description of analysis of and drop-out from the surveys

The responses to both the surveys were collected and analysed anonymously. In addition to the respondent categories described above, the survey included a number of descriptive questions. For the survey aimed at persons who had applied for funding from the Swedish Research Council, we received 1 795 responses, divided up into various descriptive categories as shown in

Table 2.

Table 2. Responses to the survey aimed at applicants to the Swedish Research Council, divided up into various descriptive categories. The proportions are relative to each category.

	Response Number	Proportion
Total number of responses	1 795	
Age group		
30–34	96	5%
35–39	554	31%
40–44	646	36%
45–49	240	13%
50–	254	14%
Not stated	5	0%
Gender		
Woman	935	52%
Man	806	45%
Non-binary	9	1%
Don't want to state	25	1%
Not stated	20	1%
Doctoral degree cohort		
2009–2012	1 138	63%
2013–2016	657	37%
Employment sector		
Higher education	1 621	90%
Higher education (technical or administrative position)	41	2%
Outside higher education	133	7%
Employment category		
Professor	129	7%
Senior lecturer	726	40%
Research associate/Associate senior lecturer	267	15%
Researcher employment	376	21%
Employment as postdoc	63	4%
Other	59	3%
Not applicable	175	10%
Research subject area		
Humanities	204	11%
Agricultural sciences	11	1%
Medicine and health	329	18%
Natural sciences	443	25%
Social sciences	498	28%
Engineering sciences	130	7%
Not stated	180	10%

The responses from those who stated that they were employed outside higher education ($n=133$) were added to the responses from the survey aimed at persons employed outside higher education, and were analysed together (see below). The responses from those who stated their employment sector in higher education as technical or administrative were too few to follow up individually, but were included where the entire group was analysed. The same applies for the responses from those who stated other than woman or man to the question of gender; these are included in analyses where the whole group is studied, but are not reported separately.

Most of the analyses are based on the 1 573 responses from women and men who stated they were employed in higher education in employment categories that entail research and teaching. These are divided up into different descriptive categories according to the table below.

Table3. Responses from persons active in higher education divided up into different descriptive categories. For gender, the proportion is relative to the total number of responses, for other categories the proportion is relative to the total number of women and men respectively in each category.

	Women		Men		Total	
	Number	Proportion	Number	Proportion	Number	Proportion
Gender	843	54%	730	46%	1 573	100%
Age group						
30–34	34	4%	48	7%	82	5%
35–39	254	30%	244	33%	498	32%
40–44	268	32%	299	41%	567	36%
45–49	140	17%	74	10%	214	14%
50–	147	17%	64	9%	211	13%
Not stated	-	-	1	0%	1	0%
Doctoral degree cohort						
2009–2012	534	63%	464	64%	998	63%
2013–2016	309	37%	266	36%	575	37%
Employment category						
Professor	52	6%	67	9%	119	8%
Senior lecturer	413	49%	299	41%	712	45%
Research associate/Associate senior lecturer	128	15%	130	18%	258	16%
Researcher employment	196	23%	168	23%	364	23%
Employment as postdoc	24	3%	36	5%	60	4%
Other	30	4%	29	4%	59	4%
Not stated	-	-	1	0%	1	0%
Research subject area						
Humanities	109	13%	91	12%	200	13%
Agricultural sciences	7	1%	4	1%	11	1%
Medicine and health	207	25%	113	15%	320	20%
Natural sciences	177	21%	248	34%	425	27%
Social sciences	294	35%	192	26%	486	31%
Engineering sciences	45	5%	81	11%	126	8%
Not stated	96	11%	77	11%	173	11%
Decision						
Rejected	587	70%	470	64%	1 057	67%
Approved	256	30%	260	36%	516	33%

The largest group of respondents from higher education with research or teaching tasks are employed as senior lecturers; 49 per cent of women and 41 per cent of men. The second largest group are those with researcher employment; 23 per cent for both women and men. Thereafter follow the career development positions of research associate/associate senior lecturer, with 15 per cent of women and 18 per cent of men, and professors, with 6 per cent women and 9 per cent men. 3 per cent of women and 5 per cent of men stated that they were employed as postdocs, while 4 per cent of both genders stated other as employment description.

Those who stated a main subject in the survey that falls within social sciences formed the largest group among women, at 35 per cent, and the second largest group among men, at 26 per cent. The largest group among men are active in natural sciences, at 34 per cent, while women in this subject area form 21 per cent of the respondents. A higher proportion of women work in medicine and health, 25 per cent, while the proportion of men working in this field constitutes 15 per cent of the respondents. The proportion who are active in humanities is around 13 per cent of both women and men. Engineering sciences, finally, is the subject area where 11 percent of men and 5 per cent of women work.

Compared to the fields of research for higher education research and teaching personnel (in 2019, individuals with doctoral degrees), a higher proportion of women among the respondents are active in natural sciences and social sciences. For both women and men, the proportion of respondents from medicine and health is lower than the proportion in higher education who are active in the area, and this also applies for engineering sciences, in particular men.

