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# Gender and Research Funding (GEFO)

## Final Report and Synthesis

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October 2008

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## Preface

Many people and institutions have contributed to making a range of material and analyses available for this final report on the project "Gender and Research Funding" (GEFO). As the project leaders, we wish to offer our sincere thanks again to everyone who took part. The project involved the following institutions and individuals:

*University of Teacher Education Zurich (PHZH)*

Regula Julia Leemann, Andrea Keck, Sandra Da Rin, Susan Gürber

*Centre for Labour and Social Policy Studies BASS, Berne*

Heidi Stutz, Philipp Dubach, Jürg Guggisberg, Gesine Fuchs, Silvia Strub

*Federal Statistical Office (BFS), Neuchâtel*

Katrin Schönfisch, Sabina Schmidlin

*Service de la recherche en éducation, Geneva (SRED)*

Irène Schwob, Shams Ahrenbeck, Karin Müller

*Socioeconomic Institute, University of Zurich (SOI/UZH)*

Stefan Boes

The English translation was provided by Dr. Misha Kavka of the University of Auckland, New Zealand.

In addition, we have been dependent on the generous cooperation of numerous people at the Swiss National Science Foundation (SNF), in particular for the analyses of its electronic application administration system and of individual applications to the SNF. The experts at the SNF, moreover, always made themselves available with valuable technical advice. To them, too, we offer our sincere thanks.

The GEFO advisory group followed our work closely and helped to advance it in very constructive ways with their input and feedback. We wish to thank Prof. Franz Schultheis (St. Gallen), Prof. Beate Kraus (Darmstadt), Prof. Thomas Hinz (Konstanz), Prof. René Levy (Lausanne) and Prof. Christian Suter (Neuchâtel).

All roads lead back to Maya Widmer, equality representative of the SNF, who gave us pivotal support with her overview, references, information and contacts. Our special thanks go to her.

# Summary

## Objectives

The study, which was commissioned by the Swiss National Science Foundation (SNF) to address the topic of “Gender and Research Funding” (GEFO), aims on the one hand to collect and quantify the gender-specific rates of loss from the academic career path (Leaky Pipeline) in the Swiss higher education system. On the other hand, it investigates the reasons, both academic and non-academic, for the disproportionate loss of women from the academic career path. Of particular interest are the significance and role of the SNF and other research funding institutions in the academic (dis)integration of female emerging researchers. The study is thus also centrally concerned with issues of access to research funding, the success of applications and the effect of research funding on academic careers.<sup>1</sup>

## Research design and evidence base

The research questions are addressed by a triangulated process using various evidence bases and methodological approaches. The envisioned target group consists of emerging researchers from all disciplines. The following substudies were carried out:

- (1) Progress analyses of the transitions from Master’s level to doctorate and doctorate to habilitation, based on data about individuals taken from the Swiss Higher Education Information System (SHIS).<sup>2</sup>
- (2) Analyses of the career paths of people awarded a doctorate in 2002, based on a panel survey of doctoral graduates as part of the University Graduates Survey carried out by the Federal Statistical Office (BFS).
- (3) Evaluations of first-time applications submitted to the SNF in the researcher’s own name between 2002 and 2006 for project funding or an SNF professorship, based on data from the application administration system at the SNF.
- (4) Analyses of SNF application files submitted by first-time applicants in four selected disciplines: human medicine, physics/astronomy, law and linguistics/literature.
- (5) Qualitative interpretive analyses of interviews with doctoral graduates from substudies 2 and 4 above.

## Description of the “leaky pipeline”

The analyses of data from the Swiss Higher Education Information System (SHIS) show that, at the transition points under investigation (doctorate and habilitation), disproportionately large numbers of women fall out of the academic system in comparison to men. Without the influx from abroad of women at the doctoral level and above, the potential pool of female emerging researchers in the Swiss higher education system would be even smaller, especially in those subject areas with a low proportion of women.

Understanding the “leaky pipeline” effect requires that we take discipline-specific differences into account. In the technical sciences and in economics, as well as in particular disciplines within the hard and natural sciences, the choice of the subject area for Master’s study itself represents a gender-specific hurdle. The transition from the Master’s degree<sup>3</sup> to the doctorate thus repre-

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<sup>1</sup> The term *Wissenschaft*, which literally means “science”, has been translated throughout this report as “academy” or “research”. Despite the increasing use of “science” throughout the European Union to refer to the entire tertiary education and research system, in Anglo-American contexts the term refers only to the hard, natural and technical sciences. In order not to exclude people working in the other disciplines, especially humanities and social sciences, I have decided to use the more open term “academy” in place of “science”. – Trans.

<sup>2</sup> The habilitation is a research-only degree, required in most disciplines (except natural science) in German Switzerland for access to the professorial level. It is undertaken after successful completion of the doctorate.

<sup>3</sup> “Master’s degree” is used here to refer to the *Lizentiat* or *Diplom*, awarded by Swiss universities. The

sents a less notable gender disparity. By contrast, in the humanities and social sciences, where the proportion of women studying for a Master's degree is high, the start of doctoral study represents the first decisive barrier for women, while completing a habilitation represents the second. In medicine and pharmacy, gender-specific differences up to and including the doctoral level are comparatively small, but thereafter women make the transition to the habilitation stage much less frequently.

After the Master's degree, it is the start – and to a lesser extent the successful completion – of a doctorate that constitutes a gender-specific obstacle. Particularly in law, humanities, social sciences and economics, women who have earned a Master's degree begin doctoral study much less frequently than men. Of those who do begin the doctorate, women complete it less frequently than men, although the differences between the success rates for women and men are smaller at this stage than at the transition to doctoral study.

In general, over the approximately twenty-year period under investigation (1978-2006), a convergence can be seen in doctoral rates broken down by gender. This, however, can predominantly be ascribed to the fact that the number of men who earn doctorates has been decreasing over the long term, especially in law, humanities, social sciences, and hard and natural sciences.

An investigation of *professional careers* (positions in higher education) shows that, within five years after the doctorate and taking into account disciplinary differences, there are no indications of a disproportionate number of women dropping out of the academic career path. They are just as frequently employed in higher education and have an academic position just as often as men. A withdrawal or forced exit of women from academic employment is not (yet) discernable in the post-doctoral phase. It can therefore be assumed that at this crucial stage of the academic career there is an undiminished pool of female emerging researchers who are attempting to pursue an academic career after the doctorate.

### **Research funding at the SNF**

Up to five years after the doctorate, women submit applications for individual and project funding to the SNF and other research support institutions just as frequently as men. Amongst those researchers between 2002 and 2006 who submitted applications for the first time to the SNF for project funding or an SNF professorship, women did not submit fewer applications than men, and they received equal amounts and had the same chances of success.

Furthermore, there are no indications that women attempt to finance their careers more frequently with the acquisition of third-party funding like fellowships or research grants, which would be an index of their poorer academic integration, nor do we find evidence for the argument that women have to overcome greater hurdles in order to submit a funding application or to have it approved. On the basis of the interviews, there is no evidence that women are less well informed about the possibilities of research funding, that they have a greater reluctance to apply for funding, or that they experience the SNF as being less accessible and less supportive than men do. In recent years the SNF has made various efforts with regard to equality between women and men. These now seem to be paying off.

The research funding provided by the SNF and other institutions has had a demonstrable effect on the academic career paths of women and men. Having an application approved supports one's chances of remaining in the academy after the doctorate, increases the likelihood of undertaking

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Lizentiat/Diplom is generally considered to be equivalent to the Anglo-American Master's degree, since it requires at least five years of study and incorporates a research component. The *Lizentiat/Diplom* model is now being phased out, gradually replaced since 2001/2002 by a BA/MA system in accord with Anglo-American universities. The time frame of the present study means that most of the data collected here relates to people who have been through the *Lizentiat/Diplom* system, unless they were educated outside of Switzerland. Our sample thus consists of graduates with a *Diplom* (in the natural sciences), a *Lizentiat* (in the humanities and social sciences), or a corresponding professional qualification in law or medicine. – *Trans.*

postdoctoral study in a foreign country, and extends one's academic contacts abroad. The SNF thus has considerable opportunity to influence and improve the career chances of women in the academy. No demonstrable effect could be established between SNF research funding and the publication output of emerging researchers.

### **Integration**

After the doctorate, women receive less *career-specific support* from senior academics, male or female, in the sense of *mentoring*. This is one of the most significant factors leading to the disproportionate drop-out rate of women from the academic field. As the results for the doctoral phase show, career-specific support increases the likelihood of remaining in the academy and undertaking research abroad; it also increases the chances of receiving further support from mentors at later career stages, promotes the submission of applications for fellowships at the SNF, supports the development of an academic network and increases publication output.

Receiving no mentoring means receiving no support from an established lecturer or professor who operates in the background as a patron and gatekeeper, writes references, helps establish contacts and vouches for the capability of the mentee. It means not having someone who can introduce the emerging researcher to the rules of the game, its requirements and practices. The crucial aspects of integration and support, without which an academic career is not possible, are thus lacking, including advice on submitting applications for research funding, job offers – especially after one's return from abroad – and opportunities for (joint) publications.

Like many other studies, our investigation also substantiates the poorer integration of female emerging researchers into the *academic contact network*. This holds, however, only for contacts with professors and peers in research institutions abroad, not for contacts in Switzerland. An established network is one of the pivotal factors when it comes to deciding whether a career is successful or should be discontinued. This is because social contacts, which are established and developed over time, are a form of capital as well as a safety net. They can lead to further relationships and collaborations which are important for one's visibility, reputation, integration and productivity, and they generate cultural, symbolic and even economic capital. *International* social capital is increasingly becoming important. Periods spent abroad, publications in international journals and research collaborations with foreign institutions all serve as a means of distinction in the symbolic battle for recognition and self-demarkation.

The weaker support for and integration of female emerging researchers in the academic network is part of a very subtle ongoing disintegration process, which begins at the doctoral stage and continues up to the postdoctoral phase. Women thus have fewer opportunities to build up the capital necessary for an academic career; they experience acts of latent underestimation and disregard, which leads step by step to their withdrawal or elimination from the academic career path.

### **Reconciling research and family life**

Female doctoral graduates who remain in research have children less frequently than their male counterparts, while amongst emerging researchers women without children plan on having them less often than men without children. Women as well as men with doctorates have children less often than the doctoral graduates who have left research within five years. The reconciliation of family and research is thus bound up with problems for men as well as women, but for women the problems are greater. Women are confronted more acutely with deciding for “either research or a family” and they tend to forego one in favour of the other.

When there are children, a dependence on traditional gender roles works to the advantage of men. Half of the fathers can fall back on a partner who is responsible for all of the childcare. This is rarely the case for mothers in research. They are always involved in childcare, either because

they are themselves occupied with childcare duties or because they organise childcare with the help of third parties or childcare centres. Accordingly, female doctoral graduates with children often work part-time, whereas their partners make only small changes in their employment and often continue to be employed full-time. By contrast, the partners of male doctoral graduates reduce their employment hours to part-time or stop working altogether, while the men mostly continue to work full-time. The time that mothers have for academic work is thus much more limited than that of fathers, which can lead the mothers to feel habitual uncertainty about whether they are able to cope with the requirements of an academic career and successfully compete with their male counterparts.

For both sexes, having children leads to time delays and lower chances of success with their first application submission to the SNF (for project funding in their own name or an SNF professorship). Moreover, for both women as well as men, children stand in a negative relation to remaining in the academy and gaining further academic qualifications (habilitation, postdoc). Children impede networking activities abroad and decrease the likelihood of a research period abroad.

Because of the taboos associated in the academy with commitment to partners and family, an uninterrupted and unlimited commitment has become accepted as the decisive criterion of excellence. This gives a competitive advantage to childless researchers over parents, to fathers in traditional roles over fathers who take on partnership roles, and to fathers in general over mothers. This cannot be the goal of the academic pursuit of excellence. It must be taken as a matter of course that having a partner as well as children is as much a part of an academic career as of any other profession.

### **Mobility and internationality**

Academic job markets are internationally oriented. In Switzerland, too, geographical mobility (*incoming, outgoing, returning*) is an important structural condition of the academic field. The academic influx of emerging researchers from abroad has radically increased since the 1990s. In the hard and natural sciences especially, as well as in the technical sciences, this *incoming* mobility has led to a considerable increase in the proportion of women amongst doctoral graduates, while in medicine/pharmacy it has led to an increase in the proportion of women undertaking habilitations.

If we investigate gender-specific markers of *outgoing* mobility, then a first glance reveals no indications of gender difference in the first five years after the doctorate. Just as many women as men go abroad for research periods. What does, however, influence outgoing mobility in gender-specific ways is the commitment to a domestic partner or family. Many men as well as women are not prepared to give up living with their partner in the medium or long term. Children and family planning complicate mobility plans even further. Those who have children are less likely to go abroad. And those who are geographically mobile (temporarily) forego having children.

But the starting point for men is not the same as for women. Men tend to have the option of combining an academic career with geographical mobility without having to give up their social connection to a partner or a family in the long run. Women more frequently face a dilemma, since they cannot count on a partner who would support their flexibility by fitting his career trajectory to the demands of their academic careers. Female emerging researchers thus fit mobility to suit family plans, restrict their movement in terms of time and space, or dispense with academic mobility altogether.

Most emerging researchers, especially those with a Master's degree from Switzerland, wish to return after a period abroad, and they try to find a permanent position in Switzerland in the medium term (*returning* mobility). But they are confronted with the fact that the academic job market in Switzerland is very small. If their partner is also pursuing an academic career, then the planning of a dual career poses nearly insoluble difficulties. Further, the *return* after a research



period abroad is not equally possible for all researchers. It can be assumed that women, who receive less support and – as other studies show – find employment less frequently at universities, have more uncertainties to cope with in relation to returning from a research period abroad.

### **Publication output**

Numerically, women researchers have a significantly lower publication output in the five years after completing a doctorate than male emerging researchers. On average they have only two-thirds as many publications as men. This result accords with a long line of studies on the topic. Since the length of a publication list is one of the most important indicators of academic performance and is significant in applications for positions and funding, the lower publication output of women is a factor that makes it more difficult for them to apply successfully for university positions and research funds, in comparison to their male counterparts.

Our investigations, however, show no indications that this result can be attributed to a fundamentally lower commitment or less academic interest on the part of women. Nor do children have a negative impact on the publication output of women, despite their greater degree of responsibility for childcare and lower degree of support from a partner. The result has much more to do with the weaker integration of women into academic contact networks and the lower level of support from mentors, without which it is not possible to generate academic output or have access to publication platforms.

### **Recommendations**

This report has found no gender-specific discrimination in SNF research funding. Precisely because of this result, which is presumably due to the success of its previous efforts at achieving equality, the SNF today needs to be sensitive to its growing influence as a funder of emerging researchers in Switzerland. As one agent amongst others, the SNF can help to dispel the existing gender-specific barriers on the academic career path by promoting genuine excellence. The following recommendations for action arise from the results of our investigation:

*Increasing the proportion of female doctoral candidates:* The Pro-Doc programme and SNF project funding can be used to increase the proportion of women.

*Requiring evidence of support for emerging researchers:* The SNF can integrate support standards into the submission of applications. With project funding in particular, project leaders who submit an application can be required to give evidence of their previous support practices, including support for women (theses, conference participation, publications, mobility of emerging researchers, etc.), as well as evidence of support planned for emerging researchers in the proposed project. These support practices would be included in the overall assessment of the application.

*Reconciling research and family:* The funding policies of the SNF should recognise other career models than just the uninterrupted career that guarantees a high degree of availability and mobility, which advantages predominantly men and academics without children. The SNF could explicitly incorporate the temporal and geographical limitations posed by having a family into its funding practices (such as when assessing academic performance in applications) by asking applicants to declare such constraints. This would also contribute to dismantling the academic taboo associated with family duties.

*Strengthening career focus:* The SNF can offer career-oriented know-how, experience sharing and networking opportunities to fellowship recipients and participants in research projects.

*Avoiding disintegration in the demand and support for international mobility:* The SNF has the opportunity to promote international mobility, even amongst academic couples, in such a way as to support women (and men) in their attempts to combine career, family and domestic partnership. To achieve this, funding offers should make planning easier, should be able to stretch over a longer term, and should provide the financial means to enable childcare abroad. In addition,

alternative forms of funding in Switzerland remain important, such as subsidies from the Marie Heim Vögtlin Foundation or the new programme Ambizione.

Preventing women from being pushed out of academic university research: Because of the lack of pressure to be geographically mobile, the greater job security and the lower level of career-specific requirements at universities of applied sciences, there is a certain danger in future that women will be pushed out of the academic universities in larger numbers and will migrate to the universities of applied sciences.<sup>4</sup> The SNF can respond to this danger by ensuring the permeability of the two systems through standardised funding practices and by not creating, where possible, any funding instruments exclusively accessible only to the academic universities or to the universities of applied sciences.

Improving recordkeeping and monitoring of funding for emerging researchers: The SNF's application administration system should in future collect application data in a way that makes it possible to undertake more valid statistical evaluations.

*Undertaking further research:* For the emerging researchers temporarily supported by the SNF (e.g., fellowship recipients and participants in research projects), it should be possible to differentiate and evaluate their situations and trajectories according to gender-specific criteria. It would also make sense, by way of long-term studies (in cooperation with the Federal Statistical Office), to regularly monitor academic careers over longer periods.

*Continuing to promote equality at the SNF:* There is still a long way to go in the academic field before gender equality is fully realised. Therefore, the SNF, as an important funding body for emerging researchers and research, has to continue to address the topic of equality. It could prove to be highly counterproductive if the SNF were to rest on the laurels of its initial successes.

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<sup>4</sup> The distinction between “academic universities” and “universities of applied sciences” here represents the distinction made in the Swiss tertiary educational system between *Universitäten* and *Fachhochschulen*. – Trans.

# 1. Introduction

This report marks the end of the study on Gender and Research Funding (GEFO), which was commissioned by the Swiss National Science Foundation SNF (Schweizerische Nationalfonds) and carried out by a research group from the Pädagogische Hochschule Zürich PHZH (University of Teacher Education Zurich), the Büro für arbeits- und sozialpolitische Studien BASS in Berne (Centre for Labour and Social Policy Studies) and the Bundesamt für Statistik BFS, Neuchâtel [Hochschulabsolventenstudien] (Federal Statistical Office [University Graduates Survey<sup>5</sup>]) in co-operation with the Service de recherche en éducation SRED (Education Research Service) in Geneva and the Institut für Sozialökonomie SOI/UZH (Socioeconomic Institute) at the University of Zurich. In this report we draw together the various research strands and reflect on the results, developing an overview which will allow us to draw conclusions and to indicate what steps need to be taken. The first chapter will introduce the premises and goals of the investigation (1.1), outline the conceptual and theoretical approaches (1.2) as well as the research plan (1.3), and briefly introduce the substudies on which the final report and synthesis is based.

## 1.1. Point of Departure and Research Questions

Because the number of women at each stage of the academic career path continues to decrease the further one advances up the ladder, the SNF has two objectives in the GEFO study:

### 1. Quantifying gender-specific loss rates (*leaky pipeline*)

Gender-specific loss rates are to be quantified for the individual disciplines as well as for the academic system as a whole, taking into account, as far as possible, the influx and outflux of university graduates to and from other countries.

### 2. Analysing the reasons for gender-specific loss rates

Further, the academic as well as non-academic reasons for the loss rates are to be investigated (Objective 2a), taking into particular consideration the role played by SNF research funding policies (Objective 2b).

The study consists of five substudies, which together shed light on the magnitude of and reasons for the gender-specific loss rates from various perspectives by using quantitative as well as qualitative methods. Triangulating data sources, methodological approaches and theoretical perspectives, the investigation focuses on emerging researchers, that is, on researchers in the doctorate, postdoc and habilitation phases of their career. This is an optimal focus because, on the one hand, the disadvantages and difficulties experienced by women are particularly important in the phases that precede the professorship, while on the other hand different methodological approaches can illuminate this phase of the academic career from various standpoints, allowing a comprehensive picture to emerge.

The study seeks to give the SNF a scientific basis for planning equality measures and therefore also draws conclusions about the gender politics of research funding. It follows on from other studies (Jänchen and Schulz 2005, Gilland Lutz et al. 2006, Widmer et al. 2005), which in turn hark back to the recommendations of the final report presented by the reflection group GRIPS Gender (2001).

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<sup>5</sup> The University Graduates Survey collects data from people awarded Master's as well as PhD degrees in the Swiss university system. In our study, however, we have analysed only the PhD respondents, and therefore refer to this survey in brief as "survey of PhDs" (Substudy Report 2).

## 1.2. Conceptual bases and theoretical approaches

From a sociological perspective, the university is the institution within the academic community which still possesses the greatest authority to produce and validate knowledge. It is thus socio-politically important that women and men be able to play an equal role in this knowledge production and validation, and that together they determine the direction of academic developments. In an age of increasingly knowledge-based economic development, it is also important to benefit from the potential represented by highly qualified women. Moreover, academic research at universities is a sub-operation market characterised by a high degree of competition; in contrast to the business world, it recognises practically no positions below the professorial level which count as legitimate career goals and in which one can remain in relatively secure employment. It is therefore all the more important that equal opportunity and equal performance assessment are made to count in the competition for the rare top positions, and that social criteria do not play a role.

### **Gender-specific loss rates on the academic career paths of women and men**

Although the proportion of women in the academy has continued to increase at all levels and across all disciplines in recent decades (European Commission 2006), one cannot yet speak of equal representation. The career paths of women and men in the academy and in research are distinguished by three structural characteristics: horizontal segregation, vertical segregation and the interplay of the two. HORIZONTAL SEGREGATION occurs by (sub)discipline, subject area and industry sector because of gender-specific choices made regarding courses of study and specialisations (European Commission 2006; Caballero Liardet und von Erlach 2005; Lévy, Pastor, Alvarez und Crettaz von Roten 2003). VERTICAL SEGREGATION (cf. European Commission 2000, 12f.; Lévy et al. 2003, 9) is the result of the underrepresentation of women at each successive level of the hierarchy of qualifications and positions. Only a longitudinal study of individual cohorts at each of the transition points can determine the extent to which this phenomenon is the result of a gender-specific loss rate between the various academic stages (metaphorically known as the *leaky pipeline*, cf. Alper 1993). Lind and Löther (2007) present a retrospective analysis of ideal-typical career paths in Germany to show that a disproportionate number of women fall out of the system over the course of an academic career.

A third structural criterion appears in the form of the INTERPLAY OF HORIZONTAL AND VERTICAL SEGREGATION. The statistics suggest that gender-specific selection processes come into play at various transition points and in various ways depending on subject area (for ex., European Commission 2000, 14; Lévy und Pastor 2003, 10; Leemann 2002, 102). The statistics, however, are themselves problematic, since an absence or lower degree of gender-specific loss rates can be linked to the influx of women researchers from abroad.

Today, if all subject areas are taken together, women are equally represented among those awarded Master's degrees. In 2007, women made up 51% of graduates (Federal Statistical Office 2008). Previous studies relating to the DOCTORATE in Switzerland also show that women have caught up and gender differences in the doctorate have decreased (Leemann 2005), although the proportion of women amongst all recent PhDs amounts to only 37% (European Commission 2006, 21f).