Those who have left higher education

Responses from those who have left higher education are based both on those who answer that they have left higher education in the survey aimed at those who applied for funding from the Swedish Research Council (n=133) and the answers from the other survey (n=299). In the latter, the material has been cleared of those who were not awarded their doctoral degrees during the period specified, or who responded despite being active in higher education. The answers from these two groups were merged and analysed together. The survey included one question relating to gender, with the options of stating “non-binary” or “don’t want to state”, in addition to “woman”/”man”. A total of nine answers state other than woman/man, which is too small a group to draw any conclusions from, and these have therefore been removed. The summary in Chapter 3 is therefore based on 423 responses from persons working outside higher education, and they are divided up into a number of descriptive categories in Table 4.

Table 4. Responses from persons active outside higher education, divided up into various descriptive categories. For gender, the proportion is relative to the total number of responses, for other categories the proportion is relative to the total number of women and men respectively.

	Women		Men		Total	
	Number	Proportion	Number	Proportion	Number	Proportion
Gender	267	63%	156	37%	423	100%
Age group						
30–34	10	4%	9	6%	19	4%
35–39	80	30%	67	43%	147	35%
40–44	93	35%	50	32%	143	34%
45–49	38	14%	13	8%	51	12%
50–	46	17%	16	10%	62	15%
Not stated	-	-	1	1%	1	0%
Doctoral degree cohort						
2009–2012	137	51%	84	54%	221	52%
2013–2016	130	49%	72	46%	202	48%
Employed outside						
Outside higher education in Sweden	249	93%	143	92%	392	93%
Outside higher education abroad	18	7%	13	8%	31	7%
Employment sector						
Industry or private business sector	77	29%	71	46%	148	35%
Public sector	135	51%	58	37%	193	46%
Abroad	18	7%	13	8%	19	4%
Other	37	14%	14	9%	51	12%
Research subject area						
Humanities and social sciences	92	34%	40	26%	132	31%
Medicine and health	94	35%	36	23%	130	31%
Natural and engineering sciences	79	30%	78	50%	157	37%
Not stated	2	1%	2	1%	4	1%

The women included in the group of persons active outside higher education are divided up relatively evenly between the fields of research humanities and social sciences, medicine and health, and natural and engineering sciences, while just over half of the men in this group are active in the last subject area. The remaining men are divided up relatively equally between the other two areas. Half of the women are active in the public sector, 30 per cent in industry or private business sector, and 15 per cent have stated other. Of the men, 46 per cent are active in industry or private business sector, 37 per cent in the public sector, and 9 per cent have stated other. 2 and 4 per cent respectively stated that they are active outside higher education in a country other than Sweden. Finally, 68 per cent of women and 63 per cent of men state that they have worked in Swedish higher education after being awarded their doctoral degrees.

Interviews

We also conducted interviews with representatives of nine departments at six higher education institutions (HEIs), for the purpose of obtaining a complementary perspective from the departments on the questions the researchers had answered in the survey. The reason why we interviewed representatives of departments was that we wanted to investigate how gender equality measures can be designed and implemented at department level. The choice of departments was based on Swedish Research Council information on the departments where the researchers who had been awarded doctoral degrees during 2009 to 2016 and had received the Swedish Research Council's grants for junior researchers could be found. To begin with, we selected those who had been the recipients of the largest number of grants, but certain adjustments were made to achieve a variation between both HEIs and fields of research.

The final selection was as follows: Two departments each at Stockholm University, Uppsala University, and Lund University. One department each at the University of Gothenburg, the Royal Institute of Technology (KTH), and Karolinska Institutet. If we follow the Swedish Research Council's subject division, the selection was as follows: Three departments each in medicine and health, and in natural and engineering sciences. Two departments in humanities. One department in educational sciences

The interviews were conducted using the digital tool Zoom. Interview questions were sent via email once we had agreed on a suitable time. The interviews were conducted during March and April 2021. In conjunction with the interviews, we partook of the HEIs' reports to the Swedish Gender Equality Agency about planned and implemented initiatives within the framework for their mandate for gender equality in higher education (Jämställdhet i Högskola och Universitet, JiHU), which gave us an overview of the activities that were ongoing at each HEI. When reporting the interviews, all answers are referenced as being from the "department head", even if the interviews were sometime conducted with persons in other positions, such as deputy department heads.

Cohort study of the careers of women and men after doctoral degree awards

To follow how women's and men's careers develop after their doctoral degree awards, we conducted a statistical investigation of the employment conditions for women and men in four different doctoral degree year cohorts (the 'cohort study'), based on data from Statistics Sweden. The earliest cohort covers persons who were awarded their doctoral degrees during the years 1998 and 1999. The other cohorts consist of persons who were awarded their doctoral degrees during the years 2002–2003, 2006–2007, and 2010–2011. The four cohorts are

designated in the text as 9899, 0203, 0607, and 1011. The study only included persons who were younger than 60 years at the time of their doctoral awards.

For each year after their doctoral degree award, we investigated where the persons were employed and, for those who were employed in higher education, also within which employment category. The data is taken from the LISA register³⁸ and from the register of higher education personnel respectively. The LISA register is based on data in November/largest income source during the year. The register of higher education personnel is based on a person receiving a certain income from a higher education institution in October each year. When a person is employed both within and outside higher education, higher education has been prioritised where the person is employed during 50% or more there. When a person has several different employments in higher education, the highest ranked position has been prioritised. The documentation lacks information whether the employment is permanent, temporary, or a locum position.

A large majority of one cohort is active outside Swedish higher education, and for these persons we report the societal sector they are active in. Persons who are on leave from higher education for various reasons, such as parental leave, or who for other reasons do not receive an income from higher education are not included in the register of higher education personnel. These persons are, however, included in the LISA register, and are then reported as employed in the public sector (provided they normally work at a public higher education institution). This means that the high proportion reported as being employed by the public sector during their first years after being awarded doctoral degrees may be persons who are employed in higher education, but who for various reasons may have been on leave during October, when the data from the register was collected. For those who were not included in the LISA register, we instead reported whether they were included in the Swedish population register or not.

The data was collected for every year after the doctoral degree award up until the last available year in each register, which was 2019 for the register of higher education personnel, and 2018 for the other registers.³⁹ The other variables are subject area for doctoral degree, and whether the person is a Swedish or immigrant doctoral student.⁴⁰ For doctoral degree holders in medicine and health, the first cycle education also forms a variable, divided up into the three groups of physician education, healthcare education, and other. The group designated as ‘other’ is assumed to consist of persons with first cycle education in basic medical sciences. We have chosen to include doctoral degree holders from a foreign higher education institution who are active in Sweden. However,

³⁸ Longitudinell integrationsdatabas för sjukförsäkrings- och arbetsmarknadsstudier (LISA), SCB.

³⁹ The significant parts of the design of the study follow (4).

⁴⁰ Follows the Swedish Higher Education Authority’s definition of foreign doctoral degree students.

for these there is no data on subject area, and they are also not included in the analysis, unless otherwise is specifically stated.

The cohorts' distribution by women and men and by subject area of doctoral degree is shown in Table 5. Proportion of women increases between cohorts. The 9899 cohort consists of 35 per cent women and 65 per cent men, the 0203 cohort of 44 per cent women and 56 per cent men, while the 0607 cohort consists of 46 per cent women and 53 per cent men. The latest cohort studied (1011) includes those who were awarded doctoral degrees in 2010 or 2011, and consists of 49 per cent women and 51 per cent men.

Table 5 Cohort size and distribution by subject area for doctoral degree and gender. Source: Statistics Sweden.

Subject area	First cycle education (MH)	Doctoral student	1998–1999		2002–2003		2006–2007		2010–2011	
			W	M	W	M	W	M	W	M
N		Swedish	232	591	352	642	369	663	344	506
		Immigrant	42	139	74	176	115	196	135	215
T		Swedish	108	427	152	454	193	507	176	383
		Immigrant	10	64	44	123	50	174	71	204
MH	Other first cycle education	Swedish	214	219	379	233	493	236	461	210
		Immigrant	80	142	114	130	163	165	164	203
L	Physician education	Swedish	153	314	222	280	204	244	228	230
		Immigrant			3			3		
S	Healthcare education	Swedish	95	53	170	49	223	66	262	62
		Swedish	60	69	67	43	56	40	57	22
HK		Immigrant	10	24	9	27	12	30	14	32
		Swedish	217	372	366	392	378	378	369	282
S		Immigrant	12	26	28	34	35	56	48	65
		Swedish	139	170	239	243	229	173	171	152
HK		Immigrant	11	12	13	16	16	16	16	12
		Foreign doctoral degree holder	319	525	548	709	782	1 007	885	1 102
Total			1 702	3 150	2 777	3 551	3 321	3 951	3 401	3 680

The average age at doctoral degree award⁴¹ in the 9899 cohort was 39 years for women and 37 years for men. In the later cohorts, the average ages had decreased slightly, and was 36 years for men. The average ages for women is 38 years in the 0203 cohort, 37 years in the 0607 cohort, and 38 years in the 1011 cohort. Women are consequently a year or so older than men throughout. Table 6 shows the average age at doctoral degree award for women and men in different fields of research and cohorts.

⁴¹ For persons younger than 60 years

Table 6. Average age at doctoral degree award for women and men in different fields of research and cohorts. Source: Statistics Sweden.

Year of doctoral degree award	1998–1999		2002–2003		2006–2007		2010–2011		
	Subject area	W	M	W	M	W	M	W	M
H		44.8	42.7	40.9	39.8	41.6	40.6	41.4	41.3
L		36.0	37.6	36.0	37.9	35.1	37.5	36.7	40.9
MH		39.8	39.5	39.3	38.7	39.0	38.8	39.7	38.9
N		33.6	33.6	33.2	33.3	33.5	33.2	33.6	33.3
S		44.1	39.4	42.7	38.8	41.0	39.4	41.2	40.4
T		35.6	35.2	34.9	33.9	34.9	34.7	34.5	34.8

Cohort study of careers after doctoral degree award for researchers who applied for funding from the Swedish Research Council

To investigate any differences between those who apply for funding from the Swedish Research Council and those who are active in higher education generally, we conducted complementary cohort studies.

These cohorts included researchers who had been awarded doctoral degrees during the period 2005 to 2016 in Sweden or abroad, and who had applied to the Swedish Research Council for a grant aimed at junior researchers⁴² and/or a project grant⁴³ at a career age⁴⁴ of maximum eight years during the period 2010 to 2019. Information on employment category in higher education or employment sector outside higher education was collected from Statistics Sweden in the same way as described above for the other cohorts. The doctoral degree holders were grouped according to gender, year of doctoral degree award (2005–2008, 2009–2012 or 2013–2016), subject area, and grant award decision. Grant award decisions were coded, so that a person who had at any time been awarded support from any of the support forms in question during the period 2010–2019 were classified as ‘approved’, while all others were classified as ‘rejected’.