Two opposing hypotheses can be formulated about whether selection processes in the academic trajectory AFTER THE DOCTORATE are characterised by gender discrimination. In the first thesis, gender-specific processes of educational self-selection and social selection up to and including the doctorate suggest that those women who have "survived" the selection process and are active in research or the academy after the doctorate represent an elect group with particular characteristics (Bourdieu and Passeron, 1971). If this assumption is correct, then no further disproport-

tionate losses could be observed at this stage, which would fit the theory of the *threshold effect* (Etzkowitz, Kemelgor, Neuschatz and Uzzi, 1992).

The opposite thesis claims that there are still unequal selection processes to be found after the doctorate, in support of the *hurdle race* thesis (Toren and Moore 1998) and the *glass ceiling* thesis (Etzkowitz, Kemelgor, Neuschatz and Uzzi 1992; Sonnert and Holton 1995). According to this thesis, the hurdles on the academic career path are consistently higher for women than for men, until women ultimately hit up against an invisible glass ceiling, which is an image for the subtle discrimination and exclusion practices in the appointment of professors. By contrast, men – precisely in those disciplines where there are numerous women at the lower stages – are transported to the top on a *glass escalator* (Williams 1992).

Several EMPIRICAL INDICATIONS suggest that hurdles and self-selection processes do exist after the doctorate. The largest gender differences in Germany are to be found in the transition from the doctorate to the habilitation in medicine (Hochschulrektorenkonferenz 2006, 23). In the investigation by Hinz, Findeisen and Auspurg (2008) in Germany, women researchers in projects funded by the German Research Foundation expressed their intention to do a habilitation less frequently than men involved in the same projects (26% as against 40%, *ibid.*, 68). This result has been also been confirmed for Switzerland in the study done by Berweger and Keller (2005) with researchers in the social sciences and humanities.

With reference to career goals, in the study carried out by Hinz et al. (2008, 68) women researchers funded by the German Research Foundation are also less oriented toward a career in higher education than their male colleagues. 16% of the women, as opposed to 24% of the men, designated this as their preferred goal. The authors of the study, however, do not distinguish between researchers who have completed the doctorate and those who have not. In Berweger's study (2008), women with PhDs in the social sciences or humanities in Switzerland express their intention to pursue an academic career as frequently as the men. Women, however, have lower expectations of themselves in relation to a career, gain less direct teaching experience during their doctoral study, and judge the personal costs of an academic career to be higher. These factors have some effect on their career intentions, so that gender does exert an indirect influence on continuing in an academic career.

In a German study on higher education careers in psychology (Lang and Neyer 2004), the loss rates for women after the doctorate proved greater than those for men. Drawing on cohorts who started their doctorates in the beginning and middle of the 1980s, the study shows that five years after the doctorate 51% of the male PhDs were still employed in tertiary education as opposed to only 39% of the female PhDs. It is above all in the first few years after the doctorate that women drop out with disproportionate frequency. After 15 years, the proportion of men with a university position was 41% and that of women 31%. Within these cohorts, 15% of the men and 10% of the women attained a professorship. The gender gap thus diminished over the course of their careers.

### **Relevance of discipline-specific characteristics**

In principle, we can assume that the structural, cultural and epistemological characteristics of the individual disciplines codetermine gender-specific career chances (Heinz, Merz and Schumacher 2004; Leemann 2002). Historically, disciplines have developed into relatively independent subsystems with their own regulations, organisations and social functions (cf. Stichweh 1988; Whitley 1982). Careers in higher education are thus not only framed by the structures, cultural norms and values of the entire university system and academic community, but are also strongly bound to the institutional characteristics of the disciplines and faculties to which researchers belong. The analysis of career patterns will thus take into account discipline-specific characteristics, which can lead to the unequal integration of women into the academy.

### **Gender-specific barriers to academic careers**

In analysing the causes behind the disproportionate decrease in numbers of women on the academic career path, we can differentiate between NON-ACADEMIC FACTORS or personal factors (like gender, age, social class, family situation, motivation and career-orientatedness) and ACADEMIC FACTORS or factors belonging to the academic field (such as research culture, disciplinary culture, mentoring support, involvement in networks, integration in the university) (Lind 2004). The individual characteristics and personal situations of people, however, can always be traced back to the characteristics of the academic field and, vice versa, the characteristics of the academic field find their expression and outcome in the people (Engler 2001, 149).

Amongst the academic factors, we also have to include access to and support from the measures and instruments of RESEARCH AND EARLY-CAREER FUNDING POLICIES, as these fields, which consciously develop research and equal opportunity policies, are more easily accessed than the academic support and integration offered by individual university lecturers, institutes and faculties, as well as the wider academic community. All of the factors named exert not only a direct but also an indirect influence, in the sense that they regulate the work and requirements necessary for an academic career (application procedures, networking, job applications, publication output, readiness to move, motivations).

With gender-specific loss rates in the academic career, we assume there is an INTERPLAY BETWEEN SELF-EXCLUSION (WITHDRAWAL) AND SOCIAL EXCLUSION, since in many of the processes it is not possible precisely to determine or separate these aspects out from each other. As various studies have shown, encouragement and support are essential to progress in the doctoral phase as well as to remaining in the academic system after the doctorate (Lind and Löther 2007, Leemann 2002, 2005). Such encouragement and support can occur, for example, through participation in a graduate colloquium, taking part in a research project, receiving help with publications or being introduced to academic networks. The instruments for personal and project support at the SNF or other research funding institutions also offer financial support and enable integration into the academic community. At the same time, formulating successful applications to research funding institutions represents one of the hurdles in an academic career.

The present study is particularly interested in the INFLUENCE OF THE SNF'S RESEARCH POLICIES AND FUNDING on successful academic advancement, in relation to the effects of the academic and non-academic factors listed above. Which of these factors are decisive when it comes to the greater hurdles that women must overcome and their tendency to withdraw or be actively excluded from the academy? Which measures and instruments of the SNF, the federal government and other institutions support women on the academic career path?

### **The academic field and the exclusion of women: Theoretical positions**

The academic field is formed or "organised" by the institutional conditions (of universities, research funding institutions) in which academic work takes place. These institutional conditions

include, amongst other things, the career pattern one is expected to follow and the institutionalised structure of positions (for example, tenure track, short-term employment prior to professorship), qualification and cooptation processes, as well as application norms and evaluation practices.

The academic field, however, is not fully bound by or limited to individual organisations. Certain aspects of the academic field are constituted independently of organisations and universities. Sociologists like Robert K. Merton, Niklas Luhmann and Pierre Bourdieu have attempted, based on their own theoretical perspectives, to describe, explain and interpret the academic field as well as its development and mode of operation. In our study we draw primarily on the conflict- and class-based theoretical approach of Pierre Bourdieu and affiliated studies of the university system and academic career paths, particularly those put forward in recent years by Beate Kraus, Steffani Engler, Sandra Beaufaÿs and Brigitte Hasenjürgen.

### *Habitus – Field*

Bourdieu describes various social fields, such as the fields of politics and art, in addition to the academic field. In each social field, symbolic contests for power take place between the agents in power and the contenders for power:

[t]he university field is, like any other field, the locus of a struggle to determine the conditions and the criteria of legitimate membership and legitimate hierarchy, that is, to determine which properties are pertinent, effective and liable to function as capital so as to generate the specific profits guaranteed by the field. (Bourdieu 1990, 11)

For Bourdieu, it is the struggle for the few positions at the top and for academic prestige and university positions that drives academic involvement and careers, rather than, as for R.K. Merton, the sublime ideal of increasing knowledge, which involves the search for recognition of one's achievements (Bourdieu 1990). Academics thus only superficially act out of individual motivation. Rather, as members and representatives of individual class factions, they strive by means of unconscious, unreflective, non-instrumental and irrational strategies to sustain or improve the social position of their group.

What are the preconditions for a social field?

In order for a field to function, there have to be stakes and people prepared to play the game, endowed with the habitus that implies knowledge and recognition of the immanent laws of the field, the stakes, and so on. (Bourdieu 1993b, 72)

Every field, according to Bourdieu, has its own stakes and interests. Those people who neither belong to nor want to belong to a field will not notice the stakes and game of that field, or will judge them to be either sublime and disinterested, or absurd and irrational (Bourdieu 1993b, 72). The players in a field bring a particular habitus with them, that is, they are endowed with a practical sense which allows them to move about the field. This practical sense regulates their actions intuitively. They identify with the game and its rules (doxa); they believe in the game, attribute to it importance and value, and possess a self-evident interest in the field and its games (illusio), which is simultaneously the prerequisite for taking part in the social games of the field.

### *Symbolic Power/Violence*

Aspects of discrimination experienced by emerging women researchers are in reality usually subtle and beyond rationality. They are located in the cultural norms (such as ideas of work, institutionalised career paths), structural conditions (such as timetables of childcare institutions, age limits for personal funding) and workplace-organisational processes (such as time required in a laboratory, mobility requirements for fieldwork) in the academic field and its institutions (see Kraus 200, 34 and 49; Leemann 2007). These are either not recognised at all by individuals –

often repressed, reinterpreted or separated out – or the discriminatory gender mechanisms and norms are incorporated into one's own set of values and behavioural maxims. Bourdieu describes this phenomenon of recognition and affirmation, which occurs simultaneously with the misrecognition of the exercise of power, as ACTS OF SYMBOLIC VIOLENCE, whose effects can be felt in all relations of domination, including gender relations (Krais 1993). "Patriarchal power is a power that rests almost exclusively on symbolic violence, that is, on misrecognition" (Bourdieu 1997, 215).

Symbolic power/violence is not experienced as real violence, since it unfolds with the cooperation of the actors; that is, it rests on the unconscious assimilation of the subjective structures – the habitus – to the objective structures – relations of inequality (Bourdieu and Wacquant 1996, 203f.). The phenomena of a gender-specific *leaky pipeline* in the academic career trajectory thus also come about by virtue of statistical self-discrimination, in the sense of a "causality of probability" (Bourdieu 1981): the hopes and efforts of academics are assimilated in anticipation to their objective opportunities. The closing of doors is not experienced as an act of exclusion. Processes of self- and social exclusion always go hand in hand, and can be neither theoretically nor empirically conceived or observed as independent processes.

#### *Forms of capital and research funding*

In the academic field, certain forms of capital are particularly important and highly valued, while others are less relevant or even taboo (Bourdieu 1983). Today, it is very difficult to pursue an academic career or be successful in a permanent position without the support of research funding institutions. They make available the necessary ECONOMIC CAPITAL that is fundamental to writing a thesis, spending research time abroad or conducting a larger research project. They thereby make it possible to develop INSTITUTIONALISED CULTURAL CAPITAL in the form of university degrees, and accordingly to turn economic capital into cultural capital. The CULTURAL CAPITAL EMBODIED by academics is also extended through research and periods abroad financed by individual and research funding. SOCIAL CAPITAL is accumulated and maintained thanks to research collaborations and the geographical mobility that is often tied to individual funding. All three kinds of capital lead to the increase in forms of SYMBOLIC CAPITAL (Bourdieu and Wacquant 1996, 151), which in turn is (and must be) reinvested in one's career as reputation, commendation and credibility.

In order to be successful in research funding and have an application approved, earlier investments have to be made, of course, in these various kinds of capital. In most cases, applicants must have doctorates, be able to show research experience and publications, and be integrated into a university and academic network. Forms of symbolic capital such as previous fellowships, academic prizes, co-publications with well-known academics or research/study periods at reputed institutions endow one in advance with trustworthiness, which can be used to secure gains.

#### *Research and gender*

In recent years a number of studies have been carried out which usefully apply Bourdieu's ideas to the unequal integration of women and men into the academic field. Krais established the basis for such a project with her *Theoretical Soundings* (Krais 2000). She posits that, within the "agonal structure" of the academy which is about competition and rivalry, women are never the first to be included in the "game", the "arena of contest", or the symbolic struggles for university power and academic recognition. Since academic reputation can only be developed through social engagement with "the same" and through recognition and appreciation by "the same", women are excluded from competition. As a result, they withdraw from the "game", in which they have never been taken seriously as players. By contrast, Brigitte Hasenjürgen (1996) argues in her study that women do not have the right understanding of the game, that they lack the necessary *illusio*



for the academic field, and that therefore they are only rarely put forward for the highest positions.

Engler (2001) and Beaufaÿs (2003) offer empirical studies in which they extend the research on constructivism by concentrating on the role played by gender in constructing female and male academics as successful agents through processes of appreciation and recognition. These approaches and findings can be fruitful for our research question. A consideration of the process of constructing an academic career, whose trajectory generates an academic persona, should also focus on the role of research funding, which has not been undertaken in any of the studies mentioned.

A further important reference oriented toward constructivist research is to be found in the ethnographic study by Heintz, Merz and Schumacher (2004), which among other things reconstructs the career paths of women and men in four different disciplines and determines which factors lead to discipline-specific, stage-specific and gender-specific differences in processes of integration.

### **1.3. Research Design**

The following table (**Table 1**) offers an overview of the five parts of the GEFO project, its data bases and methodological approaches. The quantitative investigations in substudies 1 and 2 allow representative statements to be made about gender-specific loss rates on the academic career path. The option of integrating an additional module in the second survey of PhDs in the University Graduates Survey (BFS, early 2007) enables checking the hypothesis about the causes of gender-specific loss rates, as well as checking the efficacy of measures for funding emerging researchers and research by the SNF and other institutions.

The analyses of the electronic application administration system and of the application files of the SNF itself make it possible to outline gender-specific personal profiles and application histories in order to clarify the extent to which applicants differ in terms of their personal and career characteristics, their approach to applications and their chances of success according to gender (substudies 3 and 4).

Table 1: Overview of the Research Design

<b>Substudies</b>		<b>Objectives</b>	<b>Data Acquisition</b>	<b>Analytic Methods</b>	<b>Agents / Sample</b>
<b>Substudy 1</b>	<b>Evaluation of the Swiss Higher Education Information System (SHIS)</b>	Objective 1: Gender-specific loss rates in the doctoral and habilitation phases; role of academic outflux	Secondary data (Swiss Higher Education Information System, SHIS)	Quantitative analysis: process analyses based on data regarding individuals	Full data set of all enrolments, Master's graduates, PhD graduates and habilitations at the Swiss universities
<b>Substudy 2</b>	<b>Supplementary module and analysis of the University Graduates Survey in 2002 (panel 2003/2007)</b>	Objective 1: gender-specific loss rates in the postdoc stage Objective 2a: analysis of the reasons for loss rates in the postdoc stage Objective 2b: analysis of access to and effects of measures for research and emergent-researcher funding (especially of the SNF)	Supplementary module and secondary data (University Graduates Survey of the Federal Statistical Office (BFS))	Quantitative analysis, multivariate statistical analyses	University PhD graduates completing in 2002; full data set from 2003; second survey in 2007
<b>Substudy 3</b>	<b>Evaluation of the application administration system of the SNF</b>	Objective 2b: Analysis of access to measures for research and emergent-researcher funding of the SNF	Application administration system of the SNF	Descriptive-statistical methods; multivariable contextual analyses.	Persons who first appear in the application system between 2002 and 2006 as principle or co-investigators and/or applicants for an SNF professorship
<b>Substudy 4</b>	<b>Content analysis of the application files of the SNF</b>	Objective 2b: Analysis of access to measures for research and emergent-researcher funding of the SNF	Application files of the SNF, quantifiable file analyses	Descriptive-statistical methods; Cox regressions	Sample from substudy 3 narrowed down to 150 applicants in human medicine, linguistics and literature, law and physics
<b>Substudy 5</b>	<b>In-depth interviews</b>	Objective 2a: Analysis of the subjective experiences, motivations and rationales of academics  Objective 2b: Analysis of the importance of research funding in the construction of an academic career	Topic-based interviews	Qualitative interpretative analyses (Grounded Theory)	45 post-doctorates (from substudies 2 and 4) In-depth analysis of 15 interviews

The interviews in the qualitative approach (Substudy 5) offer insights into the emerging researchers' subjective experiences, motivations and rationales regarding their academic career path, and help to analyse the importance of research funding to the process of constructing an academic career. This "understanding" approach makes it possible to generate relevant theoretical elements.

#### 1.4. Substudies

The individual substudies of the GEFO investigation each resulted in a final subreport. In what follows, the respective research contents and methods will be outlined briefly, so as to provide the bases for the interpretation of the results reported in later chapters.<sup>6</sup>

##### Substudy 1

##### **"Leaky pipelines" in longitudinal section: Evaluations of the Swiss Higher Education Information System (SHIS)**

(in brief: SHIS evaluations)

*Philipp Dubach (Centre for Labour and Social Policy Studies BASS)*

Using the official data from the Swiss Higher Education Information System, the subreport describes the gender-specific loss rates in academic careers from the point of earning a doctoral qualification to the habilitation.

Usually, GENDER-SPECIFIC LOSS RATES are determined by cross-sectional analyses, which compare the proportion of women at various career stages within a particular reference year. Methodologically, however, the cross-sectional comparisons are not unproblematic. They mask the temporal dimension of the academic career path, and thus do not clarify whether the low proportions of women are a result of current or past discrimination. If the latter is the case, then the increasing proportion of women engaged in university study would "automatically" be carried over in time to the higher career levels. With cross-sectional analyses it also remains unclear what effect outflux and/or influx have on the respective numbers.

For these reasons, we work with cohort analyses, that is, with ANALYSES OF PROGRESS BASED ON DATA FOR INDIVIDUALS, which allow us to follow and differentiate the academic career progression of graduating cohorts from particular years. Focusing on TRANSITIONS FROM THE MASTER'S TO THE DOCTORATE AND THE DOCTORATE TO THE HABILITATION, the substudy investigates whether women are disadvantaged in an academic career in comparison with men. In addition, the effects of academic influx from abroad (albeit not outflux) can be established.

The development can be traced for yearly cohorts graduating with a doctorate from 1978 onward and with a habilitation from 1992.

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<sup>6</sup> The substudies are available at the SNF: Maya Widmer [mwidmer/at/snf.ch](mailto:mwidmer/at/snf.ch).

## **Substudy 2**

### **Five years after the doctorate: Integration and elimination processes in the academic trajectory of PhDs – Analysis of the University Graduates Survey (Federal Statistical Office )**

(in brief: survey of PhDs)

*Regula Julia Leemann, Andrea Keck (PHZH), Stefan Boes (SOI/UZH), with the collaboration of Katrin Schönfisch and Sabina Schmidlin (Federal Statistical Office )*

The evaluation of Substudy 2 seeks to analyse the causes of gender-specific LOSS RATES AFTER THE DOCTORATE. This involves investigating the family situation (partners and children) and division of labour between partners, continuance in the academy, support from research funding, mentoring and academic networks, the probability of research periods abroad as well as the publication output of emerging researchers.

Since careers in research and the academy take different institutional forms according to discipline and language region, the analyses also seek to differentiate as much as possible amongst subject areas and language zones (the university system in German- versus French-speaking Switzerland).

This substudy focuses on people who received their doctorate in 2002.<sup>7</sup> It is centred on our interest in the PROGRESS OF THE ACADEMIC CAREER AFTER THE DOCTORATE. The period of observation consists of five years, with the data coming from the University Graduates Survey regularly carried out by the Federal Statistical Office. The first survey of all doctoral graduates from 2002 (with the exception of the University of St. Gallen and the University of Basel, which did not supply the addresses of doctoral graduates to the Federal Statistical Office) took place in 2003. In the second survey, in 2007, we were able to add a module for the purpose of this study which addressed topics relevant to the investigation. Compared with the number of people registered at the start (N=1689), there were 538 people in the second round with valid entries for both surveys, which yields a total return of 31.9%. Since not all of the people surveyed filled out the particular module, however, the number available for the analyses comes down to 470 people (total return: 27.8%).

The analyses are weighted, using what is known as sampling weight. The weighting factor indicates the inverse probability that a particular observation based on the sampling design will be contained in the sample.

## **Substudy 3**

### **Evaluations of the application administration system of the SNF**

(in brief: evaluations of the SNF application administration system)

*Heidi Stutz, Jürg Guggisberg, Silvia Strub (Centre for Labour and Social Policy Studies BASS)*

The substudy report highlights the GENDER-SPECIFIC DIFFERENCES IN RESEARCH BIOGRAPHIES AND CHANCES OF SUCCESS that can be interpreted from the data in the SNF's electronic application administration system. The sample selected comprises the NEWCOMERS TO SNF RESEARCH, which consist of 3,107 researchers from all disciplines who submitted their first application as principal or co-researcher for project funding or who first applied for an SNF professorship between 2002 and 2006. For the se-

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<sup>7</sup> The areas of medicine and pharmacy contributed only a few isolated subjects to the study, as the doctoral graduates from 2002 were only included if they passed the state examination at the same time. The different approach in this sampling procedure is the result of the different significance attributed to the doctorate in medicine. The results from this subject area are therefore invalid and will not receive further comment.

lected participants, all of the data kept on record by the SNF were included in the analysis. The investigation covers pure research<sup>8</sup> in all SNF divisions, the National Research Programmes, individual funding as well as various smaller contributions to publications, journals, etc. What is not included, because of problems with the data, are the National Centres of Competence in Research (NCCR) as well as the research programme DORE, which is aimed at the universities of applied sciences.

In contrast to various earlier studies regarding the question of gender-specific discrimination in the research funding practices of the SNF, we intentionally place the person rather than the application in the centre of the analysis. This enables us to link the information gained from different applications to actual personal profiles and thus to take into account, as much as possible, hidden discrimination mechanisms. The objective is two-fold: the reconstruction of personal profiles and histories of SNF applications, as well as in-depth statistical analyses of gender-specific differences in these application histories.

#### **Substudy 4: Content analysis of application files at the SNF**

(in brief: content analysis of SNF application files)

*Heidi Stutz, Gesine Fuchs, Jürg Guggisberg, Philipp Dubach (Centre for Labour and Social Policy Studies BASS)*

This substudy report undertakes in-depth analyses of the data from the SNF application administration system by applying content analysis to the application files. The non-electronic data which can thus be interpreted includes extensive EDUCATION AND EMPLOYMENT VITAE as well as information about transnational MOBILITY, FAMILY SITUATION, SYMBOLIC AND SOCIAL CAPITAL, and PUBLICATION OUTPUT. Samples drawn randomly from the SNF application administration system were arranged according to groups of 20 women and 20 men in each of the following four disciplines: *human medicine, law, linguistics/literature and physics (incl. astronomy)*. In total, we had access to information about 150 people (71 women, 79 men) with 1 to 15 SNF applications.

Of particular interest were educational trajectory, professional experience in research, international mobility and career trajectory, which also always involved recording when and where relevant changes of status and milestones took place. . Also included were publication output (purely numerically, albeit with differentiation amongst types of publication) as well as indicators of symbolic and social capital (prizes/awards, expert reviews, co-editorship of journals, etc.).

The results were first described and discussed using an evaluation grid, and then comprehensively analysed by means of Cox regressions. The Cox proportional hazards model applies when the effects of several cause variables on a time-dependent target variable (here the application to the SNF) are to be investigated simultaneously.

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<sup>8</sup> The term 'pure research' is used here to translate *freie Forschung*, which indicates the opposite of 'applied research'. Although this is commonly translated in Europe as 'basic research', the phrase 'pure research' is more common amongst Anglo-American natural scientists and also avoids implying that 'basic research' is a stage preceding advanced research. – Trans.

## **Substudy 5: In-depth interviews with emerging researchers**

(in brief: in-depth interviews with emerging researchers)

*Regula Julia Leemann, Sandra Da Rin, Susan Gürber (PHZH), in collaboration with Heidi Stutz, Gesine Fuchs (Centre for Labour and Social Policy Studies BASS) and Irène Schwob, Shams Ahrenbeck, Karin Müller (SRED)*

In this substudy report we use in-depth interviews with researchers who have recently earned doctorates and habilitations to ask how they understand the formation of their own academic trajectory, what relevance they assign to various factors, in particular to research funding, and which factors they consider to be responsible for the integration and/or exclusion of women. In this way, we explore the process of constructing an academic career.

Researchers cannot, however, simply be asked about mechanisms and processes of exclusion. We thus attempted to give the respondents enough room to codetermine the course of the conversation and the topics under discussion. The individually important aspects of each academic trajectory could thus arise in more unplanned and implicit ways in the SUBJECTIVE RECONSTRUCTION OF CAREERS and be analysed by interpretive evaluation methods. In this way, too, conflicting and contradictory responses about one's interests and motivations, reasons and decisions, or perceptions of support and withdrawal also become important material for tracing the subtle processes of exclusion.

Altogether, 45 interviews were carried out across Switzerland (via personal interviews) and abroad (via telephone interviews) with emerging researchers who have completed at least a doctorate. The respondents were chosen to reflect as broad and comprehensive an image as possible of various career realities in different disciplines. When it came to individual criteria like family situation, age, discipline, qualification and experience with SNF applications, we endeavoured to ensure in the sampling that, where possible, both genders were always represented (for example, women and men with and without children). 15 interviews were subjected to more in-depth analysis using Strauss and Corbin's Grounded Theory model, while the rest of the interviews served to check, elaborate and help differentiate the overall results.

### **1.5. Organisation of the final report and synthesis**

The final report is not organised by individual substudy, but rather bundles the results together thematically. Chapter 2 focuses on educational trajectories, and Chapter 3 on career trajectories. The topic of mentoring and support for emerging researchers follows in Chapter 4, while research funding in a more narrow sense, as undertaken by the SNF and other institutions, follows in Chapter 5. Reconciling an academic career with family life is the topic of Chapter 6, followed by internationalism and geographical mobility in Chapter 7, and the topic of academic networks, which is closely tied to the acquisition of social and symbolic capital, in Chapter 8. Finally, publication output as a performance indicator is taken up in Chapter 9. Each chapter closes with a brief summary, which relates the topic back to the research questions and objectives of the study and makes initial suggestions about how SNF funding policies are affected by the results. The report closes with conclusions, which lead to recommendations for action (Chapter 10).

## 2. Educational Trajectory

The significance of gender-specific differences in the postgraduate educational trajectory has been analysed in three substudies. The *SHIS evaluation (Substudy Report 1)* seeks to explain the phenomenon of the *leaky pipeline* by focusing on the transitions between the Master's degree and the doctorate on the one hand and between the doctorate and the habilitation on the other. In the *survey of doctorates (Substudy Report 2)* multivariable context analyses are then undertaken to identify the factors that determine whether or not people remain in the academy (in academic employment or for further qualifications) in the first five years after the doctorate. Finally, the *content analysis of the SNF application files (Substudy Report 4)* compares the educational backgrounds of researchers who are newcomers to individual or project research funding from the SNF.

In what follows we will first present the results for the doctoral phase (2.1), then for the postdoc phase (2.2) and finally for the habilitation (2.3). At the end, the educational backgrounds of SNF newcomers will be compared with these findings before drawing a conclusion.

### 2.1. Doctoral phase

The findings of the substudy *SHIS Evaluations (Substudy Report 1)* regarding the doctoral phase are based on evaluations of the Swiss Higher Education Information System (SHIS), which makes available graduation data over a long period regarding various degrees (Lizentiat/Diplom, doctorate, habilitation). This enables the tracking of developments over time by using cohort analyses from numerous graduation years based on data about individuals.

It is important to embed the analysis in an overall context. In view of the *leaky pipeline* focus, we must therefore first understand the POTENTIAL NUMBER OF DOCTORATES. This potential number basically includes everyone who has completed a Master's degree. In 2006 a total of 9,846 people graduated from Swiss universities with a *Master's degree*, including, for the first time, somewhat more women than men. In comparison with 1978 – the first year in which SHIS collected data about Master's degrees – this represents an increase of 85%. During this time, the composition of the graduates changed not only in terms of gender but also in terms of subject area. More than twice as many students completed degrees in the humanities and social sciences, while the number of degrees in medicine and pharmacy dropped by nearly a third.

Today, the proportion of women awarded Master's degrees (Lizentiats, Diploms or MAs) is highest in the humanities and social sciences. In medicine and pharmacy, as well as law, women are also in the majority. In the natural sciences, they account for nearly half of the completed degrees, while in the hard sciences they represent a fifth and in the technical sciences a quarter, which is strongly concentrated in architecture and planning. According to the predictions of the Federal Statistical Office, the proportion of women completing Master's degrees will peak in 2009 at 53% and will thereafter remain at this level.<sup>9</sup>

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<sup>9</sup> The prognosis takes into consideration the degrees which qualify one for doctoral study, namely the MA, Lizentiat and Diplom. Details can be found on the the educational projections webpage of the Federal Statistical Office:

The frequency with which graduates go on to the doctoral phase also differs markedly by subject area. In medicine and pharmacy, 60% of Master's-degree graduates have earned a doctorate within ten years; however, this is of secondary importance in the educational trajectory of health professionals. In the hard and natural sciences, at least a third of the Master's-degree graduates have completed a doctorate within ten years. Particularly high are the proportions in chemistry (over half) and physics (around 40%). In the other subject areas, the DOCTORAL RATES are noticeably lower. For instance, in the humanities and social sciences, where women are strongly represented, the doctoral rate is around 10%. Since 1978, the number of Master's graduates who go on to complete doctorates has not developed equally across all disciplines. The doctoral rates have regressed above all in medicine/pharmacy, law and the hard and natural sciences.

The total number of doctorates, nonetheless, increased between 1990 and 2006 from 2,170 to 3,180. This increase is almost exclusively the result of ACADEMIC INFLUX. Expressed as proportions, candidates with a Master's degree from abroad represented 13% of all doctorates in 1990, and 40% of all doctorates in 2006. The SHIS data does not permit us to calculate the extent of academic outflux on the part of people with Master's degrees from Switzerland completing doctorates abroad (see also Chapter 7).

In addition, there is a difference in the significance of the doctorate between the French-speaking and German-speaking universities. In FRENCH-SPEAKING SWITZERLAND, the doctorate, or *thèse*, is significant only within the university context. It qualifies one for a professorship and a habilitation is not required under normal circumstances. The *thèse* is thus comparable to the Anglo-American PhD. By contrast, in GERMAN-SPEAKING SWITZERLAND the doctorate is also valued as a certification in the labour market outside the university (cf. Leemann and Heintz 2000, 57; Leemann 2002, 121).<sup>10</sup> The doctoral rates in German-speaking Switzerland are thus around twice as high.

All of these differences influence the gender-specific probabilities determined here that a person will go on to earn a doctorate after the Master's degree. An overall comparison of doctoral rates shows that for every (Master's) graduation year since 1978 the rates have been higher for men than for women. This global result, however, is strongly affected by the subject area of medicine and pharmacy, which continues<sup>11</sup> to make up more than a third of all doctorates. **Figure 1** thus shows the relationship between the doctoral rates for men and those for women five years after the award of the Master's degree, as broken down by subject area and graduation year. Four facts emerge from this analysis:

□ Firstly, the DOCTORAL RATES FOR WOMEN ARE NEARLY ALWAYS LOWER than that the doctoral rates for men. This determination disproves the claim that the *leaky pipeline* will stop leaking once the cohorts that are strong on women advance to the career stage. Under certain circumstances, it is indeed the case that cross-sectional comparisons overestimate the loss rates for women. But the notion that the increasing proportion of women completing a Master's degree will automatically result in higher proportions at the next level is unfounded.

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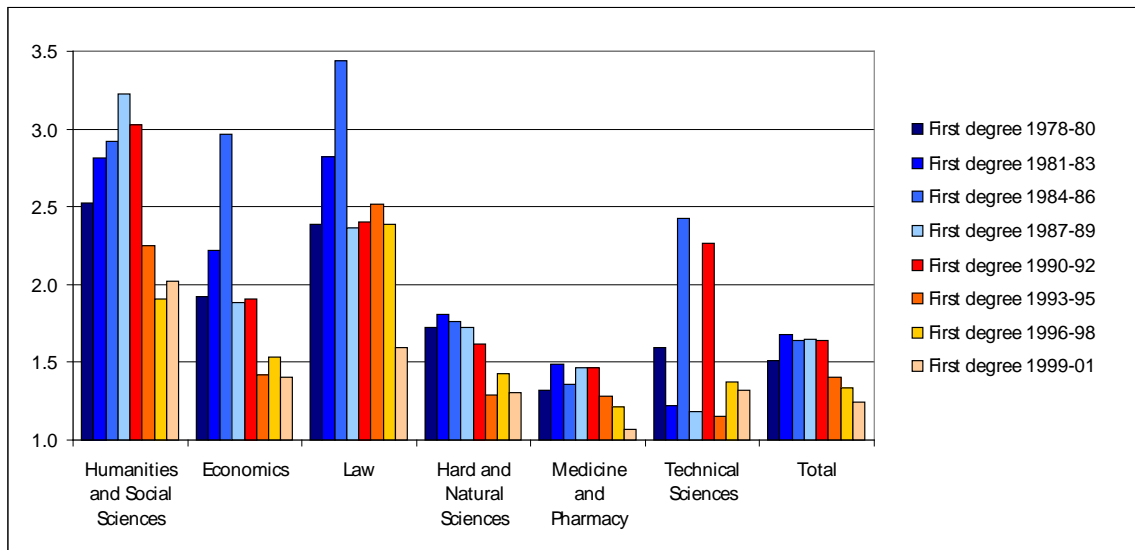
<http://www.bfs.admin.ch/bfs/portal/de/index/themen/15/08/dos/blank/03.html> (accessed 26 September, 2007).

<sup>10</sup> The two bilingual universities, Universität Freiburg and Università della Svizzera italiana, do not have a clear affiliation with either of the two systems. We have bracketed them out in the evaluations, but have included them in the total numbers.

<sup>11</sup> Master's-degree completion year 1996, cohort analysis.



**Figure 1: Relation between doctoral rates for men and for women within five years of earning the Master's degree (by subject area)**



Key: Of the people who received a Master's degree in law between 1993 and 1995, for example, 2.5 times as many men as women earned a doctorate within five years.

Source: SHIS/BFS, Computations: BASS/GEFO

Graphics: BASS/GEFO

□ Secondly, there are indications that the doctoral rates for women and men have CONVERGED OVER TIME. However, this development has in no way been linear: up until the mid-1980s, on the contrary, the doctoral rates in most subject areas registered an increase in the gap between genders. Only since then has the gap gradually been closing, above all in medicine and pharmacy. This second tendency is ultimately the stronger of the two: in each subject area, the gender-specific doctoral rates associated with the most recent Master's graduation years (1999 to 2001) are more closely aligned than in the earliest years.

□ Thirdly, although this cannot be seen in the figure itself, this alignment can be attributed to increased doctoral rates for women only in medicine and pharmacy. In the other subject areas, trends indicate rather that DOCTORAL RATES FOR MEN ARE DECREASING OVER THE LONG TERM. This holds above all in the subject areas of law, humanities and social sciences, as well as hard and natural sciences. In essence, there are two possible interpretations: either women have been able to assert themselves better than men in the increasing competition for a limited number of doctoral places and fellowships, or the appeal of a doctorate has decreased because its significance in the labour market outside universities has dwindled or an academic career is no longer so attractive. In this case, the alignment of doctoral rates for women and for men is most likely attributable to the voluntary withdrawal of men – in which case, women would just be "winners among losers", as Zimmer, Krimmer and Stallmann (2007) put it.

□ Fourthly, the greatest difference today between doctoral rates for women and those for men is in the humanities and social sciences. This contradicts the view that the chances of earning a doctorate are particularly good for women in those disciplines with the highest degree of female participation (according to the "contact thesis", see Leemann 2005, 182f.). What is noteworthy, rather, is that the DOCTORAL CHANCES FOR WOMEN IN THE TYPICALLY MALE DISCIPLINES ARE NO LOWER than in those disciplines with more neutral or even feminine connotations. The gender-specific rates are no further

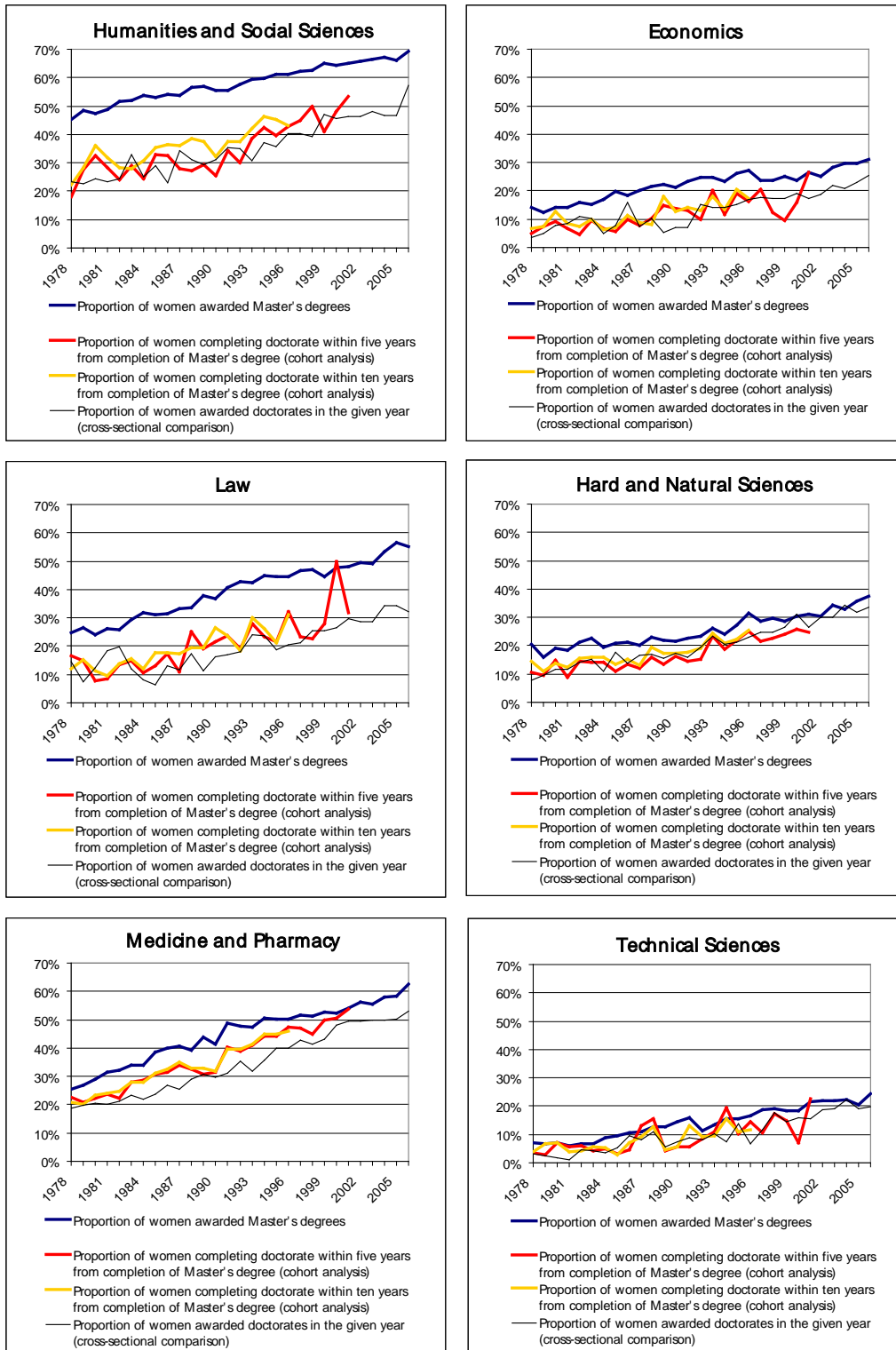
apart in the hard and natural sciences or in the technical sciences than they are in the social sciences and humanities. Indeed, in physics women usually represent less than a tenth of the people who graduate with a Master's degree, but the doctoral rates for women and for men are relatively close. This finding tends to support the argument that, in situations of stark underrepresentation, women profit from their unique and special status (cf. Leemann 2005, 183). It is also plausible that women who decide to enter a clearly male-dominated field are more competitive and are aware from the outset that they must establish themselves in an environment where they are initially considered to be outsiders.

**Figure 2** shifts the perspective and presents the PROPORTIONS OF WOMEN EARNING MASTER'S DEGREES AND DOCTORATES. It represents the following: firstly, the proportion of women completing Master's degrees (blue line); secondly, the proportion of women among the Master's graduates in a particular year who were awarded a doctorate within five years (red line) or ten years (yellow) of graduation; and thirdly, the proportion of women awarded doctorates (thin black line, cross-sectional examination, given year = year of earning the doctorate). The visible percentages reflect the proportion of women, while the proportion of men is calculable by the difference from 100%. This graph offers information about the degree of gender-specific segregation at the point of Master's and doctoral awards, as broken down by subject area. Women from a particular Master's graduation year have the same chances of earning a doctorate as men when the red and/or yellow lines converge with the (thick) blue line. When the red and/or yellow lines lie under the red line, their doctoral chances are lower, and when these lines lie above the red line, their chances are higher.

In those subject areas, as mentioned, in which people seldom do a doctorate, what seem to be small differences in doctoral rates can have large implications. This is most clearly seen in the humanities and social sciences, as well as in law. In 1982, for instance, women represented the majority of Master's degrees completed in the humanities and social sciences. It took nearly 20 years, however, before the majority at that level corresponded to a majority at the level of doctoral awards.

Together with medicine and pharmacy, the humanities and social sciences are the only two subject areas today in which women also represent the majority at the doctoral level. In most other subject areas, women are still far from being in the majority. Aside from one-off peaks, the proportion of women in economics and the technical sciences lies under 20%, while in law as well as the hard and natural sciences the number is under 30%. This observation to a certain extent qualifies the convergence we noted earlier of gender-specific doctoral rates: even when the chances for advancement are the same for both genders, women never make a stronger showing than their representation at the previous level in the hierarchy.

**Figure 2: Proportions of women awarded Master's degrees and doctorates**



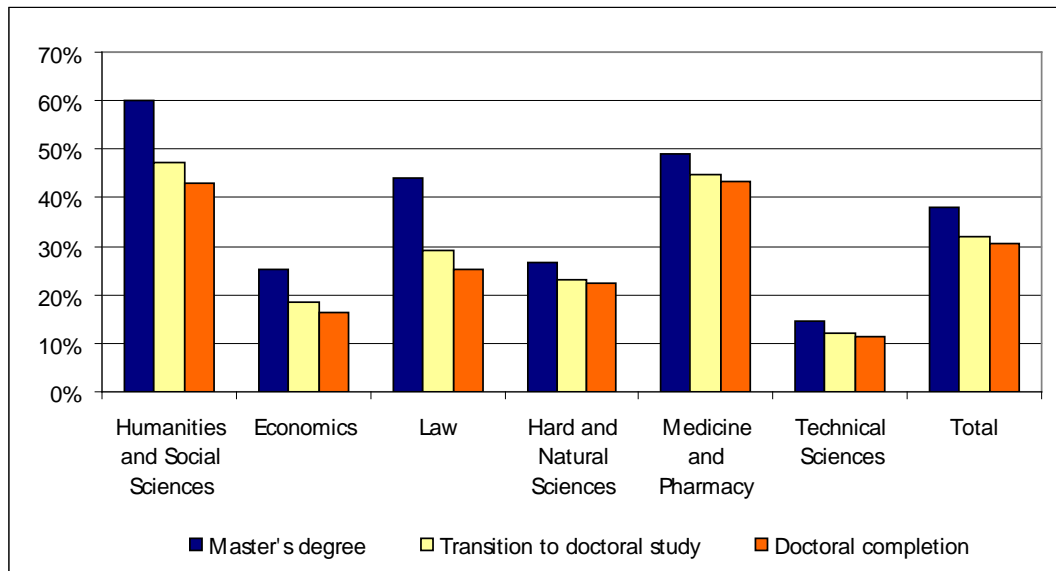
Key: Of the people who in 1996 completed a Master's degree in medicine or pharmacy, 50% were women (blue line). Of the doctorates awarded in medicine and pharmacy in the same year, 40% went to women (thin black line). Of the people who completed a Master's degree in 1996 and earned a doctorate within five years (i.e., by 2001), 47% were women (red line); of those who completed a Master's degree in 1996 and earned a doctorate within ten years, 46% were women (yellow line).

Source: SHIS/BFS, Computations: BASS/GEFO; Graphics: BASS/GEFO

The figure also shows what the results would be if one were to do a simple cross-sectional comparison in place of a cohort analysis. The thin black line shows the number of women awarded doctorates (incl. those with Master's degrees from abroad) in the same year as those graduating with Master's degrees. The distance between the thick blue line (proportion of women awarded Master's degrees in year X) and the thin black line (proportion of women awarded doctorates in year X) thus corresponds to the gender-specific percentage difference which cross-sectional comparisons normally use to measure the extent of the *leaky pipeline*. The red and yellow lines indicate the correctives provided by the more complex cohort analyses. Depending on the effects of academic influx from abroad, they can lie above or below the black line.

It can also disadvantage their academic career if women are on average older than men when they complete the doctorate. This is not the case for the doctorates awarded between 2002 and 2006, neither in the total nor in individual subject areas. The only significant difference which holds for all of Switzerland is that women earn a doctorate earlier in medicine and pharmacy, where, however, it does not have high importance for career advancement.

**Figure 3: Proportions of women (Master's degree: 1992-1996) making the transition to doctoral study**



Key: In the humanities and social sciences 60% of all people who completed a Master's degree between 1992 and 1996 were women. Of the graduates in the humanities and social sciences between 1992 and 1996 who then decided to proceed to the doctorate, 47% were women. Of these same graduates who completed the doctorate within ten years of graduating with the Master's degree, 43% were women.

Source: SHIS/BFS, Computations: BASS/GEFO

**Figure 3** offers a more detailed view of the doctoral phase and makes clear where women lose the most ground. In the humanities and social sciences, economics and law in particular, women decide much less frequently than men to pursue a doctorate. Between starting and completing the doctorate, the proportion of women drops less drastically. The "pipeline" is thus "leakiest" in the transition to doctoral study. Once women decide to do a doctorate, they are nearly as likely to complete it as men (for comparable findings, see Leemann 2002, Lind and Löther 2007, Hinz et al. 2008). Gender also has little effect on the time it takes to complete a doctorate.