The oldest cohort covered just under 2 600 researchers, of which 45 per cent women and 55 per cent men. The middle cohort covered just over 2 750 researchers, of which 46 per cent women and 54 per cent men, while the youngest cohort covered just under 1 430 researchers, of which 44 per cent women and 56 per cent men. In total, 19 per cent of women and 23 per cent of

⁴² Grant forms aimed at junior researchers are available in natural and engineering sciences and in medicine and health, and include: Grant for employment as research associate; Starting grant – junior researcher; International career grant; Project grant junior researcher.

⁴³ All grant forms relating to project grants were included, that is: Project grant; Undirected project grant; Project grant with focus.

⁴⁴ Career age was calculated based on year of doctoral degree and year of application, that is: career age = year of application – year of doctoral degree award.

men received approval for grants from the support forms in question. The approval rate for women and men respectively within the fields of research is similar in humanities and social sciences for all three cohorts. In medicine and health, the approval rate is lower for women in all three cohorts, in natural and engineering sciences it is slightly lower for women in the first two cohorts, but higher in the last, while it is lower for women in educational sciences in the first two cohorts, and equal in the last. The cohorts' distribution by women and men, subject area, and approval/rejection decision is shown in Table 7.

Table 7 Size and distribution of cohorts of applicants to the Swedish Research Council by application subject area, gender, year of doctoral degree award, and decision. Source: Statistics Sweden.

Year of doctoral degree award	HS		MH		NT		U		Total	
	Decision	Women	Men	Women	Men	Women	Men	Women	Men	
2005–2008		351	336	421	332	262	695	121	77	2 595
Rejected		296	279	351	246	190	497	98	52	2 009
Approved		55	57	70	86	72	198	23	25	586
2009–2012		408	382	388	299	321	736	149	69	2 752
Rejected		325	307	330	242	245	543	120	52	2 164
Approved		83	75	58	57	76	193	29	17	588
2013–2016		261	278	156	129	141	335	74	53	1 427
Rejected		222	230	140	106	110	277	60	43	1 188
Approved		39	48	16	23	31	58	14	10	239
Total		1 020	996	965	760	724	1 766	344	199	6 774

Age at appointment as professor

To describe the age of the women and men who were appointed as professors, data from Statistics Sweden was used, based on the register of higher education personnel. Information on employment category is included in this register as from 1995. The summary includes data on median and mean ages of newly appointed professors in total and per subject area for those who were appointed between 2005 and 2019, grouped into two-year intervals. A 'newly appointed professor' refers to a person who for the first time is found in the employment category 'professor' in the register. Fields of research included in the summary are humanities and social sciences, medicine and health, and natural and engineering sciences. As from 2012, a new classification of Swedish research was introduced in the subject classification standard "Standard för svensk indelning av forskningsämnen 2016" by Statistics Sweden/Swedish Higher

Education Authority, which was then updated in 2016. To obtain data for a longer time period, the highest levels in the previous standard national register of research subjects “Nationell förteckning över forskningsämnen”, which applied up until the change, were matched with the corresponding highest level in the new classification.

Appendix 2: Supplementary figures

Cohort study

This section describes data for the four cohorts studied. The figures show how the women and men of the cohort are divided up into employment categories in higher education, societal sectors in Sweden, and, for those who have no occupation in Sweden, whether they are included in the population register, for every second year after their doctoral degree award.