## 2.2. Postdoc phase

The "postdoc" is not an examination or acceptance procedure, but rather designates a further academic qualification phase after the doctorate which takes various institutionalised forms, depending on discipline. It is widespread particularly in the hard and natural sciences, but in the other subject areas it also increasingly has a role to play. A postdoctoral fellow is employed on a limited contract at a university or research institution abroad, or possibly at home, and works during this time on research projects. Usually, the positions are financed by third-party funds. According to the *survey of doctorates (Substudy Report 2)*, approximately 28% of those questioned had begun and possibly completed a postdoc within five years of completing the doctorate. Depending on the discipline, this proportion can, however, be much higher or lower. In the hard and natural sciences it is over 45%, whereas in law only 3%. A postdoc does not have the same degree of career relevance in all subject areas.

As the multivariable analyses show, there are NO GENDER DIFFERENCES with regard to the likelihood of undertaking a postdoc. By contrast, increased AGE makes further academic qualification through the postdoc more difficult for both genders. It can be assumed that age norms in an academic career mean that, on the one hand, older emerging researchers (can) take less time for a longer research period (abroad), and on the other hand they have less funding and are less motivated to seek a postdoc position at another research institution. Since this form of further qualification is particularly important in the hard and natural sciences, this is an indication of the power of the age norms that prevail in these disciplines.

RESEARCHERS WITH DEGREES FROM ABROAD do not undertake a postdoc more frequently than researchers with Swiss degrees. Having an ACADEMIC FAMILY BACKGROUND also has no effect. A YOUNG CHILD, however, makes a further academic qualification in the form of a postdoc significantly more difficult. This, we assume, has to do with the geographical mobility which is usually associated with a postdoc. The LANGUAGE REGION plays no role. By contrast, INTEGRATION DURING DOCTORAL STUDY is central to gaining further academic qualification after the doctorate. Whoever receives support in the discipline during doctoral study is more likely to undertake a postdoc.

The variables involved in RESEARCH FUNDING also have clear connections with the postdoc. SNF fellowships and participation in research projects (whether financed by the SNF or other institutions) are particularly important, as are independent research applications to institutions other than the SNF. This has to do with the fact that the postdoc qualification phase is largely financed by research funding institutions. Fellowships from the SNF as well as research funding from institutions abroad make it possible to have international postdoc placements, while participating in research projects funded by the SNF and others makes it possible to engage in research at home.

## 2.3. Habilitation

The habilitation is an examination and acceptance procedure in the German-speaking university context, which may vary somewhat from university to university but is grounded in certain regulations and standardisations that go beyond individual practices. In Switzerland at the German-speaking universities, the habilitation is (still) usually the prerequisite for a professorship at a university, above all in the humanities and social sciences, law and medicine. In the French-speaking universities, the habilitation is recognised only in medicine, where, however, in comparison

to German-speaking Switzerland, it is somewhat less demanding. The habilitation procedure establishes teaching competence in an academic discipline, after which one is granted authority to teach (*venia legendi*) in a particular discipline.

The *SHIS Evaluations (Substudy Report 1)* of habilitations are limited to GERMAN-SPEAKING SWITZERLAND and focus – as in the doctoral phase – on people who are pursuing their career within the Swiss university and research system. Here this means people who have already been awarded a doctorate by a Swiss university. This applies to just under two-thirds of all people awarded the habilitation between 1992 and 2006 at a Swiss university.<sup>12</sup>

In most subject areas, 70% to 80% of those undertaking a HABILITATION acquire it within twelve years of earning a doctorate. This takes noticeably longer in medicine and pharmacy, where only half of the people who have earned a habilitation have completed it within this time frame. We can assume, however, that when habilitations are presented later than this, they are no longer directly relevant to a university career.

If one sets the investigation period at twelve years after being awarded a doctorate, then the HABILITATION RATES lie between 4% and 6%. When we compare the habilitation rates for women awarded a doctorate between 1990 and 1994 with those for men awarded a doctorate in the same years, then significant differences appear in three subject areas as well as in the overall total. The largest gap, to the disadvantage of women, is in medicine and pharmacy. This subject area, which seems open to and supportive of women at the doctoral level, becomes far less so at the habilitation stage. The proportion of women who habilitate within twelve years of completing a doctorate is four times smaller than that of men. Since over a third of the habilitations under consideration belong to this subject area, this inequality has a strong effect on the overall picture. Women also have significantly lower habilitation rates in the hard and natural sciences as well as in the humanities and social sciences.

If, independently of the cohort analyses, one investigates the proportions of women granted habilitations as a TEMPORAL DEVELOPMENT over blocks of five years (1992-1996, 1997-2001, 2002-2006), then one notices a more or less marked increase between the middle and the last group in habilitations earned across all subject areas. The largest increase occurs in the technical sciences (from 3.7% to 16%) and in law (from 13% to 32%). In the humanities and social sciences alone the proportions remain at a relatively high level, since the increase there had already occurred during the 1990s.

In one subject area, medicine and pharmacy, there are strong indications that the increase in the proportion of women can be traced back to ACADEMIC INFLUX. The proportion of women awarded habilitations in medicine and pharmacy is significantly higher amongst those with a doctorate from abroad (23%) than amongst those with a Swiss doctorate (14%). The impression here is that academic influx partially compensates for the low number of women with Swiss doctorates who then earn a habilitation.

With reference to AGE at the time of completing a habilitation, the subject areas can be divided into three groups. By far the youngest are those awarded habilitations in economics, where the average age is below 38 years. Next are law and the hard and natural sciences (in which habilitations have only partial significance), with an aver-

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<sup>12</sup> With a good 10% of the habilitated academics it is not clear whether they earned their doctorate at a Swiss or a foreign university.

age age of 40 years, followed by medicine and pharmacy as well as humanities and social sciences with 42 years. Only in the humanities does gender account for significant differences in the time it takes to do a habilitation as well as age at completion: women here on average take 1.5 years longer than men to complete a habilitation.

As the *in-depth interviews with emerging researchers (Substudy Report 5)* show, many academics today are undecided whether it is worth doing a habilitation to further their career. This also holds for those disciplines in which it has up until now been common to do a habilitation. According to the *survey of doctorates (Substudy Report 2)*, 4% of people who have doctorates in economics are working on or have completed a habilitation five years after the doctorate. The multi-variable analysis indicates NO GENDER DIFFERENCES. As opposed to the SHIS evaluations, it is not possible here to separate out the figures by discipline. It could also be the case that women begin a habilitation as frequently as men, but do not complete it (within a period that is useful for an academic career). *Age*, a MASTER'S DEGREE FROM ABROAD, an ACADEMIC FAMILY BACKGROUND, INTEGRATION DURING DOCTORAL STUDY and SUCCESSFUL RESEARCH FUNDING APPLICATIONS do not, according to the survey of doctorates, affect the probability of undertaking of habilitation. By contrast, having a YOUNG CHILD decreases the probability for both genders.

#### **2.4. Educational trajectories of SNF newcomers**

The analysis of the educational backgrounds of "newcomers" in the *content analysis of SNF application files (Substudy Report 4)* makes it clear that those who submit research applications in their own name already belong to a SELECT GROUP OF ACADEMICS. On average they complete their Master's degree for the most part earlier than their peers, according to university statistics. This earlier completion rate, however, is connected to the high proportion of people who have completed their degrees in countries where the graduation age is generally lower. Educational background thus only conditionally reflects the conditions encountered by Swiss emerging researchers. What is consistently mapped, however, are the realities of people involved in the research market.

The educational trajectories of emerging researchers reflect VERY HETEROGENEOUS CIRCUMSTANCES. In physics, students move efficiently through the Master's degree and on to an academic career, so that a professorship or senior position can be reached before the age at which women must make a decision about having children. By contrast the time it takes to earn degrees and qualifications in human medicine is significantly longer, so that the phase of having children critically collides with further academic qualification. While law still has the characteristics of a "domestic sector" with the possibility of completing all qualification stages at one and the same university, whoever wants to gain academic qualifications in physics has to be more or less globally mobile. Highly structured qualification stages before and after the doctorate, as can be found in medicine and physics, contrast with the less clear situation in law as well as linguistics and literature.

The educational trajectories FOR BOTH GENDERS in this relatively newly constituted group of "newcomers" proceed VERY SIMILARLY, with the following nuances: In human medicine, women earn a doctorate and the first medical title (FMH) somewhat earlier, but a possible second FMH title and the habilitation follow somewhat later. The time delay is aligned with the phase in which women typically have small children. In law,

women are older when they earn doctorates and less frequently undertake a habilitation. In linguistics and literature, women also take longer to complete a doctorate and are significantly older at the habilitation stage (which they undertake more frequently). In physics, women tend to complete the Master's degree and doctorate faster than the men. They earn doctorates at just under 30 years of age, while the habilitation is of little significance.

## 2.5. Summary

The analyses show that the gender-specific effects of the *leaky pipeline* at transition points between the doctorate, postdoc and habilitation are not the same for all disciplines. In the technical, hard and natural sciences, as well as in economics, the choice of subject area already represents a gender-specific hurdle, which then carries over to the proportion of women earning doctorates. The transition from the Master's degree to the doctorate in itself, however, reflects comparatively little inequality. The career relevance of a habilitation, at which point larger gender-specific differences arise, is not high. By contrast, in the humanities and social sciences, where there is a high proportion of women studying for the Master's degree, beginning a doctorate represents the first decisive hurdle for women, while completing a habilitation represents the second. In medicine and pharmacy, the gender-specific differences up to and including the doctorate are comparatively small, but thereafter women go on to do a habilitation significantly less often.

There is thus clear evidence for certain *threshold effects* (Etzkowitz et al. 1992), that is, decisive discipline-specific hurdles after which it is easier to reach the next level, even though inequalities never completely disappear. All of the disciplines, however, present gender-specific discriminations at each qualification stage. The image of the *hurdle race* (Toren and Moore 1998) is thus also applicable. For all subject areas and at all transition points under investigation, except for postdocs, women as a rule are disadvantaged in comparison with men. To put it simply, the question is not which of the two groups has the better chance of advancement and success, but rather how much smaller are women's chances of advancement.

Women in subject areas where they represent a high proportion of those studying for a Master's degree do not find it easier to pursue an academic career, particularly in the humanities and social sciences, than women in disciplines where they represent a small minority. The opposite point, however, does not necessarily hold true. There is no systematic connection, on any axis, between the proportion of women and women's chances of success in an academic career. By contrast, there are indications to support the thesis of cultural devaluation, as postulated by research into occupations, which argues that the prestige of a vocational field drops when it develops into a field with a high percentage of women (England, Hermsen, Cotter 2000). The tendency is for men in such a field to strive to attain career positions as quickly as possible, in order to distance themselves from the female majority.

It is important to keep in mind that there is no evident mechanism which can automatically ensure that the proportion of women at a lower stage of the qualification scale will gradually move up to the higher stage. The leaky pipeline problem for women will thus not be resolved on its own just over the course of time. Even though the general tendency in recent decades has been toward a convergence of doctoral and habilitation rates for women and for men, the question still remains whether this just makes women "winners among losers" (Zimmer et al. 2007). Thus, the ad-



vances made by women in doctoral rates can above all be traced back to the decrease in numbers of doctorates awarded to men (aside from medicine/pharmacy).

Certain reasons given in political discussions for the problems that women experience in academic careers can now be better assessed on the basis of our evaluations. Age difference between the genders thus has hardly any effect on the educational transition points under analysis (with the exception of the habilitation in humanities and social sciences). Nor do women complete doctorates considerably less frequently once they have begun. The supposition that academic influx props up the proportion of women doing doctorates and habilitations can be confirmed for particular subject areas. This result should be offset by the effects of academic outflux, about which there is no information. There is little reason, however, to think that disproportionately more women than men undertake the doctorate or habilitation abroad, and hence little reason to think that the proportion of women would be higher with the inclusion of this group.

The following chapter will go into more depth regarding the reasons for the inequalities that have been determined.

### 3. Career Trajectories

The career trajectories of researchers and any observable gender-specific differences amongst them were investigated in three substudies. The *survey of PhDs (Substudy Report 2)* addresses the factors that lead women and men to pursue an academic career after the doctorate (3.1). The *content analysis of SNF application files (Substudy Report 3)* maps the previous career paths of newcomers to SNF research funding who are applying in their own name (3.2). In the *in-depth interviews with emerging researchers (Substudy Report 5)* various institutional uncertainties in the academic trajectory, which take gender-specific forms, emerge as a dominant topic in academic careers (3.3). The chapter closes with a summary (3.4).

#### 3.1. Academic employment after the doctorate

The *survey of PhDs (Substudy Report 2)* also took into consideration the professional trajectory of respondents, so as to ascertain whether people pursue an academic career after the doctorate. Six indicators were used to determine employment in research or higher education directly after the doctorate and five years later.

Around 40% of the people surveyed were employed in the academic field directly after the doctorate. Five years later, depending on which indicator is used, the proportion shifts to 20% to 30%. This decrease is to be expected, since the academic career path involves elite recruitment processes, with only a portion of candidates surviving the selections. Two questions were crucial in our investigation. Firstly, we were interested in whether women leave academic employment in disproportionate numbers. Secondly, we wanted to know which other factors influence the recruitment process, with a particular focus on the support provided by research funding.

Based on the results of the estimated models, there are ABSOLUTELY NO INDICATIONS THAT WOMEN LEAVE ACADEMIC CAREERS MORE FREQUENTLY than men in the period under observation (from PhD award to five years after the doctorate). This finding holds true even without yet controlling for other academic and non-academic factors. In contrast to the educational trajectory (see Chapter 2), we find no evidence in our study of the academic career phase five years after the doctorate for a *leaky pipeline* whose holes are bigger for women than for men.

At first glance, this result corresponds to the *threshold effect* hypothesised by Etzkowitz et al. (1992), who argue that the gender-specific selection processes in previous career stages mean that the women academics who remain are very career-focused and strive to stay in the academy. As we will see in later chapters, however, women in this postdoc phase are less well integrated.

These findings, namely that the tendency to remain in the academy is not related to gender, have been confirmed in other studies of the academic field in Switzerland. In the study carried out by Leemann (2002), as many women as men remain in the academic field after completing the doctorate. Berwerger (2008) can find no gender differences affecting the group she investigated of academics from the social sciences and humanities who are in the final stages of the doctorate. Women express their intention to pursue an academic career as frequently as men. One year after the doctorate, too, there is no evidence of differences in the actual performance.

The final career step up to the professorship, where women hit what in the literature is called the "glass ceiling" (Etzkowitz et al. 1992; Sonnert and Holton 1995), could not be systematically examined in our investigations.

Regarding other factors that affect whether or not one remains in the academic field five years after the doctorate, the following findings should be mentioned. AGE plays no particular role in the pursuit of academic employment. WOMEN EDUCATED OUTSIDE OF SWITZERLAND, who then enter the Swiss university system in order to undertake their doctorate, are more likely to remain in the academic field. It can be assumed that they are more academically oriented, since they left their own country for a position at a university in Switzerland. FAMILY BACKGROUND, which compares academic with non-academic social backgrounds, is irrelevant to continuance in the academic field at this late point of the trajectory. We assume that, by the time one reaches the doctoral phase and undergoes the socialisation processes connected with it, the habitual problems of fitting in are increasingly less important and are registered only as "small distinctions".

When academics are PARENTS, this affects the probability of remaining in academic employment; or, to put it another way, those people who work in the academic field start a family and have children less frequently. Based on the statistical analyses, however, there is no evidence for the supposition that the birth of a child tends to lead women rather than men to leave academic careers.

In the FRENCH-SPEAKING universities, more of the people surveyed had attained a professorship within five years of the doctorate, which can be explained by the different significance of the doctorate (thèse) in the French-speaking university system. The thèse is equivalent to a PhD and qualifies one for a professorship, in contrast to the doctorate in the German-speaking university system, where the additional habilitation is often required for a professorship. There are few DISCIPLINE-SPECIFIC DIFFERENCES in this phase, and they were subject to statistical controls in the models. A central factor in the continuance of an academic career is SUPPORT AND INTEGRATION DURING THE DOCTORAL PHASE. A position as an assistant, participation in a graduate colloquium, disciplinary and career-oriented support by mentors and other members of the academic community all significantly increase the probability of remaining in the academy.

RESEARCH FUNDING is also extremely important for remaining in the academy. People who receive research fellowships, submit successful research applications or work on a research project are significantly more likely to be employed in the academic field five years after the doctorate. Here we can assume reciprocal effects. Receiving approval for projects and research periods abroad supports one's continuance in the academy and this in turn increases the chances of submitting more (successful) applications. With regard to SNF funding, it is the fellowship for prospective and advanced researchers as well as collaboration in research projects funded by the SNF that constitute important "resilience" factors which diminish the risk of leaving the academy. By contrast, one need not have submitted a successful project application to the SNF, as this seems to have little relevance. On the other hand, successful research applications to other institutions in Switzerland and abroad do support continuance in the academy. In the career phases prior to a professorship, it is above all the individual funding instruments (direct: fellowships; indirect: project collaboration) that seem to be important in supporting continuance in an academic career. By contrast, applications submitted for one's own projects are not particularly important.

### 3.2. Academic trajectories of SNF newcomers

From the *content analysis of the SNF application files (Substudy 4)* it is clear that the career trajectories of *newcomers* are strongly marked by DISCIPLINARY DIFFERENCES. In medicine and physics, the qualifications pathway after the Master's degree is more clearly structured because of frequent changes in assistant and research positions. At the same time, however, this places higher demands on mobility. What is particular to medicine, moreover, is the double engagement with research and clinical work, which all applicants have experienced and many continue to pursue. Physics is characterised by a highly global labour market, few permanent research positions at universities, and at the same time the possibility of shifting to permanent research positions at non-university institutions and private corporations. In law as well as in linguistics and literature, the classical route to research also goes through an assistant position, but after that the career routes differ by discipline. Research in law is often combined with juridical employment. It is also still possible to complete all qualification stages at a single university. In linguistics and literature, employment is less continuous and more precarious than in the other disciplinary groups. Funded fellowships are thus an important factor for academic career success in this discipline. The combination of research and more practical employment is also widespread.

The most important gender-specific observations are as follows: In human medicine a good 10% of men and women work part-time as assistant or senior physicians. It is nearly impossible to interrupt the career trajectory, but women undertake a postdoc abroad much less often than men. In law, there are no differences with regard to part-time work, which is seldom undertaken. Women tend to hold assistant and senior assistant positions more often than men. In linguistics and literature, by contrast, it is the exact opposite: here there tend to be more men in assistant and senior assistant positions. Women, however, take much more frequent advantage of an SNF professorship. The five female professors in the sample (four of whom are foreigners) were considerably older when they started than the four male professors; the phase between the doctorate and appointment to a professorship takes nearly twice as long on average for women. In physics (including astronomy), the two (foreign) female professors were very young when they started, at 34 and 37 years of age respectively.

### 3.3. Institutional uncertainties in academic careers

The “mad hazard”, as Max Weber (1985 [1919]) called the precarious employment situation of academics because of the uncertainty of recognition and success, can affect both genders equally. Because of the limited number of professorships, the uncertainty of achieving one's goal and not having to drop out of the academic trajectory is very high for both genders, even though the probability of landing a professorship is still statistically smaller for women than for men. This could not have been more clear in the *in-depth interviews with emerging researchers (Substudy 5)*:

“One falls into a hole after the dissertation. There is no career, there are only various individual positions, somehow, that one has to fight hard for. But that also means that many people drop out”. (Hard and Natural Sciences, Woman 2, 695-698)

“There's just a problem with security, precisely this feeling of not being validated or secure.” (Humanities and Social Sciences, Man 2, 605)

“The great leap into the void. I think everybody gives their best, but just the fact that there is this great hole in the middle means that many people fall into it, and that this career does not meet our high hopes, because it’s always disappointing us, because you give and give and give, and then when you get to the postdoc stage and you want to climb up, it’s so hard, because the step is missing, and so many people do fall and decide to give up at this level. And I think that this is one of the main causes of . . . one of the main places where you hope for a bit more, especially after . . . if you have put in the years, so to speak . . . well, the sacrifice, in fact, yes or no, you know, you’re involved in research because you love it, right? (...) Am I going to take a couple of steps back to make the leap, or am I simply going to fall?” (Hard and Natural Sciences, Woman 5, 1358-1373)

An important strategy in the interviews for coming somewhat to terms with this haphazardness and uncertainty was the readiness to take on risks, called “PUTTING ALL YOUR EGGS INTO ONE BASKET”. This readiness to take risks was explicitly discussed by the interviewees as an individual characteristic or competence that not everyone possesses to the same extent. We have shown in the analyses that risk-readiness is closely tied with habitual patterns of thinking, perceiving and doing. It cannot simply be understood as an individual readiness to take risks, or as something one *wants* to do. Rather, the capacity to engage with risk must be considered as something that one *can* do, which is strongly influenced by BACKGROUND. This is connected to a HABITUAL SELF-CONFIDENCE, which allows one to take to the academic field like a fish to water, feel secure in the environment, and therefore be ready and able to take on risks.

A pronounced GENDER-BASED UNCERTAINTY becomes evident, in light of the underrepresentation of women, in connection with whether an academic career is realistic and compatible with starting a family (see Chapter 6). FEMALE REPRESENTATIVES AND ROLE MODELS are an important point of orientation when it comes to overcoming these individual uncertainties, precisely in those disciplines where women are heavily underrepresented.

“I noticed that it did me good to see female assistants, because this showed that there are also women doing a doctorate, not just studying for the Master’s degree”. (Hard and Natural Sciences, Woman 2, 79-80)

“And then when I got pregnant, I asked myself, ‘How is this going to go? (...) Will it work out?’ or ‘Can I finish the habilitation? And when? And what’s going to happen after that?’ So that is definitely an uncertainty, especially when you know that most academics, I think 60%, don’t have any children. From that perspective, it was always good for me to see women with children who actually had roles like that”. (Law, Woman 1, 565-571)

While men find role models in "inspirational personalities" who have made an indelible impression because of their academic work, women focus on female role models who have managed to gain a foothold in the academic field and/or to reconcile career and family.

Integration also involves NETWORKS AND MENTORS. These provide access to social, symbolic, cultural and economic capital by passing on the academic habitus through instances of socialisation. The net of personal contacts and support can be a safety net beneath a (career) ladder without rungs. However, as our analysis based on the *survey of PhDs (Substudy Report 2)* shows, female emerging researchers are less well

integrated into academic networks and are less frequently supported by mentors, which in turn increases their insecurity (see Chapters 4 and 8).

Especially for women, mentoring and role models reduce the access barriers to academic careers and therefore operate as catalysts for an academic career.

In addition to the habitual conditions as well as (the lack of) mentors and role models, which increase or decrease the uncertainties of this "mad hazard" and can improve one's chances of coping, INSTITUTIONAL CONDITIONS are also relevant. This has mainly to do with the degree of integration into the academic community, which can help to buffer the experience of uncertainty.

Thus, in comparison with emerging researchers who are only able to support themselves through third-party funded positions and fellowships, the advantage falls to those who have a secure mid-term university position, where they become academically socialised and develop an academic profile.