Natural sciences

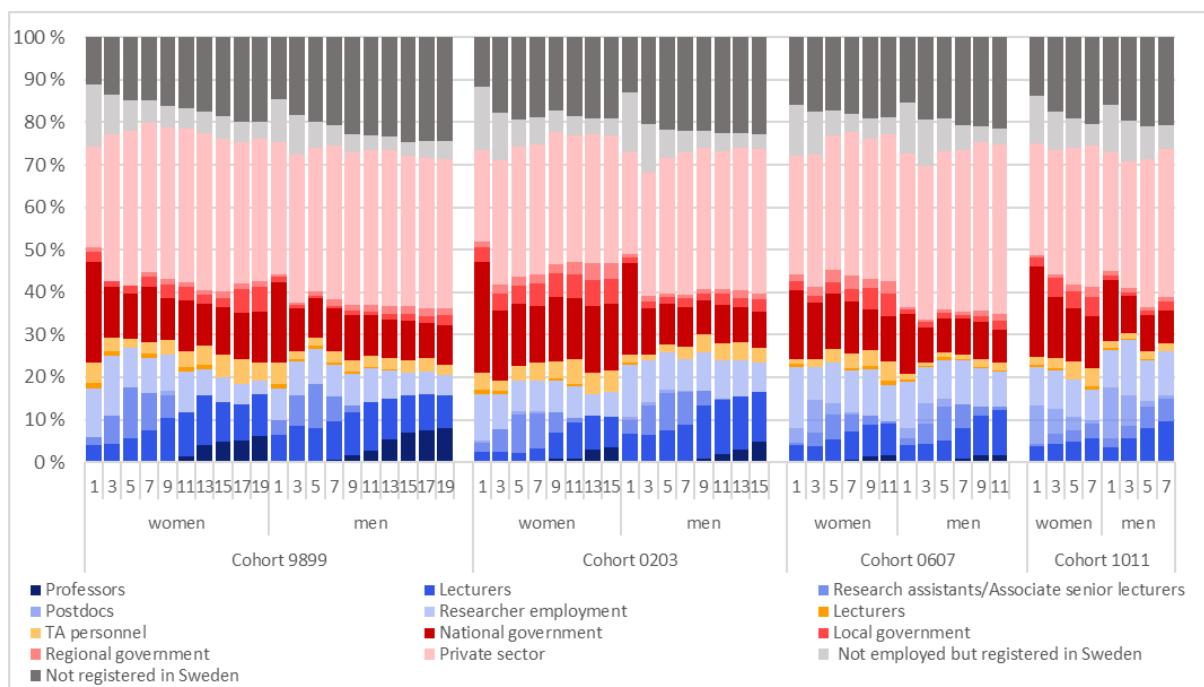


Figure 19: Occupation of female and male doctoral degree holders in natural sciences, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Engineering sciences

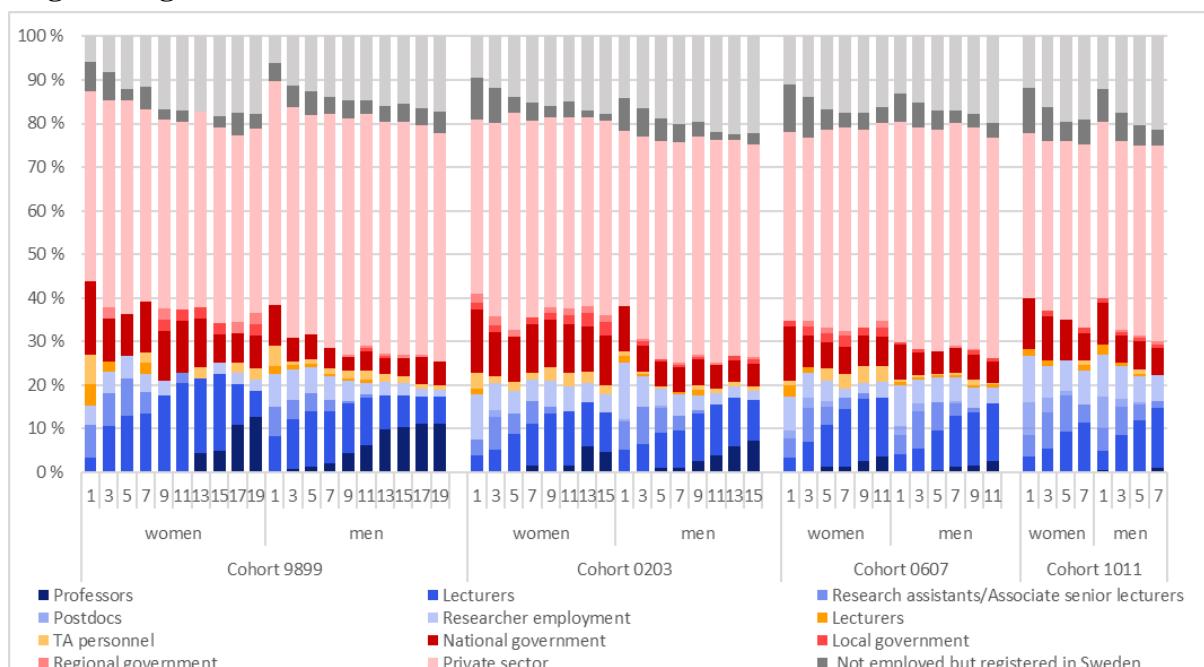


Figure 20 Occupation of female and male doctoral degree holders in engineering sciences, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Medicine and health

Basic medical sciences (first cycle higher education)

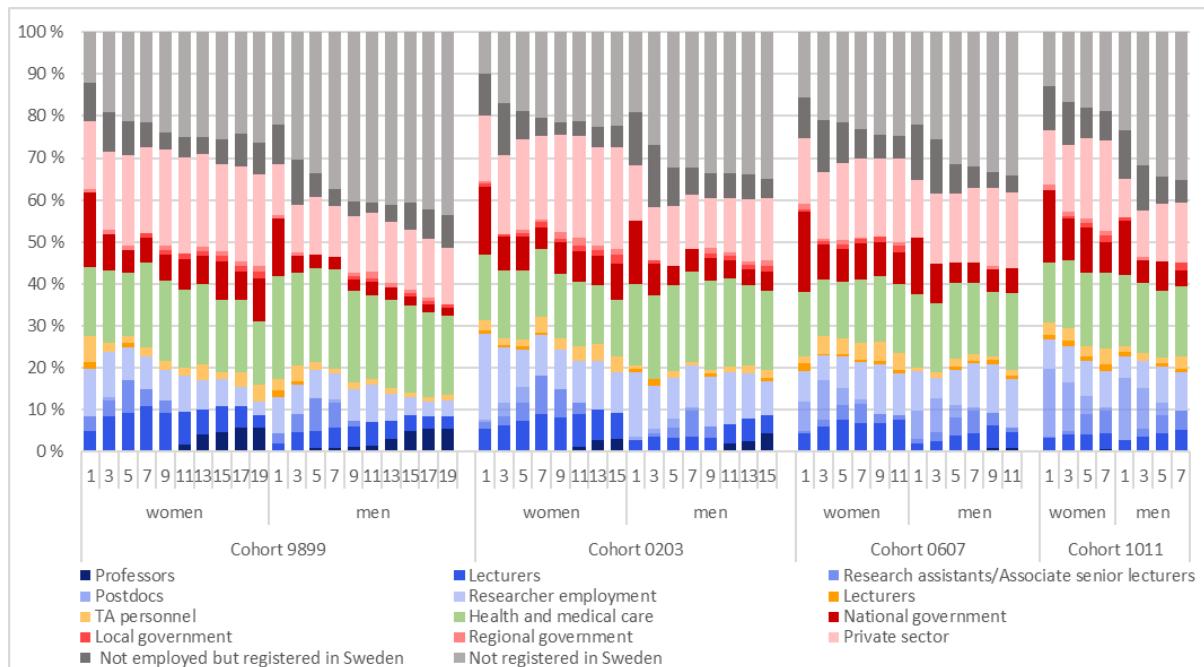


Figure 21 Occupation of female and male doctoral degree holders in medicine and health with first cycle degrees in basic medical sciences, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Physician education

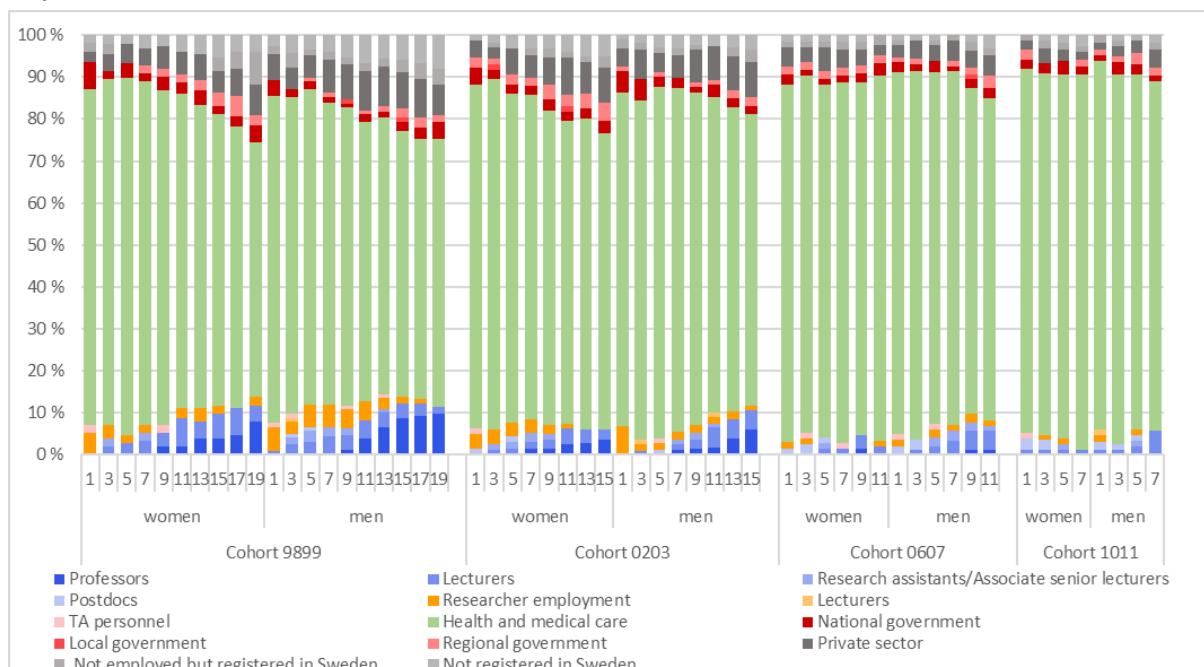


Figure 22 Occupation of female and male doctoral degree holders in medicine and health with physician education, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Healthcare education