"I was in a relatively comfortable situation when I proposed this project, in a position that would still continue for some time. It wasn't like, if the project were rejected, I'd be left with nothing. The position still has another two or three years to run (...) I knew, ok, I can submit the proposal again in a year. For others, though, pulling out could mean the end of their career, or at least heading to the unemployment office. Or something. In that sense, yeah, it was annoying, but it wasn't really so serious". (Humanities and Social Sciences, Man 1, 320-328)

There are empirical indications in the literature that female emerging researchers find themselves in more precarious employment conditions than their male colleagues (Spieler 2008, Hinz et al. 2008), which increases the uncertainty of their situation.

### **3.4. Summary**

Career trajectories in the academic field are strongly marked by disciplinary differences. With controls for these disciplinary differences, there are no indications in the period under investigation, from the PhD award to five years after the doctorate, of a disproportionate number of women dropping out of the academic career path. They are just as frequently employed at universities and have an academic position just as often as men. Having to withdraw from or being pushed out of academic employment is not yet noticeable in the postdoc phase, either, so we can assume that there is an available group of female emerging researchers attempting to pursue an academic career after the doctorate. In our investigations, however, we have found evidence that children make it more difficult to remain in the academy, for women as well as for men.

Academic careers do not offer a clear, strongly institutionalised succession of positions which would allow emerging researchers to move forward step by step. Positions in higher education, with the exception of professorships, are for the most part limited in term and, especially after the doctorate, available only in small numbers. Project-related positions are often shorter in term than university positions. Research periods abroad must be financed by third-party means, for which one has first to apply.

These institutionalised uncertainties affect women as well as men and can be overcome only through support and promotion by mentors, a high degree of integration

into scientific networks and habitual self-confidence. Research funding by the SNF is very important in this process. For women as well as men, fellowships and collaboration on SNF projects allow them to continue in the academic field after the doctorate. Equal access to research funding thus remains a concern for the future, too.

The hazard of undertaking a professional career in the academic field poses even greater challenges for women than for men, because they face underrepresentation in the discipline and/or in higher positions, because they are less often supported by mentors (Chapter 4) and less well integrated into academic networks (Chapter 8), and because it is above all they who must reconcile family care responsibilities with research (Chapter 6). This often leads women to experience habitual uncertainty. Female representatives and role models are thus an important orientation point to help individuals overcome such uncertainties.

For the SNF, the question is how to account for the difficulties of connecting academic work and family, so as to factor this greater potential for uncertainty amongst female emerging researchers into its funding policies.

## 4. Mentoring and Support for Emerging Researchers

The importance of mentoring and support to the academic careers of emerging researchers was analysed in two substudies, along with the extent of gender discrimination in this area. The *in-depth interviews with emerging researchers (Substudy Report 5)* sheds light on the importance of mentoring from a subjective perspective (4.1). The *survey of PhDs (Substudy Report 2)* on the one hand analyses whether women in the postdoc phase are mentored by a professor in the same numbers as men, and on the other hand investigates the career effects of informal mentoring and institutionalised support for emerging researchers (graduate colloquia, mentoring programmes) during and after the doctorate (4.2). The chapter ends with a brief summary (4.3).

### 4.1. Subjective importance of mentoring

The *in-depth interviews with emerging researchers (Substudy Report 5)* make clear that mentoring by an established academic has a decisive influence on the academic trajectory and serves as a kind of safety net. In numerous conversations, the extreme importance of support and promotion was emphasised, often starting with supervisors in the doctoral phase and continuing beyond that.

“It’s still my good fortune to have Professor \*Name\* behind me, he’s a bit like my safety net, really ... My safety net. My life preserver”. (Hard and Natural Sciences, Woman 5, 1270-1272)

This support and promotion take various forms, such as the offer of an assistant or senior assistant position, good working conditions that allow one to concentrate on completing a qualification, co-publications and publishing support, or concrete help with compiling applications for a fellowship or research project. In addition to these active forms, more passive forms of support were also mentioned, such as the willingness to write recommendations or make a phone call in order to establish an important contact.

Sometimes the actions of supervisors aroused a certain degree of ambivalence, although the positive, supportive dimension was accentuated. Mentors thus also serve as ROLE MODELS, requiring that emerging researchers orient themselves according to their expectations, behaviour and style in order to gain recognition and, furthermore, support (Krais 2002, 415).

“I did have to struggle occasionally to get through. For him . . . you certainly have to work a lot. Sometimes I had to set boundaries and say . . . But he is someone who just says, ‘You can do it!’ and throws you in at the deep end: ‘Here is the lecture. You don’t know the subject. Doesn’t matter. You’ll do it next semester!’” (Law, Woman 1, 75-80)

Female mentors who themselves have been able to reconcile an academic career with a family can also be important role models and orientation points for female emerging researchers. Ideally, they are also people whom emerging researchers can talk to and who can offer pointers and advice.

“I primarily wanted . . . here in the hospital I have a young and dynamic mentor, but precisely what I didn’t have was a woman, someone who could say



what happens when you have a family, when you can't work 150% of the time. And I was pregnant just then, and because of that I was interested in the topic. And there aren't that many positive role models yet. But I had a female professor [as a mentor; authors' note] who had just retired, but still, she had had four children at a time when it was a lot harder. That was very important to me. She looked at it from a certain distance, not in the rush of her own career anymore. She could look back a bit and she told me: 'You have to figure out what's more important to you. Take some time for the child, too.'" (Medicine, Woman 3, 185-195)

Mentors know the academic field, the rules of the game, its demands and practices, and they can pass this knowledge on. Support for emerging researchers takes place in daily and informal ways, and often consists of small pointers, tips and advice. The following quotation nicely shows that academic employment as a long-term career is something that has to be learned, and that it takes a long time to become professionally socialised, since "so many small things that you come across" must first be practised, refined, emulated and incorporated as part of a career-specific habitus. We can assume that in this socialisation process the complex interaction of personal dispositions, the processes of representation, attribution and recognition, as well as the circumstances specific to the situation, all have a decisive influence on an academic career.

"That one can fall back on the experiences of someone who really understands how to support young researchers. And who passes all this knowledge on. Because I find it difficult, there are so many things that he provided me with over the course of these five years of working with him, which can't be taught in a lecture or seminar. And which you can't learn from a publication. (...) I think, it can't happen in any other way. Because there are just so many, there are these fine points which are so hard, there are so many small things that you come across which are difficult to impart in any simple way. I would have never known how. Style issues in part, too. Or questions of 'how do you do that?' Sure, someone can put a model proposal in front of you, say this is what a successful proposal looks like, that could maybe be helpful, but I think that this alone wouldn't answer all the questions". (Humanities and Social Sciences, Woman 2, 586-604)

If there is no MENTOR SUPPORT in this process, then this frequently has negative effects on a career. One is not made aware early enough of the important factors and strategies in an academic career; one is not integrated into social networks nor does one receive offers of positions or fellowship opportunities (abroad), as well as many other things.

Beaufaÿs und Kraiss, in their observations of and conversations with professors and their mentees, show how such a mentoring relationship is built on the anticipation of trust and produces long-term trust as a reciprocal investment by the mentor and the emerging researcher (Beaufaÿs 2003, 196f., Kraiss and Beaufaÿs 2005). This trust, or belief of a mentor in the mentee's capacity to produce work of a certain standard, is a central factor in the process of constructing academic careers and academic personas. This belief is not just about recognising the capabilities and achievements of the mentee, but also about attributing such capabilities to him or her. Achievements only become socially relevant and visible through this construction process, rather than being something produced "in loneliness and freedom" (Engler 2001). This is

the prerequisite for being able to position oneself in the academic field as a legitimate, if emerging, researcher (Beaufaÿs 2003, 246f).

According to Beaufaÿs's and Kraiss' conclusions, it is more difficult for women to gain such trust and build on it, because they receive less recognition as researchers whose work is to be taken seriously and because impending motherhood (at least as anticipated by [male] professors) puts their supportability into question. All of this often happens through very subtle actions and messages.

As CATALYSTS for attributing and recognising achievement, mentors can help people develop and demonstrate a certain independence in research. They can make it possible for emerging researchers to present an independent, (lower-level) academic persona at a time when one is not yet independent but is actually reliant on the grace of mentors. The following quote shows this very nicely:

“In the position I am in at present, you have to prove yourself while at the same time . . . Well . . . We don't have the means they prove ourselves yet, and yet we are expected to have proven ourselves already in order to advance. And this situation, it's a little, it's a bit ambiguous, you see, at the moment . . . Basically, I think that there isn't a choice: at some point, you're required to get a mentor to support you, to be able to do research more or less independently, to try and attain, so to speak, an intermediate position. The problem is that when you leave, for the first time, to go abroad, if you want to make a submission as someone on a fellowship when you're abroad, you have to have had a boss who lets you pursue your own ideas and publish as the last author<sup>13</sup>, to be able to show when you're abroad that you've already taken the step of becoming independent. And the mentors who will let you do that are very rare indeed”. (Hard and Natural Sciences, Woman 5, 452-465)

We can conclude by saying that mentoring is an indispensable form of support which enables access to further cultural, social, economic and symbolic resources that are important for an academic career. We thus speak of mentoring as a catalyst that triggers the process of constructing an academic career and speeds up its progress. In this construction process, mentoring is the prerequisite for achieving the status of a “promising young academic” within the scientific community and for advancing further on the career path.

If women are less often seen to be worth supporting than their male colleagues and less frequently have adequate mentoring in the sense that they are given recognition as well as trust (in advance), then they are crucially disadvantaged in building up an academic career and have lower chances of successfully establishing themselves. This will be documented in what follows with “hard facts” taken from quantitative data analyses.

#### **4.2. Mentoring in the postdoc phase and the effects of academic support and integration on career development after the doctorate**

As the *survey of PhDs (Substudy Report 2)* shows, in comparison with men, women with doctorates have a significantly smaller chance in the postdoc phase of finding a professor who will rigorously support and promote them in a mentoring relation-

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<sup>13</sup> In the hard and natural sciences, the senior scientists, project leaders and/or professors are the last to be listed in the publication credits. This is different in the humanities and social sciences, where their names come first.

ship.<sup>14</sup> This result corresponds with a number of other studies, which document that women are less frequently able to count on an academically established person who will concretely support and promote them in their careers (Siemienka 2007, 263, Zimmer et al. 2007, 122f., Ledin et al. 2007, 985, Allmendinger, Fuchs, von Stebut 2000, Grant and Ward 1996; Bagilhole 1993, Geenen 1994, 91).

The following results from statistical analyses show that informal mentoring and overall academic support and integration of emerging researchers have a demonstrable effect on further career development. In the *survey of PhDs (Substudy Report 2)* we focused on the question regarding how support and integration DURING THE DOCTORAL PHASE and IN THE POSTDOC PHASE affected the academic career progress of the doctoral graduates after the completion of their PhD. The analyses show that the DEGREE AND QUALITY OF INTEGRATION AND SUPPORT DURING THE DOCTORAL PHASE have significant impact on the academic career after the doctorate. Doctoral graduates who received CAREER-ORIENTED SUPPORT during the doctoral phase from their supervisor, from other people in the academic community or within the framework of courses or consultations tended to stay longer in the academy, go abroad more often after the doctorate, be mentored by professors further on in the postdoc phase, submit applications for fellowships more frequently to the SNF, be better networked and publish more.

SUBJECT-SPECIFIC SUPPORT, A POSITION AS AN ASSISTANT and PARTICIPATION IN A GRADUATE COLLOQUIUM during doctoral study also, in relation to certain questions, have a positive effect. PARTICIPATION IN A MENTORING PROGRAMME, however, has no positive effect, and in relation to certain questions (e.g., about academic networks, publication output prior to doctoral award) the impact is even negative. It can be assumed that the first generation of participants in the Swiss Federal Equal Opportunity at Universities Programme did not correspond to the envisaged target group.

Integration and support during the doctoral period promotes not only continuance in the academic field, but also generates further support for the emerging researcher as well as integration into the academic community. This effect, known as ‘cumulative advantage’, stems from the fact that, in the form of a self-fulfilling prophecy, those doctoral candidates who are considered by mentors to have promise and above-average academic talent also receive more recognition and support after completing their doctorate (Cole 1979, Merton 1985).

INTEGRATION FACTORS AFTER THE DOCTORATE – such as participation in a graduate colloquium or mentoring programme as well as positions in the academic and research field – also have a positive impact on the extent of one’s academic contacts and on publication output in the later phase of the trajectory (five years after the doctorate).

With these results, it has been empirically proven using a longitudinal design that qualitatively good integration and support during the doctorate and in the postdoc phase have a demonstrable positive impact on further career progression. It has been repeatedly documented that female emerging researchers during the doctoral phase receive fewer offers of positions and are less frequently motivated to pursue an academic career; it is more difficult for them to find a mentor or join academic collaborations and they have more trouble gaining access to important academic contacts and networks (for an overview, see Leemann 2002, 49ff). As a consequence of these sometimes very subtle disintegration processes, which are already ongoing

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<sup>14</sup> A synoptic overview of the results of the model estimations can be found in the appendix (Table 6).

during the doctoral period, female academics fall victim with disproportionate frequency to a “*cooling out*” process, while men are just *warming up* (Merz and Schumacher 2004).

### 4.3. Summary

On the basis of our results, we can assume that the lower degree of career-oriented support, or mentoring, of women by established academics is one of the most significant factors in the disproportionate loss of emerging female researchers from the academic field. Mentors are important because they pass on knowledge about the academic field, the rules of the game, its requirements and practices in daily and informal ways. They offer concrete positions, give advice regarding the submission of applications for research funding, arrange for further positions after one’s return from abroad and make it possible for one to become visible through publications and conference appearances. They work as promoters in the background, writing references, arranging contacts and vouching for the capability of the mentee. Female mentors, especially those with children, serve as role models for female mentees, exemplifying through their own life that it is possible to reconcile family and academic career. We have thus identified mentoring as one of the important catalysts for an academic career.

Doctoral graduates who received career-oriented support during their doctoral period are also more likely to stay in the academy, go abroad after the doctorate, receive further mentoring from professors, and submit fellowship applications to the SNF; they are also better networked and publish more. But disciplinary and institutionalised forms of support for emerging researchers also have a positive impact, such as participation in a graduate colloquium, employment in higher education and also, in part, participation in a mentoring programme.

A lack of or inadequate mentoring of female emerging researchers is part of a very subtle ongoing disintegration process, which begins in the doctoral phase and extends through the postdoctoral phase of the career trajectory. Women therefore not only have less social capital and resulting access to further resources, but they also experience latent acts of underestimation and disregard. We can assume that, as a consequence, they judge themselves to be less suited to an academic career than their male colleagues and in a sense “voluntarily” withdraw from the academic field, which Bourdieu refers to as symbolic power/violence (Bourdieu and Wacquant 1996, 203f.).

The SNF is thereby challenged to use its support policies to make professors at the universities aware of the problem, to motivate them to understand that female emerging researchers are just as supportable as male researchers, and hence to allow women to be granted such support.

## 5. Research Funding

Funding for the academic career path is provided by universities and third-party sources, with the latter becoming increasingly important. On the one hand, support funding in the form of fellowships and financed projects makes it possible to attain further qualifications while also having value as a FORM OF SYMBOLIC CAPITAL. On the other hand, such forms of financing academic careers can also work as INDICATORS OF POOR INTEGRATION, since emerging researchers who are financed by universities experience their qualification phase as being more secure and stable than peers who are dependent on third-party funding. For instance, Krimmer and Zimmer (2004) have shown for Germany that, in the earlier qualification stages, successful female professors had predominantly been employed in university positions. Against this backdrop, participation in research funding is thus not per se a positive or negative factor in the development of a career, but must rather be contextualised according to the specific situation.

In Switzerland, unlike other countries, there are relatively few alternatives to supporting one's research through the SNF. In addition to the research funds provided by universities, industry and foundations as well as departmental research, EU support programmes are worth noting. The SNF has access to a wide range of instruments for funding academic research, which are fundamentally open to all academics working in Switzerland, regardless of their nationality. PURE RESEARCH accounts for 80% to 90% of the funds distributed, which are disbursed in the form of PROJECT FUNDING (project applications to Divisions I to III and to the special programmes) as well as INDIVIDUAL AND CAREER FUNDING (incl. fellowships for prospective researchers, fellowships for advanced researchers, Marie Heim-Vögtlin Programme, SNF professorships and various special programmes).

The SNF also supports TARGETED RESEARCH, which is overseen by Division IV. This comprises the NATIONAL RESEARCH PROGRAMME NRP (one-time awards which run for a few years) as well as the NATIONAL CENTRES OF COMPETENCE IN RESEARCH NCCR (long-term development of thematically oriented research alliances).<sup>15</sup> The funding provided by the SNF is variously distributed across the individual subject areas. Around three quarters of the funds go to medicine/biology and mathematics, natural and engineering sciences, with each subject area receiving half. The remaining quarter goes to the humanities and social sciences.

In terms of research applications to the SNF, the proportion of those submitted by women is low: for pure research in 2007, 19% of the submissions were made by women (the highest proportion was in the humanities and social sciences, at 27%). The proportion of women, as Jänchen and Schulz (2005) ascertained for three selected disciplines, is not likely to correspond to the actual potential of the field. In their study, however, Jänchen und Schulz did not determine the career level of the principal applicants. It could thus be the case that the underrepresentation of women in professorships and the precarious position of women at the middle level of the academy mean that women make fewer applications, especially as the funding cannot be used to finance their own salary. Since an application submission to the

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<sup>15</sup> The 20 NCCR projects could not be included in the analysis due to problems with the data. In terms of volume, they account for less than 10% of the funds distributed by the SNSF. The assessment within the SNSF is that the NCCR reflects more or less exactly the same disciplinary differences as can be found in the pure research proposals submitted to Divisions I to III.

SNF has to meet high quality standards, it is also possible that women at the post-doc level wait longer before daring to put forward an application in their own name.

Amongst the PROJECTS APPROVED by the SNF in 2007, the proportion of women dropped further to 14%. In the category of individual funding, the approval rate was higher, at 36%. In building an academic career, it is also important for emerging researchers to participate in projects funded by the SNF. Of the 4,200 positions funded in 2007 by pure research SNF projects, women represented 35% of the doctoral positions and 45% of the positions for other researchers. In targeted research, the proportion of women amongst the funded researchers is generally lower (SNF 2007).

Three substudies thus investigated the role played by research funding, and in particular the funding offered by the SNF, for women and men between the doctorate and professorship. The *survey of PhDs (Substudy Report 2)* mapped the application history of doctoral candidates from completion of the Master's degree to five years after the doctorate, and investigated the frequency of participation in research projects financed by the SNF and other institutions (5.1). It cannot be determined from this data whether women have equal chances of approval for a fellowship or research project application, as the number of approved research applications was too small. With reference to SNF funding, however, this proved possible in the *evaluations of the SNF application administration system (Substudy Report 3)* (5.2). The focus of these evaluations lies not on the individual application but rather on the person, who over the course of time has perhaps submitted several research applications in his/her own name and has a history in the application administration system as a co-researcher or fellowship recipient. Furthermore, the significance of research funding for an individual academic career was addressed in the *survey of PhDs (Substudy Report 2)* as well as in the *in-depth interviews with emerging researchers (Substudy Report 5)* (5.3). A summary draws together the findings at the end (5.4).

## **5.1. Involvement in applications for research funding and participation in research projects**

In order to determine whether women and men in comparable academic circumstances are equally likely to submit funding applications for individual and research funding, we analysed the application histories from the *survey of PhDs (Substudy Report 2)* with regard to individual funding (SNF research fellowships, other research fellowship and SNF professorships) and project funding by the SNF as well as other institutions abroad and in Switzerland. We investigated whether at least one relevant application was submitted. We also investigated whether in the course of their career the PhDs had participated in projects financed by university or third-party means. The period under investigation covered the years between award of the Master's degree and five years after the doctorate. A synoptical overview of the results of the model estimations can be found in the appendix (Table 5 and Table 6).

### **5.1.1. Individual funding**

A total of 29% of the doctoral graduates surveyed had submitted applications for individual funding since being awarded a Master's degree: 12% had applied at least once for an SNF fellowship for prospective researchers, 7% at least once for an SNF fellowship for advanced researchers, 14% at least one for another kind of fellowship, and 5% at least once for an SNF professorship.

### **Fellowship applications**

NO GENDER EFFECT could be detected in the regression analyses investigating the factors that influence the frequency of fellowship applications. The birth of a child before the completion of the doctorate stands in inverse relation to the likelihood of submitting a fellowship application as a prospective researcher. Either those who submitted such an application had not started a family before completing the doctorate or, of those who had a child, none planned to use the SNF fellowship to spend a period abroad. For the other kinds of fellowships, no such circumstances could be determined. On the other hand, under controls for subject areas, there is evidence that applicants who completed their Master's degree abroad were less likely to submit applications to the SNF as prospective researchers. Since they had already proved mobile by coming to Switzerland to undertake the doctorate, they had less need for a fellowship to study abroad, as such applications are usually submitted just before completing the doctorate or shortly thereafter. In the applications for advanced research fellowships, this is no longer the case. Once one has advanced to this stage of the academic trajectory, the career-specific support during the doctorate kicks in, generating a greater submission of applications. There is also evidence of discipline-specific effects: academics in law and the technical sciences apply for SNF fellowships less frequently. Further, having submitted an application has a positive effect on the likelihood of further submission. If someone has already formulated a fellowship application during the course of their research, then he/she is more likely to do so a second time, including making submissions to other funding institutions.

### **Applications for SNF professorships**

In terms of the probability of submitting an application for an SNF professorship, there is NO EVIDENCE OF GENDER BIAS five years after the doctorate, nor any evidence that the birth of a child before the completion of a doctorate makes a difference. As can be expected, however, the language region is significant. Doctoral graduates from the French-speaking part of Switzerland, where the "thèse" (PhD) stands in a clear relation to an academic career, submit applications for an SNF professorship more frequently than doctoral graduates from the German-speaking part of Switzerland. Having had previous experience with the acquisition of third-party funds is also significant. If one has already submitted an application for an SNF fellowship for advanced researchers or for project funding by the SNF, then he/she is more likely to apply for an SNF professorship. For women, having participated in a mentoring programme during the doctoral phase, has a highly positive effect on the likelihood of submitting an application for an SNF professorship, although this does not necessarily determine anything about the chances of success. Since the SNF professorship may not be taken at one's home university and the application submission must meet high academic standards, it is particularly important to have support from mentors. The further factors of integration and support during the doctorate are not significant, probably because the applicants are already several years past the doctoral period.

## **5.1.2. Project funding**

### **Applications for project funding**

A quarter of the doctoral graduates surveyed had submitted at least one application for financial support of a research project since being awarded a Master's degree.

Only 10%, however, had submitted an application for SNF project funding. This could be the result of two conditions imposed by the SNF. On the one hand, having a doctorate is a prerequisite for submitting an application in one's own name to Divisions I to III; on the other hand, project applicants receive contributions only for researchers in their team and as a rule have to finance their own work through a university position. By contrast, 26% of doctoral graduates submitted applications for project funding to other research funding institutions in Switzerland and abroad, which consists of a highly heterogeneous mix of funding instruments. This could be, for example, money coming from departmental research in the federal government or cantons, or on the other hand national research funding institutions abroad like the DFG (Germany) or the NSF (USA).