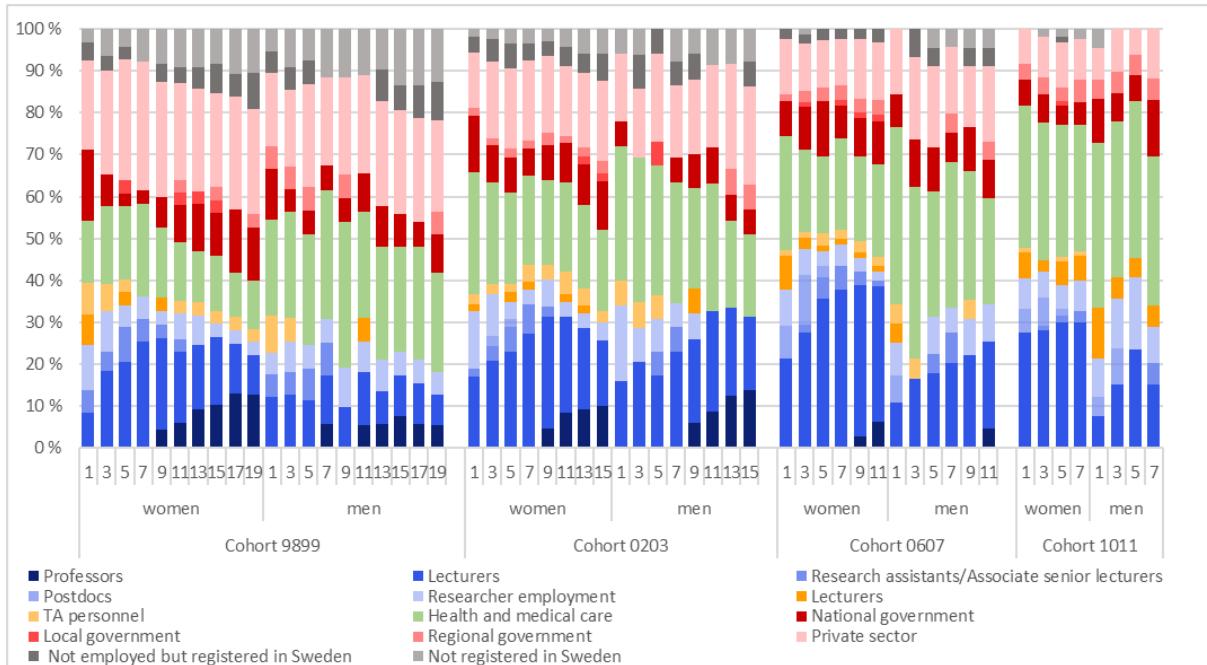


Figure 23 Occupation of female and male doctoral degree holders in medicine and health with medium-length healthcare education (nurse, etc.), every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Social sciences

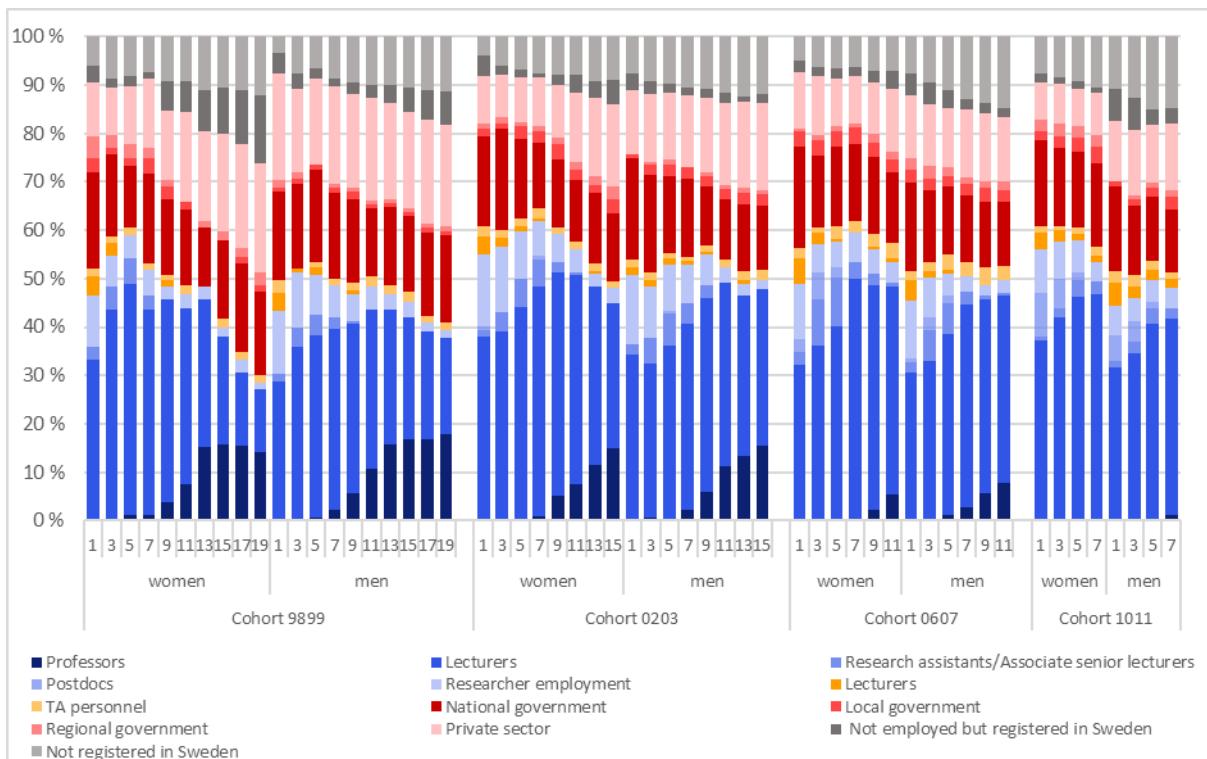


Figure 24 Occupation of female and male doctoral degree holders in social sciences, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Humanities and arts

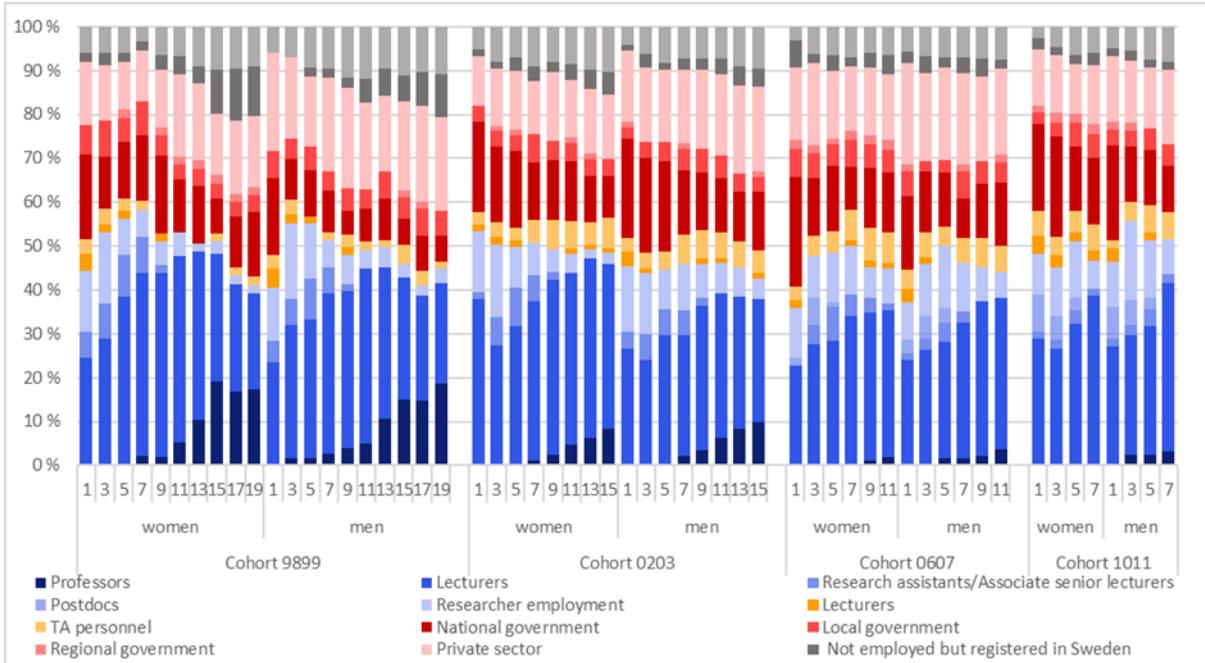


Figure 25 Occupation of female and male doctoral degree holders in humanities, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

Foreign doctoral degree holders (all subjects)

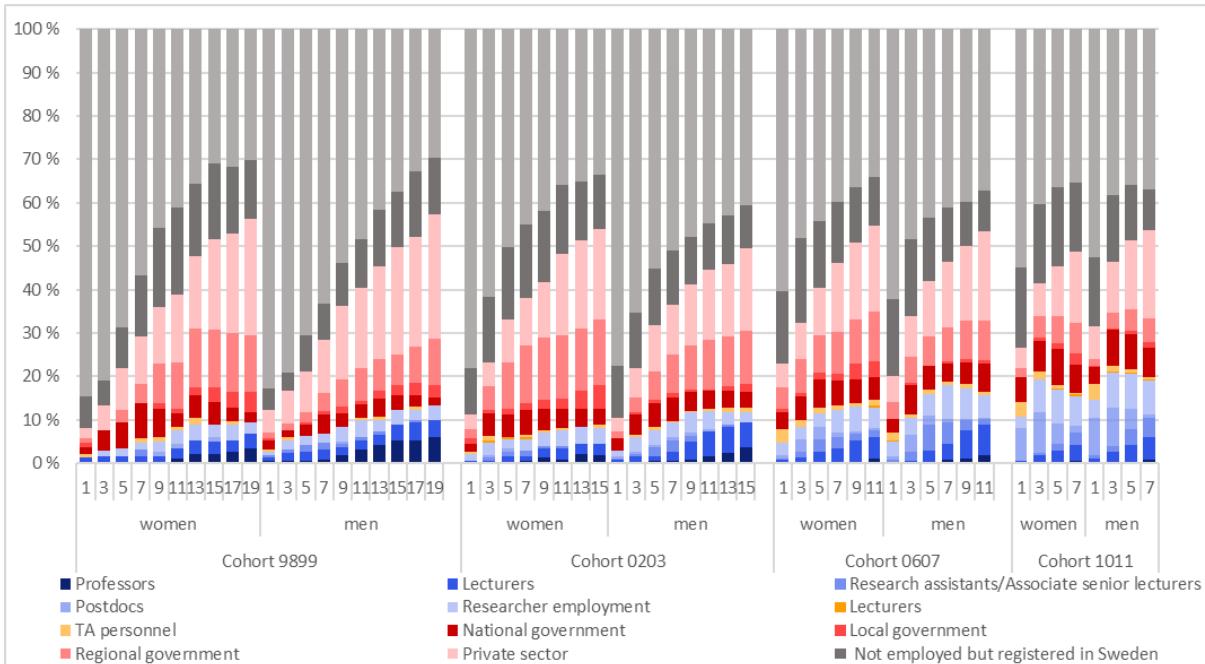


Figure 26 Occupation of female and male doctoral degree holders, every second year after doctoral degree award. Source: Statistics Sweden, calculations: The Swedish research council.

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