Again, GENDER HAS NO EFFECT on the likelihood of submitting an application for SNF project funding, nor is the birth of a child before the completion of the doctorate decisive. By contrast, employment in the academy directly after completing the doctorate has a strong effect, since such a position offers the temporal and financial conditions for being able to plan and implement a larger research project. No effects can be detected in regard to social origin, language region or integration during the doctorate. When broken down by subject area, it becomes clear that applicants for SNF project funding come above all from the humanities and social sciences.

If we consider only SNF project applications in the category of pure research, then other factors come into play. People with Master's degrees from abroad who have left their own country to pursue a doctorate are more likely to submit an application for SNF project funding, which could be explained on the grounds of their high degree of career focus and lower "pressure" to be geographically mobile. Doctoral graduates who have applied for SNF fellowships so as to spend a research period abroad, and thus are clearly striving for an academic career, are also more likely to submit applications for SNF pure research funding.

For other kinds of project funding (not through the SNF), having the social and cultural resources (family background) to submit an application abroad proves to be relevant, since well-known foreign research funding institutions also fall into this category alongside the federal government, cantons, foundations and industry already mentioned. People with Master's degrees from abroad as well as those coming from an academic family have an advantage in this regard; they make more frequent use of other sources of project funding. The subject area one belongs to is also relevant here: there is a significantly higher rate of application to non-SNF project funding sources in the technical sciences than in the hard and natural sciences. As is to be expected, academic employment directly after the doctorate stands in a positive relation to the likelihood of submitting an application for project funding to sources other than the SNF. Furthermore, it proves to be important to have experience with related institutions, such as the submission of fellowship applications to institutions other than the SNF, when one applies for non-SNF project research funding. No effect on the likelihood of submitting project research applications outside the SNF can be detected in terms of gender, the birth of a child before completion of the doctorate, language region or integration during doctoral study.

### **Project participation**

As the analysis pertaining to project participation shows, nearly 60% of doctoral graduates have experience with working on research projects, 28% of them on projects funded by the SNF and 39% on other research projects. Whether or not one is



able to participate in a research project is largely dependent on one's disciplinary affiliation and/or the part played by research and particular research funding institutions in the various disciplinary fields. Thus, SNF projects are particularly important for the hard and natural sciences, as well as the humanities and social sciences, while in the technical sciences project funding and participation outside of the SNF (whether in Switzerland or abroad) play an important role. GENDER, starting a family before completing the doctorate, social background, language region as well as integration and support during doctoral study have NO IMPACT. By contrast, people with Master's degrees from abroad, as well as those who have applied for an SNF fellowship to go abroad, are more likely to participate in research projects which are not funded by the SNF.

We can conclusively state that there are no indications that women seek to finance their career more frequently by means of third-party funding in the form of fellowships or research applications, nor is there a basis for arguing that women must overcome greater hurdles when they submit a funding application.

This finding is supported by the results of the study carried out by Hinz, Findeisen and Auspurg (2008), who investigated proposals submitted to the DFG (*Deutsche Forschungsgemeinschaft*, a.k.a. German Research Foundation) and found only negligible or no gender bias with regard to individual and project funding. In other investigations, too, there are few or no indications that a lower number of applications is submitted by women (Allmendinger and Hinz 2002, Gustafsson, Jacobsson and Glynn 2007, Jacobsson, Glynn and Lundberg 2007). Brouns (2000), by contrast, in her investigation of highly prestigious fellowships awarded by the two most important research funding institutions in the Netherlands, concludes that men apply more frequently for one or the other of these fellowships than women (Brouns 2000, 194). An explanation for the co-existence of these two claims is offered by a very broad study carried out in Great Britain, which surveyed over 3,000 people at 44 institutions of higher education about application submissions for research funding (Blake and La Valle 2000). Amongst these, women indeed tended to submit a research funding proposal less often than men in the last five years (50% of the women in comparison with 59% of the men). A large part of this gender difference can, however, be explained by the lower academic positions and weaker academic profile of women (incl. publication output), their poorer employment and research conditions, and the lower degree of institutional support for applications submitted by women. According to this study, children also lower the likelihood of submitting applications, above all amongst women.

The sample we investigated is based on a cohort. Therefore it is much more homogeneous than that of Blake and La Valle, which is probably a contributing factor to our determination of gender equality.

## **5.2. Personal profiles, application patterns and chances of success in research funding at the Swiss National Science Foundation (SNF)**

A further barrier on the academic career path could be found in unfair assessments of the academic abilities and achievements of women in comparison with men in the course of gaining approval for proposals and research fellowships. To counter this, the academic system has instituted a process, the *peer review*, in which such deci-

sions are made by a group of experts from the academic community. This process is meant to guarantee that only the quality of the submitted project (innovation, methodological fit, feasibility) is taken into consideration. Jansen et al. (2007) offer an overview of the problems with the peer review.

There is little agreement amongst the studies about the gender dimension in research funding decisions, which is not surprising given their highly diverse approaches, topics and geographical focus points. The conclusions range from finding evidence of definite discrimination (Wennerås and Wold 1997) to detecting bonuses for women (Brouns 2000). In studies for the SNF, Jänchen und Schulz (2005) find that gender difference plays a small part, while Widmer and Levy (2008) discover it has a partial impact and Gilland Lutz et al. (2006) detect no impact.

There has been no Swiss study so far that has monitored the "quality" of the applicants.<sup>16</sup> It could thus be the case that the female applicants have a better profile (e.g., research experience, publication output) than their male rivals, since they have "survived" particular gender-specific selection processes (*threshold effect*) and because they submit applications as principal investigators only when they have met higher quality standards, in comparison with men, or when they have themselves attained a certain position (professorship).

Behind this finding of "no gender effect", therefore, there could still be hidden discrimination against women in the sense that women have to have better qualifications in order to achieve the same outcome (see also the findings of Wennerås and Wold 1997). Or it could be the case that women in the postdoc level of the academic hierarchy prepare proposals but do not list themselves as the principal investigator on the application, seeking instead a (male) principal investigator in a higher position for that role.

The problem of HIDDEN, INDIRECT DISCRIMINATION MECHANISMS also makes apparent that it makes sense to take into consideration the personal and structural preconditions which affect each application, above and beyond the actual selection process of the SNF. It is therefore not just a question of whether the allocation practices of the SNF themselves lead to gender bias, but also in what ways the SNF is complicit with the inequalities that have marked the academic trajectories of applicants. We have attempted to find this out by consistently focusing on the person rather than the individual application. This allows us to connect the information from various applications to actual personal profiles when there are several references to the same person in the system.

In contrast to earlier studies, all of the disciplines and the data recorded in the application administration system of the SNF are evaluated with a focus on the gender-specific differences amongst 3,107 EMERGING RESEARCHERS BETWEEN THE DOCTORATE AND PROFESSORSHIP. The criterion of selection requires that people have made the career move of submitting a research application in their own name for project funding or for an SNF professorship. This attempt at focussing was not perfect, since information about whether someone already has a full professorship is not contained in the application administration system. With applicants who have Master's degrees from Switzerland, it is less often the case that they make their first application to the SNF in their own name as professors; with those professors who have come from abroad to take up a position in Switzerland, this happens as a rule. The picture that

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<sup>16</sup> In the evaluation of the Marie Heim Vögtlin Programme, too, only those women who had received a contribution were relevant to the investigation (Belser 2006). This programme, however, is aimed exclusively at women.

emerges thus holds for researchers up to and including the first phase of a professorship.

The group under investigation is therefore not the same as the sample in the *SHIS evaluations (Substudy Report 1)*, all of whom have completed a doctorate or habilitation at a Swiss university, or the sample in the *survey of PhDs (Substudy Report 2)*. Amongst the researchers who apply to the SNF for funding, international mobility plays a much greater role than in the other groups. Half of these researchers (47% of the sample) are immigrants to Switzerland without a Swiss passport. It is thus not possible to draw conclusions about the Swiss university system and emerging researcher support on the basis of their situation or their actions. In addition, the analysis focuses on a point at which a good part of the *leaky pipeline* is already behind the group under investigation. The gender-specific difficulties which can lead to an early withdrawal from the system thus no longer arise, as we are investigating only those people who have been able to maintain themselves in research up to the point of submitting an SNF application in their own name.

The evaluations of the application administration system of the SNF have a double objective: the *reconstruction of individual profiles and SNF application histories* in the chosen sample of *newcomers* (5.2.1), as well as *in-depth statistical analyses* of gender-specific differences in these SNF application histories. Success indicators that can be identified from the data are analysed in terms of their dependence on explanatory characteristics such as gender, amongst other factors (5.2.2).

### 5.2.1. Descriptive reconstruction of individual profiles of applicants

The sample in the *evaluations of the SNF application administration system (Substudy Report 3)* comprises 753 women (24%) and 2,354 men, with foreigners comprising a slight majority. The proportion of women does not exhibit significant statistical variation either by LANGUAGE REGION or by NATIONALITY. The average age in the first application at the time proposed for starting research is 39 years, for both genders. The AGE DISTRIBUTION for women and men coincides to a surprising degree. For both sexes, the 36 to 40 year-olds are the most heavily represented age group at the time of their first independent attempt to acquire research funds from the SNF. The individuals applying for the first time for a SNF professorship exhibit a significantly different pattern of age distribution. The proportion of those over 40 is markedly higher amongst women than amongst men, which, however, can be explained by the fact that the age restrictions for women have been lifted.

Personal characteristics do not contribute to explaining possible gender-specific differences, at least not at this aggregated level, where there is no available information about whether one has children. In what follows, we will investigate in greater depth the various features of the career trajectory<sup>17</sup> as well as the interconnection of disciplinary differences and internationality.

#### **Characteristics of the career trajectory**

The majority of the researchers are backed by a university at the time of submitting their first application. Gender-specific proportions vary significantly amongst the research institutions, but this is strongly connected to differences amongst discipli-

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<sup>17</sup> Information about important factors such as educational career and professional position, however, was not available.

nary fields. The proportion of women is represented in **Table 2** in terms of individual applications submitted and successful applications.

**Table 2: Career characteristics by gender**

	<b>Women</b>	<b>%</b>	<b>Men</b>	<b>%</b>	<b>Total</b>	<b>%</b>
<b>Total applications</b>	2045	24	6379	76	8424	100
As principal investigator	605	24	1887	76	2492	100
<i>Success rate</i>	48%		49%		49%	
As co-investigator	478	22	1716	78	2194	100
<i>Success rate</i>	48%		53%		52%	
Project proposals preceded by related project	462	24	1432	76	1894	100
Project proposals succeeded by related project	406	24	1288	76	1694	100
Application for an SNF professorship	222	26	622	734	844	100
<i>Success rate</i>	16%		13%		14%	
<b>Total number of people</b>	753	24	2354	76	3107	100
Number of people with at least one successful application	388	23	1301	77	1689	100
First application Div. 1, Humanities & Social Sciences	161	26	456	74	617	100
First application Div. 2, Mathematics, Natural & Engineering Sciences	102	15	565	85	667	100
First application Div. 3, Biology/Medicine	309	28	809	72	1118	100
First application Div. 4 National Research Programmes	73	28	189	72	262	100
First application, SNF professorship	108	24	335	76	443	100
Professorship (selfdeclaration)	110	18	502	82	612	100
<i>in % by gender</i>	15%		21%		20%	
<b>History with SNF prior to first application</b>						
Participation in SNF projects	414	26	1192	74	1606	100
Fellowship received for prospective researchers	114	23	374	77	488	100
Fellowship received for advanced researchers	54	22	191	78	245	100
Other fellowship received*	63	32	132	68	195	100
Contributions received for international relationships	29	18	126	81	155	100
Contributions received for publication	51	32	108	68	159	100

\*e.g., EURYI, exchange programmes, Marie Heim Vögtlin, Pro\*Doc

Source: Excerpted from SNF application administration system; Computations: BASS/GEFO

For applications as well as individuals, the gendered proportion of the total is always presented in the first line (grey background) as a comparative value. What is noticeable here is that the proportion of women amongst individuals is no different than the proportion of women amongst applications submitted. The analyses from the PERSPECTIVE OF APPLICATIONS in the upper part of the table show that the patterns deviate only slightly from the total average in terms of proportion of women when broken down according to principal investigators, co-investigators and applicants for an SNF professorship.<sup>18</sup> In addition, we examined whether men were more likely to submit proposals for projects which were either preceded or succeeded by a related projects. This is not the case. Even the success rates did not significantly differ by gender, although women tend to be somewhat more successful at gaining SNF professorships than men, who are somewhat more successful as co-investigators.

<sup>18</sup> The success rates with project grants given here are notably lower than those in the standard statistics of the SNSF, since we investigated a select sample of *newcomers* to the SNSF. Taking all of the SNSF project applications together, the proportion of successful applications for 2003-2006 was around two thirds.

As a second point, from the PERSPECTIVE OF INDIVIDUALS (lower part of the table) we analysed how many researchers submitted at least one successful proposal as a principal or co-investigator or successfully applied for an SNF professorship. This represents only 54% of the sample, or 1,689 people. As successful we count those applications which received a sum of more than zero francs. Women with at least one successful application do not appear less frequently amongst the *newcomers* than women in general.<sup>19</sup>

As expected, differences in gender proportions can be detected amongst the DIVISIONS OF THE SNF to which the *newcomers* have submitted their first application, as defined above. In Division 1, Humanities and Social Sciences, the proportion of women is surprisingly no higher than that of the overall total, even though the proportion of women amongst university lecturers is well over the overall average.<sup>20</sup> This could indicate higher hurdles for women when it comes to the submission of research proposals to the SNF in those disciplines with a traditionally high number of women. The proportion of women in Division 2, Mathematics, Natural and Engineering Sciences, is significantly lower than in the other divisions, but this to some extent corresponds with the proportion of women amongst the university lecturers. The proportion of women in Division 3, Biology and Medicine, is surprisingly high, higher than the proportion of women amongst university lecturers.<sup>21</sup> The National Research Programmes also seem to offer women above-average chances of being successful with their applications. Further, it can be seen that the proportion of women amongst first-time applicants for an SNF professorship corresponds exactly to the proportion of women amongst the total number. With the exception of Division 1, there are thus absolutely no indications that women are confronted with higher hurdles when they submit their first funding application. In absolute numbers, by far the most women as well as men submitted their first application to Division 3. The next greater number of women applicants appears in Division 1, while for the men it is Division 2.

Amongst the *newcomers*, women are far less likely to bear the title of professor. This indicates a weaker positioning at the outset when applying for research funds. There are no significant differences regarding the SNF APPLICATION PREHISTORY of the *newcomers*, as far as previous participation in projects or successful fellowships application. Overall, previous participation in research projects funded by the SNF represents a more common prehistory than SNF-funded fellowships. More than half of both women and men had already gained research experience by participating in SNF-funded projects before submitting their first SNF application in their own name. This seems to be an important building block for the SNF research career. In the category of other individual funding, women have a significantly stronger presence, because the Marie Heim-Voegtlin Programme, which is reserved for women, falls into this category. Men are overrepresented when it comes to contributions received for

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<sup>19</sup> The small difference between 23% and 24% is statistically not significant. With men as well as women, 66% of the successful applicants had submitted only one successful application, 23% had submitted two, 7% had submitted three, and only a few individuals had submitted more than that. The maximum number of successful applications is 12 (for a man) and 10 (for a woman).

<sup>20</sup> As the grounds for comparison, we have always taken the middle personnel category of "lecturers" from the personnel statistics of the SHIS. In the humanities and social sciences at Swiss universities, women made up 43.5% of the lecturers in 2006; amongst the considerably fewer lecturers in economics and law, they made up 21%.

<sup>21</sup> According to the SHIS, women made up 14.1% of the lecturers in the hard and natural sciences at Swiss universities in 2006, and 10.4% in the technical sciences.

international relationships, while women are overrepresented in contributions toward publication.

The lack of gender bias in these descriptive analyses is not a matter of course in other studies; however, most of these do not focus on newcomers to research funding. Hinz et al. (2008), for instance, do discover gender differences in project and individual funding at the German Research Foundation.

### **Disciplinary fields and internationality**

The equally high success rates for women and men could, as is often supposed, be solely due to the presence of established female researchers from abroad who have been appointed to a professorship in Switzerland. For this reason, we broke down the proportions of approved and rejected applications by nationality. The evaluations show that the PROPORTION OF FOREIGN WOMEN (% by gender) submitting successful applications is in fact higher than those submitting unsuccessful applications, namely 60% as against 54%. This phenomenon, however, is also to be found amongst the men (56% as against 49%). Overall, then, there is no significant gender-specific effect.

It is only when we turn our attention to the interrelation between disciplinary fields and international mobility that we are able to gain other perspectives. In the subject areas with a low proportion of women, the percentage of immigrants is markedly higher amongst women than amongst men. Thus, in the hard and technical sciences, 86% of the women applicants do not hold a Swiss passport (for the men it is between 69% and 64%). The same effect, however, also pertains to linguistics and literature. Here 59% of the women applicants are foreigners (men 29%). The influx of established female researchers from abroad does in fact raise the overall proportion of women in these subject areas.

### **5.2.2. Multivariate data analyses of application patterns and chances of success in SNF research funding**

Multivariate data analyses were carried out in order to isolate gender effects from other factors. In this process of measuring discrimination, we were interested in how strongly gender, as the unexplained remainder alongside other explanatory factors – in particular one's application history at the SNF itself (participation in SNF projects, SNF fellowships) – impacts on the success of applications for research funding. Numerous similarly formulated empirical studies regarding the fairness of the peer review process in research funding (see Sandström and Hällsten 2008; Widmer and Levy 2008; Bornmann, Mutz and Daniel 2007; Jacobsson, Glynn and Lundberg 2007; Ledin, Bornmann, Gannon and Wallon 2007; Laudel 2006; Gilland Lutz et al. 2006; Jänchen and Schulz 2005; Viner et al. 2004; Gannon et al. 2001; Brouns 2000; Wennerås and Wold 1997; Grant et al. 1997) have investigated factors such as the particulars of the applicants (university position, age, publication productivity, previous application success, social capital, gender), the particulars of the peer reviewers (number of (foreign) reviewers, university position of reviewers, age and gender of reviewers) and the particulars of the context (competitive situation, discipline, status of the university). In the present analyses, we monitor age at submission and submission year, number of previous collaborations on SNF projects, SNF fellowships received, professorship (self-declaration), nationality, language region, subject area and SNF division, as well as the type of institution (academic university, university of applied sciences, etc.) In this way we make available several indicators that

help to measure the differences amongst qualification levels, as has proven central in the study by Wennerås and Wold (1997). The professional position of the applicants, however, is missing, as is information about their family situation.

In total, MODELS were specified for seven different success indicators: 1) TOTAL SUM RECEIVED, 2) AVERAGE SUM RECEIVED PER APPROVED PROJECT, 3) TOTAL SUM REQUESTED, 4) AVERAGE SUM REQUESTED PER SUBMITTED PROJECT (all OLS, logarithmised), 5) NUMBER OF APPLICATIONS, 6) NUMBER OF SUCCESSFUL APPLICATIONS (both Count models, Poisson Regression), and 7) TYPE OF FIRST APPLICATION, as principle investigator or co-investigator for project funding or an application for an SNF professorship (multinomial logistical model). The first six models, when combined, produce an overview of gender-specific application patterns and success rates, while the seventh focusses on the question of whether there are gender-specific aspects to SNF application histories. Since decisions regarding research funding should be based only on the excellence of the proposal, what we are fundamentally after here, in contrast to other context analyses, is models that are able to provide in-depth explanations of structural conditions.

Since personal project applications are often submitted in more than one name, any INTERPRETATION of the results must take into consideration that the success of such an application cannot just be ascribed to individual abilities, but ALSO TO SUCCESSFUL INTEGRATION INTO RESEARCH COLLABORATIONS. In the interpretation of the SNF success indicators, it must also be kept in mind that not all unsuccessful applications to Division 4 are recorded in the application administration system. There are no records of unsuccessful proposal abstracts submitted to the National Research Programmes, as those proposals did not make it past the first step of the two-step application process.

The calculations from the first six analyses are provided in overview in Table 8 of the appendix.<sup>22</sup> Here are the most important results:

### **Sums requested**

When women submit a project application to the SNF as a principal or co-investigator or an application for an SNF professorship, they REQUEST NEITHER SIGNIFICANTLY LESS NOR SIGNIFICANTLY MORE RESEARCH FUNDING for their projects than men, given controls for age, prehistory of SNF applications, professorship (self-declaration), nationality, region, subject area, SNF division, type of institution and year of submission. This holds equally true for the total sum per applicant and the average sum requested per application.

There are thus FACTORS OTHER THAN GENDER which explain the differences in the sums requested. For instance, people with a professorship (self-declaration) request significantly more funding and the sums vary according to subject area.

This result differs from the findings of Hinz et al. (2008, 51ff.), who discovered that women applying for project funding to the German Research Foundation request somewhat smaller sums. The difference, however, could simply be explained by the fact that their basic population did not consist only of newcomers, as well as the fact that they incorporated no variables for monitoring professional status.

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<sup>22</sup> The same analyses were also carried out separately for the principal applicants alone as well as for the more homogeneous group of researchers applying for an SNSF professorship. We also made separate calculations for gender and subject area, and tested various interaction effects. Since the results deviated from the total sample only in a few details, additional analyses were not included in this report.

### **Sums received**

The same thing can be said about sums received. When WOMEN are successful with an application to the SNF, they RECEIVE NEITHER SIGNIFICANTLY LESS NOR SIGNIFICANTLY MORE RESEARCH FUNDING for their projects than men. This holds equally true for the total sum per application and the average sum received per application. With regard to the average sums received, there is absolutely no difference between women and men.

Again, FACTORS OTHER THAN GENDER are responsible for the differences. Being older at the time of a first submission has a slightly negative effect on the total sum received. By contrast, having participated in previous SNF projects significantly raises the average and total sums received. This also holds true for the total sums for previous SNF fellowship recipients, although they receive on average less funding per application. The most obviously positive impact on total SNF funding received comes from having a professorship (self-declaration). Applicants of foreign nationalities also receive higher total sums than Swiss applicants. In addition, differences can be detected amongst disciplines.

### **Number of applications**

With regard to the number of proposals submitted by applicants as principal or co-investigators on a project or for an SNF professorship, there is again no evidence of any gender-specific effects. Amongst the applicants, WOMEN have SUBMITTED NO FEWER RESEARCH APPLICATIONS and on average have NO FEWER SUCCESSFUL APPLICATIONS than men, where success is defined as a sum received above zero. In the total sample, people submitted on average 1.8 such applications, of which 1.5 were successful.

THE SIGNIFICANT FACTORS, by contrast, are age at the time of first submission and nationality. Older academics submit somewhat fewer applications, but have relatively better success. People of foreign nationality submit more applications and are also more successful. Application history also has a strong influence: people who have already had SNF fellowships submit more applications with on average a nearly 20% greater success rate than the others. Even more positive is the impact of a professorship (self-declaration) on both number of applications submitted and success rate. Differences also exist between the subject areas. Amongst the divisions in the SNF, submissions of research proposals per person tend to be overall higher than in Division 1, which is also reflected in a greater number of successful applications. In the natural and technical sciences (Division 2), a low number of applications is paired with higher chances of success. And in Division 3 there are significantly fewer successful applications per person.

In contrast to our study, Hinz et al. (2008, 45ff.) claim that women applicants to the German Research Foundation have somewhat lower chances of receiving project funding. The reasons for this difference could be the same as those mentioned above in relation to requested sums.

Our multivariable analyses of the application patterns and funding decisions regarding newcomers to the SNF correspond with the findings of Gilland Lutz et al. (2006), who also find no gender differences when controlling for other factors. We did not come across the problem described by Widmer et al. (2008) regarding the National Centres of Competence in Research (NCCR), which our study does not cover, that in the peer review process at the SNF women are just as likely to receive a Class A assessment, but less frequently receive the discussed sums. Our analyses only represented the final decisions made about funding. The results presented here also



suggest that the slight disadvantage for women found in Jänchen and Schulz (2005) cannot be generalised beyond the in-depth groups they investigated.

The present finding should not be considered obvious. Bornmann, Mutz and Daniel (2007), for instance, find robust gender differences in a meta-study based on 21 studies of research funding decisions made by peer review. Despite large differences in the individual studies, the relative chances of men (odds ratio) obtaining funding is approximately 7% higher, according to these sources. In addition to Hinz et al. (2008), other new studies, such as Jacobsson, Glynn and Lundberg (2007), also discover some smaller degrees of discrimination against women. In the study carried out by Sandström and Hällsten (2008), by contrast, women come off better than men.

In sociology, Allmendinger and Hinz (2002) show that gender-specific differences could be co-determined by research content. Women in sociology concentrate heavily on research in women's and gender studies. Other reasons are suggested by the new EMBO Report by Ledin et al. (2007), which found that in this funding programme women continued to have lower chances of success even when all references to gender were removed from the application documents. Ledin et al. consider other factors, which are not part of our model, to be relevant, such as the family-related division of labour within a domestic partnership and the lower number of publications for women (despite a higher impact factor!). We will return to this, but will first present the final multivariable analysis.

#### **Routes to submission**

Are there gender-specific routes to research funding? What are the manifest conditions that determine whether a person presents oneself as principal investigator, co-investigator or applicant for an SNSF professorship in the first application, and what is the role played by gender in particular? Since the application administration system does not document subject area when it comes to SNF professorship applications, we cannot undertake an analysis of discipline-specific support trajectories. **Table 9** in the appendix lists the influential factors according to type and degree of impact.

Here, too, GENDER has no significant influence. Previous participation in a higher number of SNF projects tends to mean that the first application is submitted not as a principal investigator but rather as a co-investigator or for an SNF professorship. Having had an SNF fellowship, on the other hand, means that the applicant tends to be the principal rather than co-investigator. There is a stronger tendency, however, to aim directly for an SNF professorship. Being older at the time of first submitting an application lowers the likelihood of presenting oneself as a co-investigator or applying for an SNF professorship. In contrast to German-speaking Switzerland, in French-speaking Switzerland applicants tend to submit proposals more frequently as co-investigators or for an SNF professorship.

To a large extent, the results also reflect the requirements connected with the funding grants. Thus, fellowships for prospective and advanced researchers are necessarily connected with a research period abroad. And a period spent abroad for at least one year is also the precondition for being able to apply for an SNF professorship. "Only" having worked on an SNF project in Switzerland means that one does not even have the option of applying for an SNF professorship.

### 5.3. Relations between research funding, career trajectory and gender

We further investigated the impact of research funding on one's career trajectory, the experiences of researchers with the SNF, and the conclusions to be drawn about the relationship between university and third-party funding.

#### **Effect of research funding on the academic career trajectory**

The results of the *survey of PhDs (Substudy Report 2)* confirm the current importance of research funding to the academic career trajectory in Switzerland. Having the option to work on SNF projects therefore stands in a positive relation to one's chances of continuing in the academy after the doctorate and undertaking a postdoc. PARTICIPATION IN PROJECTS funded by universities and other institutions in Switzerland and abroad also raises one's chances of remaining in the academy and gaining further qualifications, as well as having a positive impact on one's integration into academic networks and publication output.

Supporting one's career trajectory through SNF FELLOWSHIPS has a close and clear relation to the probability of undertaking a research period abroad or a postdoc period after the doctorate and gaining academic contact with foreign professors. Fellowships provided by other organisations also have a positive impact on the chances of establishing contacts abroad, but they have no significance when it comes to periods spent abroad.

Doctoral graduates who have already had an application for research project funding approved by the SNF are significantly better networked in Switzerland and abroad, but they are prevented for a certain period from undertaking research at a foreign institution. None of the respondents had spent a period abroad engaged in academic research. RESEARCH APPLICATIONS APPROVED by other institutions in Switzerland and abroad increase the chances of remaining in the academic field, support further qualification through a postdoc, make research periods abroad possible and increase publication rate.

No impact of research funding by the SNF could be determined on PUBLICATION OUTPUT after the doctorate. This can in part be explained by the fact that participation in a project (without being an applicant oneself) often occurs before the doctorate and has only limited impact on publication activity after the doctorate. Fellowships for advanced researchers and project applications can be submitted only after completion of the doctorate. Since publications usually come after the end of a project, the low impact could be connected with the fact that the time of data collection (five years after the doctorate) comes somewhat too early to provide evidence for the impact of SNF research funding.

As becomes clear in the *in-depth interviews with emerging researchers (Substudy Report 5)*, the relative significance of research funding for the process of constructing an academic career can be interpreted and understood only in the context of the entire career trajectory and the researchers' situation within the academic field. A research fellowship for a few months spent at a renowned institution abroad can provide a woman with the initial impetus for taking up an academic career after the doctorate. For another academic, a one-year SNF fellowship for prospective researchers in the USA can represent a postdoc phase which, according to the interviews, has no particular significance or consequences. For another female academic, the funding for her own career and subsequent research as a professor, as well as the possi-

bility of supporting emerging researchers through third-party research funding, can be a core foundation without which academic work is unimaginable.

Particular funding or a specific instrument of research funding thus has only limited "value" in and of itself for the academic trajectory. The FULL SIGNIFICANCE or relevance unfolds ONLY WITHIN THE FRAMEWORK OF EACH INDIVIDUAL CAREER that is affected by social structures and embedded in a particular context (in part differentiated by discipline).

### **Experiences with the SNF**

The Swiss National Science Foundation (SNF) and its instruments for funding research are well known to all of the people surveyed who are pursuing or are interested in pursuing a university career. There are no indications that female academics are less well informed, are more reluctant to apply for funding, or find the SNF to be less accessible or supportive than men.

Emerging researchers find their experience of personal contact with the SNF in the context of submitting applications to be GENERALLY POSITIVE. They find that the overall framework for submitting an application is communicated in a clear and transparent way. If they had questions or were uncertain about something, the interviewee consistently received the help and references that they required, whether by email, telephone or in a personal conversation with a member of the Research Council. Even when an application was not accepted, many of the interviewee received helpful advice and explanations, and found the assessment procedure in most cases to be fair. Some interviewee also described situations in which they were able to work with the SNF to find solutions to individual problems, as in the case of an early return from abroad due to the birth of a child.

The idea of a fair and sensible academy that is oriented only by performance criteria belongs to the *illusio*, the belief in the academic field, and the self-belief of the academics in it (Engler 2001, 449ff., Beaufaÿs 2003, 169ff.). It did not escape a number of the interviewees, however, that research funding and its associated practices do not always conform to ideas of a "pure" and universal pursuit of knowledge. They observed that – as in other social fields – social processes and relationships have a part to play in the allotment of research funds.

In isolated instances, the interviewees had personal contact with members of the Research Council or directors of programmes at the SNF, and were thereby better and more quickly informed about programme announcements. Several interviewees drew on their own experiences as experts for the SNF and, precisely because Switzerland is so small, they saw the personal interrelations as obstacles to research applications being assessed solely on the grounds of quality and feasibility.

For reviewers, the task of assessing the competence of an applicant was seen as a gateway to possible particularising processes. This poses the question of which particulars – aside from the quality of the project proposal itself – of a career or a publication list best signify competence. It can thus be assumed that other indicators, such as social characteristics, are brought in to aid the process of making a decision. In this context, age and gender come forward as factors that are easily grasped. For instance, one of the female academics interviewed claimed that, as a "young woman", it had been insinuated that she had submitted an overly ambitious research project, which she hypothesised would not have been imputed to a "young man" or an "older woman".

### **Relationship between university and third-party funding**

For all of the people involved in the *in-depth interviews with emerging researchers (Substudy Report 5)*, independently of discipline, the SNF is a very important – indeed, usually the most important – source of individual and project funding in Switzerland. For all of them, an obvious part of their academic trajectory is to orient themselves according to the possibilities and requirements of the SNF. In outlining their careers, the interviewees often name other funds in Switzerland and particularly abroad to which they have successfully applied for funding or to which someone else has submitted an application and thus funded a phase of their academic career. For those with Master's degrees from Switzerland, however, the SNF not infrequently represents the first funding institution in their experience. Only afterwards do emerging researchers look abroad for further funding opportunities.

Thanks to financial support from the SNF or other research funding institutions, many academics were able to write their doctoral thesis and/or habilitation. For several of them, they were able to complete this qualification requirement only because of the funding. Without this support they would have had to leave the academy for economic reasons or because of time pressure, or to finish the qualification at a much later date, which would have led to delays in the career path and corresponding consequences.

The subsidies provided by the Marie Heim Vögtlin Foundation offer female academics who have given birth to children an opportunity to combine academic work and family and/or to focus on completing qualification requirements (e.g. thesis). They also, however, gives women the option – in contrast to the fellowships for prospective and advanced researchers – of remaining in Switzerland with their family. In addition, the fellowship offers a funded period of more than a year, which diminishes uncertainties.

In representing their careers so far and their plans for the future, the emerging researchers interviewed made it very clear that ALL OF THEIR CAREERS have been CO-FINANCED BY RESEARCH FUNDING INSTITUTIONS. Having a purely university-oriented career – that is, a career financed exclusively by universities – is hardly possible nowadays and in many disciplines is not even appropriate, since the acquisition of third-party funding represents an important indicator of achievement (Jansen, Wald, Franke, Schmoch and Schubert 2007).

It was clear from the conversations with the emerging researchers that the SNF has significance for women as well as men because it BUFFERS THE INSTITUTIONAL UNCERTAINTIES. Especially for people who have completed the doctorate, there are only a few university positions funded by universities, and normally these are limited-term positions, even if they last several years. Emerging researchers are thus dependent on the SNF and its funding instruments in this phase of their career in particular. The requirements of the SNF, however, themselves conceal institutional uncertainties and dependencies. Receiving funding is uncertain, fellowships for prospective researchers cover only one year, extensions are approved only at short notice, and a successful application requires that one be well integrated into the university and academic system.

The relationship between third-party and university funding for an academic career has thus become a CENTRAL ASPECT OF INTEGRATION OR DISINTEGRATION. In developing their career, emerging researchers are variously dependent on third-party funding. Some have senior assistant positions and are "in a relatively comfortable situation" rather than "just staring into emptiness" if a project application or fellowship is not

approved. Others, by contrast, are dependent on financing for a certain degree of security and stability, so the funding must not be too meagre. In this context, we know from studies and statistics that women are more frequently employed in third-party funded positions (Spieler 2008, Hinz et al. 2008). The conditions for submitting an application and the importance of being awarded funding must thus be seen in different terms for women than for men.

In our study, we interviewed numerous academics, in particular from the humanities and law, who had obtained a "subsistence contribution" from the SNF. In all of these cases it was clear that this kind of support in Switzerland had made a great deal possible for them. In this way, career trajectories which in all likelihood would not have been continued can be successfully supported. This support within the country – which has in the meantime been reorganised by the SNF – was judged to be very helpful and supportive by women as well as men. It allowed the academics to build up a profile and visibility, which are fundamental at this stage of the career. In Chapter 7, we will return to the gender-specific effects of funding for going abroad as well as for staying in Switzerland.

#### **5.4. Summary**

When other relevant factors are taken into consideration, women up to five years after the doctorate do not submit applications for individual and project funding to the SNF and other institutions any less frequently than men. Of the people who submitted their first application to the SNF between 2002 and 2006, women are no different than their male colleagues with regard to application patterns (total sums requested, sums requested on average, number of applications) or chances of success (sums received, sums received on average, number of successful applications). There are also no gender-specific differences to be found in SNF application histories. Women, for instance, do not participate more frequently in research projects under another project leader before daring to submit an application in their own name. They also do not apply for fellowships any more or less frequently. And they submit first applications as principal or co-investigators or for SNF professorships in the same measure as men.

This is a good result for the SNF. It indicates that its practices of funding do not introduce decisive gender-specific obstacles to research career paths. Nonetheless, it remains to be explained why the proportion of women amongst first-time applicants in certain SNF divisions is lower than the proportion of women in the respective categories at universities, and why in other SNF divisions this proportion is higher. It must also be kept in mind that the gender balance in particular subject areas looks more favourable for women because of academic influx from abroad. It has thus been confirmed that an analysis which differentiates amongst disciplinary fields is indispensable for the investigation of gender-specific aspects of the academic career trajectory.

Despite the SNF coming off well, what remains unresolved is the problem of the greater frequency with which women drop out of academic careers. And since, as we have shown, research funding plays a crucial role in the career trajectory, the question arises about how the SNF's own funding policies could have a greater impact on factors that are unfavourable for women. For instance, little is known about the employment situation and future opportunities of those who work on SNF funded projects or hold SNF fellowships. From our survey we have only an indication that such

funding – in contrast to funding from other institutions – does not lead to a higher publication rate. There could be opportunities here, in terms of a more systematic call for funding emerging researchers, to bring to an end possible sources of gender discrimination.

## 6. Reconciling Career and Family

What is the gender-specific impact of having family on the *leaky pipeline* phenomenon in academic careers? This question was analysed by way of three substudies. The *survey of PhDs (Substudy Report 2)* supplies data not only about how many researchers have children five years after the doctorate, but also about how they divide the labour of parenting with their partners and what effects children have on the academic career trajectory (6.1). The *in-depth interviews with emerging researchers (Substudy Report 5)* help to explain what considerations and dilemmas lie behind the statistically derived patterns as well as what challenges are posed by children to a research career (6.2). Finally, the *content analyses of the SNF application files* determine what can be deduced from this source about the family issue for people who submit SNF applications in their own name (6.3). As always, a short summary follows at the end (6.4).

### 6.1. Family situation, division of labour and leaving the academy

In the *survey of PhDs (Substudy Report 2)*, the respondents were asked about their family situation (children, domestic partnership) as well as the division of labour amongst couples who have children five years after the doctorate. In contrast to results from older studies, which investigated the *family situation* of academics and focussed in particular on the first generation of women professors (Baus 1994, Kuckartz 1992, Onnen-Isemann and Oßwald 1991, Schultz 1991), the female emerging researchers we interviewed have a DOMESTIC PARTNER nearly as often as their male colleagues. The problem arises once children enter the picture.

The results suggest that reconciling a family with an academic career poses problems for women as well as for men. Doctoral graduates who are employed in the academic field five years after the doctorate are MORE LIKELY NOT (YET) TO HAVE CHILDREN than doctoral graduates employed in other fields (see **Table 3**). Just over two fifths of all male academics have children, whereas the proportion of doctoral graduates employed in other fields who have children is just under three fifths.

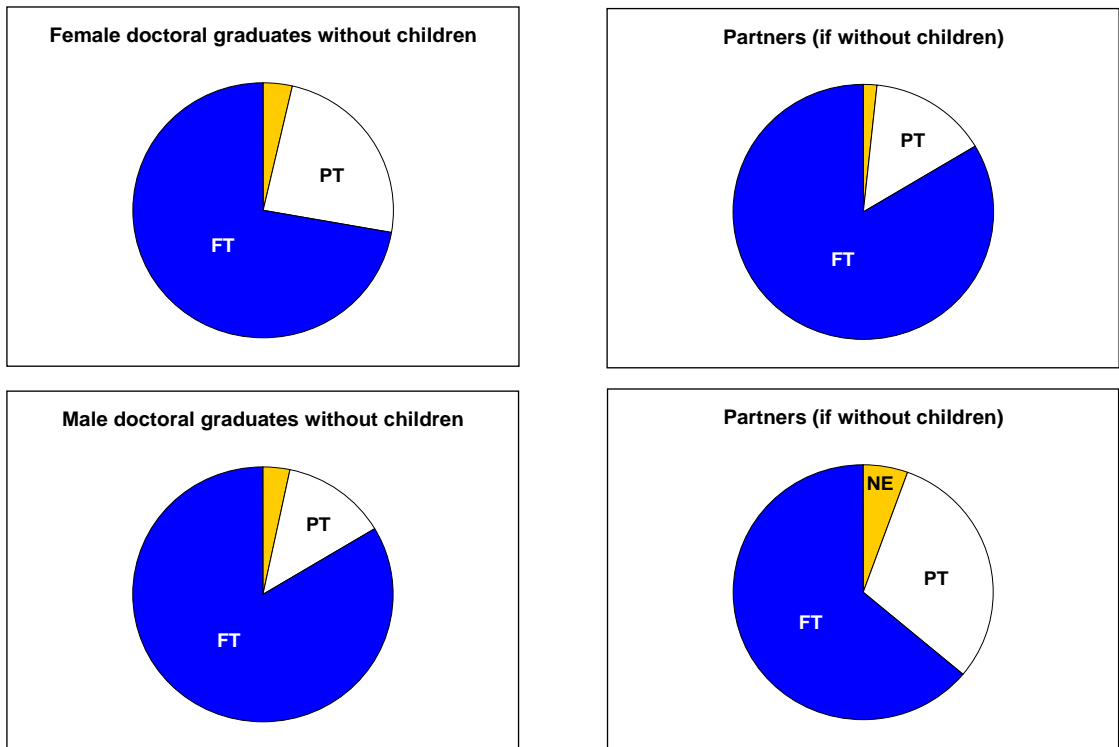
**Table 3: Children and field of employment five years after the doctorate (by gender)**

Children	Field of employment five years after the doctorate			
	Men		Women	
Yes	Academic field	Other	Academic field	Other
	43%	57%	32%	38%

Source: University Graduates Survey (BFS), Computations: PHZH and SOI/UZH

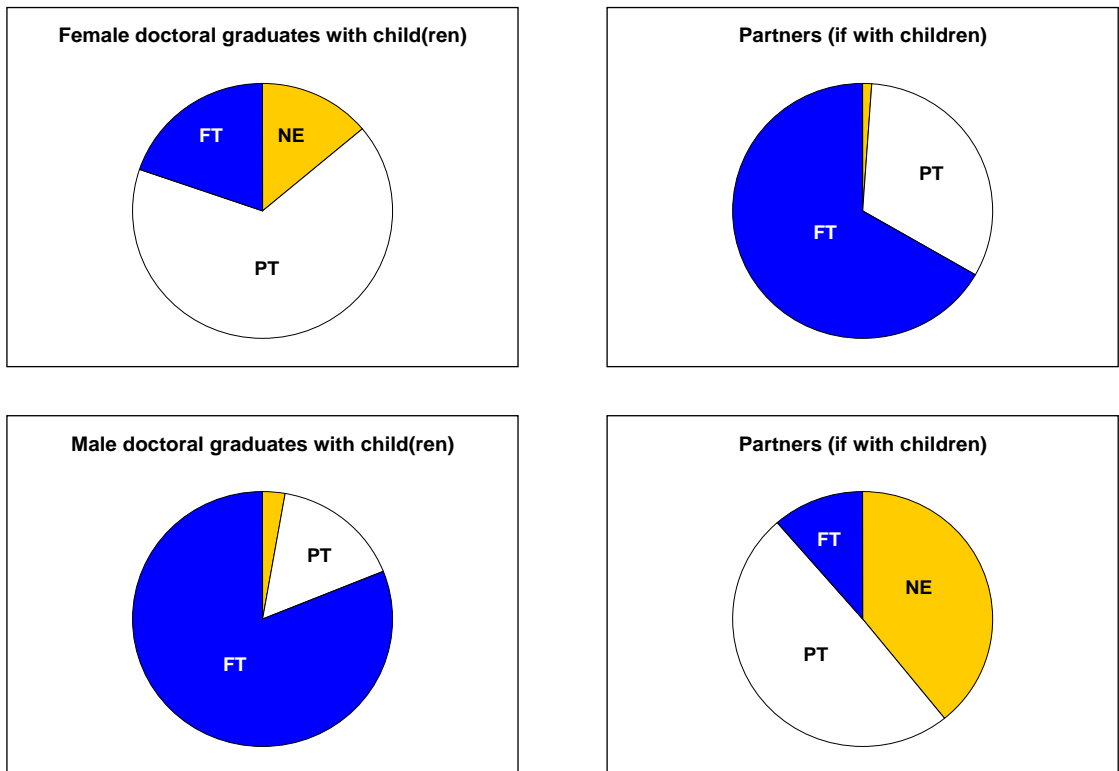
The same difference also holds for women, but in less marked form (32% versus 38% with children). Above all, fewer women with doctorates have children than men with doctorates. This result accords with numerous other studies (e.g., Ledin, Bornmann, Gannon and Wallon 2007, 985, Zimmer et al. 2007, 147ff., Mason and Goulden 2004, Leemann 2002, Allmendinger, von Stebut, Fuchs and Brückner 1999, 214). As other analyses show, women who do not (yet) have children are also less likely to plan having them in the future than men. The gender gap is thus set to increase further.

**Figure 4: Employment patterns of couples without children**



Source: University Graduates Survey (BFS), Computations: PHZH and SOI/UZH  
 PT = part-time (white), FT = full-time (blue), NE = not employed (orange).

**Figure 5: Employment patterns of couples with children**



Source: University Graduates Survey (BFS), Computations: PHZH and SOI/UZH  
 PT = part-time (white), FT = full-time (blue), NE = not employed (orange).



If we take a look at the EMPLOYMENT PATTERNS of couples, then we see in **Figure 4** that the female doctoral graduates questioned and the partners of the male doctoral graduates tend to be employed part-time or not at all to a greater degree than the male doctoral graduates or the partners of the women interviewed. As long as there are no children, the two couple households share overall similarities.

With the arrival of children, the employment pattern of the couple households changes (see **Figure 5**), producing a known gender-specific pattern even amongst this group of highly qualified doctoral graduates. Female doctoral graduates with children are for the most part employed, but frequently only part-time. In around 30% of the cases, their partners are also employed part-time, while the remaining 70% are employed full-time. By contrast, when male doctoral graduates have children, their employment patterns do not change. They continue for the most part to be employed full-time. Their partners, however, often reduce their employment to part-time or give up employment altogether. These results accord with those of other studies (Ledin et al. 2007, 985, Majcher 2007, 313, O’Laughlin and Bischoff 2005, 88 and 94, Mason and Gouldon 2004).

The DISTRIBUTION OF CHILDCARE RESPONSIBILITIES (**Table 4**) follows the same gender-specific pattern. Half of the fathers from the survey of doctoral graduates can rely on a partner who takes care of or organises all childcare on weekdays. This is rarely the case with the mothers. They are always involved with the children, in that they themselves take over childcare duties and/or arrange for the care of the child(ren) with the help of a third person or a childcare institution. Various studies also provide evidence of this pattern of gender-specific labour distribution (Zimmer et al. 2007, 154, Probert 2005, 63, Spieler 2004, Leemann 2002, 176, Blake and La Valle 2000, 29).

**Table 4: Distribution of childcare duties amongst couples**

<b>Who is / was predominantly responsible for the care of your preschool children during the week (Mon-Fri)?</b>		
	<b>Men</b>	<b>Women</b>
a. I alone	1%	14%
b. The other parent and/or my partner	51%	2%
c. I, together with the other parent and/or my partner	7%	3%
d. Other persons or institutions	10%	15%
e. I, the other parent and/or my partner, and other persons or institutions	31%	55%
f. I, and other persons or institutions	0%	11%
<b>Total</b>	<b>100%</b>	<b>100%</b>

Source: University Graduates Survey (BFS), Computations: PHZH and SOI/UZH

The reasons for this gender-specific pattern can in part be found in the academic field itself. The prevailing work norms (high number of hours of availability, high degree of temporal and geographical flexibility) make it difficult to reconcile family and career, as do career expectations ("all the eggs in one basket", the pressure to achieve) (Dressel and Langreiter 2008, Jacobs and Winslow 2004, Merz and Schumacher 2004, Beaufaÿs 2003, 146ff.) and the taboo status of family duties and commitments. This taboo status can be seen, for instance, in the fact that childcare duties are not taken into consideration when assessing career track records during professorial appointments, or that the university does not consider itself responsible for providing childcare opportunities (see also Rusconi and Solga 2002).

An added external factor is the fact that CHILDCARE INFRASTRUCTURE in Switzerland is not tailored to academic careers. In view of the low salaries (except for professorial level), childcare is often costly (Spieler 2004, 64ff). In many cases there are too few places available, and the hours do not correspond to the needs of academics. However, even optimal childcare conditions do not fully solve the problem. PARENTHOOD, according to the subjective assessment of female *and* male academics, PLACES LIMITS ON ONE'S AVAILABILITY FOR ACADEMIC WORK (frequency of attending conferences, research time, networking opportunities, geographical mobility (O'Laughlin and Bischoff 2005, Romanin and Rover 1993) and leads to PROBLEMS OF COMPATIBILITY (Spieler 2004, Blake and La Valle 2000, 29).

If women (want to) stay in the academy, then they forego having children more often than men, or they push the decision to have children ever further off, with the result that, whether they want to or not, they remain childless (Majcher 2007, 313, Auferkorte-Michaelis, Metz-Göckel, Wergen and Klein 2006). Women academics without children are more likely to explain their childlessness on the grounds of the difficulty of reconciling an academic career with family life (Spieler 2004) By contrast, men can still become fathers at a later point in their careers (Mason and Goulden 2004).

How does the BIRTH OF A CHILD actually affect the academic career trajectory? The results of the *survey of PhDs* confirm that the birth of a child after the doctorate stands in a negative relation to remaining in the academy and pursuing further qualifications (habilitation, postdoc). A small child also makes it difficult to undertake networking activities abroad and reduces the likelihood of a research period abroad, although the causality here is not clear. Whoever plans to go abroad for a research period, or is already abroad, tends to postpone the decision to have children. On the other hand, it is worth noting that measurable performance in the form of publication output is not curtailed by starting a family. This result, too, accords with various studies (e.g. Romanin and Over 1993).

Because of the small number of mothers, we could not statistically calculate verifiable interaction effects between birth and gender. Based on gender-segregated calculations, however, there are no indications that the birth of a child has a different impact on the academic careers of women than of men. In view of the different gender-specific responsibilities of caring for small children, this is a striking result. The *interviews with emerging researchers (Substudy Report 5)* offer several ways of understanding the backgrounds to this result, which will be discussed in what follows.

## 6.2. Daily research life and family duties

As the *in-depth interviews with emerging researchers (Substudy Report 5)* show, reconciling a family with a research career is a daily challenge for the mothers we interviewed, leading to an intensification of the feeling of risk or "mad hazard" as well as to greater uncertainties.

"It happens daily! It's my everyday dilemma: is it more important to get home on time or to finish the project? And how can I organise myself to get everything done?" (Technical Sciences, Woman 1, 731-732)

This happens above all, as the interviews show very clearly, because daily work and nightly rest are turned upside-down, which leads the women fundamentally to doubt whether they can deal with the increased pressure and whether, as academics who are simultaneously mothers and thus not always available for work, they can even be taken seriously in the academic world.

“As far as handicaps go, I have to say, honestly, that you often have the feeling, ‘Is my family a handicap?’ If you handicap yourself, like when you’re running a race, it means that you have to achieve the same thing while carrying an extra weight, right? And so sometimes you feel, I can’t, I just can’t do the same amount, or work as long, as someone who doesn’t have a child, who doesn’t have to get up maybe two, three times in the night when the child cries, etc. Then, sure, you sometimes have the feeling, ‘Can I do it? Will I be taken seriously? Can I really establish myself?’ But that’s something that only time will tell, right?” (Law, Woman 1, 611-619)

Mothers also experience NO SUPPORT FROM THE UNIVERSITY. It is considered a private matter how the young woman professor who has just started her job organises the care of her small child; she has to find the solutions on her own.

“And there, you’re actually left completely alone. So, you have the position, and then: figure it out! So, I found that very difficult”. (Law, Woman 1, 354-355)

The ideas and expectations within the faculty and workplace about ONE’S AVAILABILITY AND FLEXIBILITY are not compatible with childcare hours and family life. Mothers who have spent time abroad point out that, in other countries, they did not experience these same conflicts.

“Somehow the favourite time of day for a meeting is after 6:00 p.m., once the crèche is closed. I just found that difficult, ‘difficult’ being the mildest term for it (...) Thus, I actually found that my position [as a professor] in [a city in German Switzerland] was in a certain way the hardest in my academic career, because I suddenly had so many conflicts between childcare and my private life and my position and my work. I hadn’t experienced problems like this before; things had gone relatively smoothly, even with a child in [abroad]”. (Humanities and Social Sciences, Woman 5, 209-224)

By contrast, male academics do not discuss the family in terms of uncertainty or constraints placed on academic work. Family and academic work seem to belong to two different spheres. In several interviews there are indications that MALE ACADEMICS see themselves as FAMILY PROVIDERS, which means that they cannot or do not want to find themselves in a financially precarious academic career.

“Yeah, the compromises were that I have a clinical career, that I have a clinical position here which primarily puts bread and butter on the table, where I know that I can support my family (...). I could become a medical specialist, which indirectly offers career security, because I can go into practice with that too, and hence provide for my family. But where I lacked the courage and the security was to commit myself only to experimental work, only in the laboratory, where I would have been dependent on three-year positions and an uncertain future [*unclear*]”. (Medicine, Man 1, 643-654).

With the men, then, the central theme is the economic uncertainty connected to an academic career, while the women are concerned above all about the uncertainty of their academic habitus, and about the question of their recognition and achievement. On this basis, we can formulate the argument that women tend to be confronted with more fundamental uncertainties than their male rivals. Male academics can for the most part count on being able to connect research with family, simultaneously ensuring that they can make the required academic commitment.

This does not, however, mean that starting a family does not have problematic aspects for fathers, too, with regard to the shape of their career trajectory. But, in addi-

tion to a synchronous model (career and family at the same time), men also have the opportunity to implement a diachronic model, which is to say that they can start a family after reaching a certain point in their careers, particularly after having attained a permanent position. They can rely much more heavily on their partners for childcare. For that reason, it is easier for them to put "all their eggs in one basket". For women, this is more difficult, since they cannot postpone the birth of children for an unlimited time and do not have strong support for (the organisation of) childcare, especially during periods spent abroad.

In the interviews with emerging researchers, there are several indications that women who do not want to give up having children question whether or not to remain in the academy, or they have already left the academy. One does not find this pattern amongst the men.

### **6.3. Influence of children on the timing of the first application submission to the SNF and chances of success**

In the applications for research funds, children are not systematically mentioned, and difficulties posed by families to the research career are not widespread. Therefore, the SNF application files are not an ideal source for addressing the question of children. Nonetheless, we drew together the data available to the SNF in order to reach at least a MINIMAL ESTIMATE OF THE POSSIBLE EFFECTS OF HAVING CHILDREN. At the same time, the numbers indicate possible discipline-specific patterns in relation to the declaration of one's family situation.

By far the highest proportion of applicants who declared parenthood, according to the *content analysis of the SNF application files (Substudy Report 4)*, is in human medicine with 60%, even though at first glance the shift work, including night shifts and very long shifts, seems more likely to pose difficulties for reconciling family and work. In the main, there is no difference between women and men in the frequency of parenthood, although women on average have fewer children. At the other end of the spectrum are the disciplines of law as well as linguistics and literature. Although the applicants are not on average younger, only a quarter of them indicate that they have children. The lower proportion of parenthood could be linked to the reporting practices in these disciplines, but it also could reflect real situations. In physics, up to 30% of the applicants, who are on average two or three years younger, mention having children. In the SNF application files, men from all of the subject areas disclose parenthood more or less as often as women. The gender-specific differences in relation to parenting, which have very real effects according to the survey of PhDs (see 6.1), thus do not emerge here. This can be a result of selection, because of the selectiveness of the sample, but the erasure of such differences can also be traced back to gender-specific differences in the information one gives about oneself. Presumably, both affect the outcome.

One only seldom finds THE MARKS OF FAMILY DUTIES ON THE CAREER PATHS of applicants in the SNF files and, when they do appear, it is almost exclusively in applications by women. In medicine, women who were at the time or would later be mothers had a postdoc abroad less frequently than men who were or would be fathers. One woman applied for a Marie Heim Vögtlin subsidy. One other female applicant with three children was part of a dual-career couple, but could find no university base for her research project. In law, it is clear from the file of one of the older female applicants that she worked only half-time until her youngest child was eleven years old. In lin-

guistics and literature, there is one instance of a woman who took a long time to gain her Master's degree, which can be explained by the fact that she is a single mother, while a second woman explains the six years of part-time work in her curriculum vitae as being necessitated by having children. The effects of parenthood can also be seen in the case of two female applicants in physics. The curriculum vitae of one shows an employment gap of two years; since she indicates that she has two children, it is obvious that the gap can be explained by a "baby break". The other woman mentions that, directly after completing her Master's degree, she took maternity leave in her home country.

In the analyses of the time required between completing the doctorate and making the first (successful) APPLICATION FOR SNF RESEARCH FUNDS, CHILDREN have a SIGNIFICANTLY NEGATIVE effect across all groups analysed. Researchers who explicitly state that they have no children make the move from the doctorate to the first SNF application significantly more quickly than those with children or those who do not report their family situation. The length of time before submitting the first successful application is also dependent on parenthood. The chances of submitting a successful application by a particular point is 38% lower amongst people with children than without. Children thus delay not only the time of submission, but also lower the chances of success. In both analyses, the limitations imposed on a research career by children affect fathers as well as mothers. There are no interaction effects with gender.

#### **6.4. Summary**

As discussed, domestic partnership and family are taboo subjects, which are ignored in the academy, even if to different degrees depending on disciplinary field. This means that the uninterrupted and unlimited commitment that is needed to achieve the decisive criterion of excellence gives a competitive advantage to childless people over parents, to fathers who have traditional roles over fathers with partnership responsibilities, and in general to fathers over mothers. This cannot, however, be the aim of striving for excellence in the academy. It is rather an unconsidered relict of an earlier age, when the academy consisted only of men who fulfilled traditional roles.

When it turns out that people who work in the academic field have an above-average chance of not having children, then this is not a good testament to the field. When women who do not want to give up a research career often have to decide in favour of "either research or family", then the SNF, too, has to ask itself to what extent it contributes to this indirect discrimination through its own assessment criteria, especially in the area of mobility. Here, as with all other career-related decisions, one needs a clear idea of how to deal with parental and childcare periods in the curriculum vitae so that parents in general and mothers in particular are not disadvantaged. It has to be taken for granted that having a partner, male or female, as well as children is as much a part of an academic career as of any other career. In other words, it must be accepted that there are limits on the time commitment and geographical mobility of people with children, without assuming that their work is therefore of lower quality. Where the limits of commitment lie, however, depends on the overall conditions as well as childcare infrastructure and the availability of funding instruments.

Recently, there has been much talk about funding for "dual career couples". So far the topic has arisen in relation to professorial appointments which involve hiring a

woman. Since women with doctorates less frequently have a partner at home whose moves are determined by their own career goals, their situation would surely be improved by taking into consideration dual-career options. Dual-career funding, however, would have to begin significantly earlier and include the possibility of having children. As a free-standing measure, this could be nearly impossible to realise because the request for dual funding conflicts with the excellence criteria applied today in funding and appointment decisions, which, as described above, favour men and people without children. The precondition for a real change thus involves a fundamental rethinking, at the SNF as well, of the domestic partnership and family taboos.

## 7. Mobility and Internationality

Academic job markets and careers are international (Dubach, Koller and Teichgräber 2005). Intermittent periods abroad (*outgoing*) are an important factor in the academic trajectory for improving one's career chances, even at home. The SNF fellowships for prospective and advanced researchers are devised to support these individual qualification periods abroad. For the university labour market, too, it is important to acquire highly qualified researchers from abroad (*incoming*) as well as young researchers returning from a period abroad (*returning*).

Issues of mobility and internationality were considered in all of the substudies. The *SHIS evaluations (Substudy Report 1)* offer data regarding academic influx in the context of doctoral and habilitation study. The *survey of PhDs (Substudy Report 2)* is able to track which people go abroad after the doctorate to pursue further academic qualification. In the *evaluations of the SNF application administration system (Substudy Report 3)* as well as in the *content analyses of the SNF application files*, influx as well as mobility patterns can be established for the group of newcomers to Swiss research funding. And the *in-depth interviews with emerging researchers (Substudy 5)* make apparent how people handle the mobility requirements of an academic career as well as what gender-specific difficulties they face.

The chapter first addresses academic influx (7.1) and then introduces the results of the mobility patterns of emerging researchers (7.2), before outlining, with an eye to the gender question, initial arguments with regard to the social significance, social conditions and consequences of institutionalised internationality in research careers, as based on the interviews with emerging researchers (7.3). A summary follows at the end (7.4).

### 7.1. Academic influx

This section turns directly to the question of academic influx, as so far no data has been available regarding academic outflux. It should be kept in mind, however, taking into account the rest of the mobility patterns, that there is little reason to assume that women go abroad for the sake of their academic careers more frequently than men. It is thus unlikely that the proportion of women at the upper levels of the academic ladder in Switzerland would be higher without academic outflux.

Academic influx, on the other hand, leaves clear traces. As the *SHIS evaluations (Substudy Report 1)* show, influx from abroad is entirely responsible for the increase in doctorates at the Swiss universities since 1990. The number of doctoral graduates with a Master's degree from abroad increased in this period by a factor of 4.5, while the number of doctoral graduates with a Swiss Master's degree remained largely stagnant. In terms of proportion, 13% of all doctor titles in 1990 went to people with a Master's degree from abroad, while in 2006 it was 40%.

If one looks at the total number of doctorates awarded in a calendar year, then academic influx leads to a marked RISE IN THE PROPORTION OF WOMEN AMONGST DOCTORAL GRADUATES, particularly in the HARD AND NATURAL SCIENCES as well as the TECHNICAL SCIENCES. If, instead of looking at the total, one looks only at people with a Swiss Master's degree, then the proportion of women drops by several percentage points. This reflects the fact that, by international comparison, Switzerland has a low par-

ticipation rate of women in the hard and natural sciences as well as the technical sciences (Ryser and von Erlach 2007, 62f).

What is the effect of influx on the number of women involved in the HABILITATION? The investigation is limited to the graduation years 2002 to 2006. In the subject area of medicine and pharmacy, there are clear indications that academic influx contributes to an increase in the proportion of women doing a habilitation. Amongst those awarded a habilitation who have a Swiss doctorate, the proportion of women is only 14%, while those who have a doctorate from abroad represent 23%. One has the impression that the underrepresentation of "Swiss" female doctoral graduates amongst those awarded a habilitation is partly compensated for by academic influx, and/or that the habilitation chances of women with a doctorate from abroad are greater than those of women who were awarded the doctoral title by a Swiss university.

The dynamic determined in the *evaluations of the SNF application administration system (Substudy Report 3)* suggest the same interpretation. Here, too, it is in the subject areas with a low proportion of women, that is, the technical and hard sciences as well as (much less starkly) the natural sciences, that the arrival of established female researchers from abroad significantly increases the proportion of women in the field. However, the same can be said of linguistics and literature.

## **7.2. Periods spent abroad by doctoral graduates and overall mobility patterns**

The *survey of PhDs (Substudy Report 2)* shows that, at five years after the doctorate, women are just as likely as men to have spent a period abroad at a research or academic institute.<sup>23</sup> Being OLDER and having CHILDREN, by contrast, pose an obstacle to spending a research period abroad, because the older a doctoral graduate is, the more likely s/he is to be responsible to a partner or family, which makes geographical mobility more difficult. Planning a period abroad with children and partner is complex. Childcare has to be organised and suitable employment must be found for the partner; both partners must have realistic options on their return home; the entire organisation of mobility requires adequate financial resources, etc.

These points could help explain why it is an advantage to have COME FROM AN ACADEMIC FAMILY, which as a rule is financially well situated, when taking the step to go abroad. Such emerging researchers are possibly more aware of the importance of spending a period abroad, and they tend to be more willing to take on all of its intricacies and uncertainties. PEOPLE WITH A MASTER'S DEGREE FROM ABROAD are also more mobile than those who completed their Master's degree in Switzerland. Not only have they come to Switzerland to do their doctorate, but afterwards they are also more willing (for a certain period) to move to another research institution abroad or to go back to their home country.

INTEGRATION DURING DOCTORAL STUDY is also important to an internationally oriented academic career trajectory. Those who received career-specific support from their doctoral supervisor, from other people or from particular courses were geographically more mobile in the five years after completing the doctorate. SUPPORT FROM RESEARCH FUNDING INSTITUTIONS also stands in a positive relation to spending a period abroad. The SNF fellowships connected to mobility requirements are particularly important, as are research applications and research participation in projects which are not

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<sup>23</sup> A synoptic overview of the results of the estimated models can be found in the appendix (Table 6).



financed by the SNF (which can be presumed in part to be funded by research institutions abroad). It is interesting to note that even SNF research fellowships that have not been approved stand in a positive relation to geographical mobility. This implies that those who submit an unsuccessful application for individual funding to the SNF still have a clear intention of undertaking a research period abroad and acquire the funding from different sources.

Discipline-specific differences in mobility patterns are made apparent in the *content analyses of the SNF application files (Substudy Report 4)*. It should be noted, however, that the people in the investigation FOR A LARGE PART COME FROM ABROAD, and hence have already demonstrated their mobility by being in Switzerland. In medicine as well as in linguistics and literature, they make up around half of the sample; in physics, they make up 70% of the sample, while only 2 of 16 women in the sample come from Switzerland. The situation in law is completely different, as only a sixth of the researchers come from abroad, without any effect on gender distribution.

In general, linguistics and literature as well as physics are the fields with the highest degree of cross-border mobility. In the former, such mobility is already high amongst those studying for the Master's degree; in the latter, mobility gets under way only after the doctorate. A period abroad is also common in medicine during the postdoc phase. The lowest degree of mobility is in law, where the object of research is often strongly bound to the Swiss legal system.

If we consider only those who completed their Master's degree in Switzerland, it is notable that in medicine considerably more Swiss men take up postdocs abroad than Swiss women. In law, Swiss women represent nearly half of those who carry out research in Switzerland, which is a significantly higher proportion than that of Swiss men. The gender differences in mobility patterns are small only in linguistics and literature. In physics, no statement can be made because of the small number of cases (two Swiss women). The results indicate that EARLY MOBILITY, such as is required in linguistics and literature, poses considerably FEWER PROBLEMS for women than mobility in the phase that is referred to in the literature as "rush hour", when decisions about career and children fall at the same time (Folbre and Bittman 2004).

From the *in-depth interviews with emerging researchers (Substudy Report 5)* it becomes clear that, for many women as well as men, spending research periods at an institution abroad are normative requirements, and that they orient and structure their careers in terms of these requirements, usually without question. Those academics who cannot (yet) point to a phase spent abroad are well aware of this blemish on their curriculum vitae and the problems connected with it. Hardly anyone today thinks that s/he will be able to gain a permanent position at a university in Switzerland without having had experience abroad.

For most emerging researchers who complete the Master's degree and doctorate in Switzerland, the goal of their career plans is a PERMANENT POSITION IN THEIR OWN COUNTRY. They plan on a one- or several-year postdoc or, after completing the qualification stages, they take a permanent position abroad in the hope of being able to return at a later point in time. Their plans, strategies and career decisions are structured by their rootedness in a Swiss-based network of family (original family as well as one's own family), domestic partnership, friendships and local familiarities. At the same time, they know that there are no guarantees about fulfilling such a desire and that under the circumstances they may need to stay abroad for a longer period or even forever.

### 7.3. The significance of institutionalised internationality in academic careers

Internationality has been institutionalised in the academic career trajectory. The requirement of being geographically mobile is bound up with various objectives. The norm of having worked for a certain period at a research institution abroad in the course of gaining academic qualifications can be functionally and disciplinarily justified. It also serves, though, to socialise, sort and select out academics.

The longer it continues, the more internationality becomes an added dimension of a researcher's capital base and serves to set one apart in the competition for university positions and academic recognition. The social capital one develops through internationality includes contacts with academics abroad and consists of foreign collaborations and networks. One's cultural capital is extended, for instance, by knowledge of foreign languages, especially English, as well as by confident appearances at international conferences or articles in international journals. If one spends longer periods at renowned research institutions abroad, then s/he gains symbolic capital, and is for these reasons advantaged.

The requirements for geographical mobility, as well as the willingness to be flexible with one's own plans when options present themselves, make up what we call, following Schultheis (2007), the IDEAL TYPE OF ACADEMIC ENTREPRENEUR. This ideal type of independent, cosmopolitan individual who confidently settles into new living situations is part of the institution of internationality, and as such, it provides a model for emerging researchers. But the spectrum of lifestyles amongst the academics we interviewed shows above all that this ideal is an ideological construction which masks the social conditions of possibility behind the norms.

Because of various institutional and economic conditions, emerging researchers feel the uncertainties and problems created by geographical mobility requirements more or less acutely. Class and gender inequalities can gain a foothold here, since financial support from one's family of origin or career support by mentors and doctoral supervisors is fundamental to planning and undertaking a period abroad.

Furthermore, academics are not nomads without connections or roots, and their lives cannot be conceptualised in terms of individual trajectories. Rather, they need to be analysed in the context of the formative institutional forces of (heterosexual) domestic partnership and family. Drawing on the life trajectories outlined by Krüger and Levy (2000, 2001), which are linked to partnership and marked by gender inequalities through various connections to family and career, we have set out FOUR TYPES OF ACADEMIC ENTREPRENEURS:

1. Flexible academic entrepreneurs "without obstacles to mobility set by domestic partnership and family"
2. Flexible academic entrepreneurs who "put all their eggs in one basket"
3. Dual career academic entrepreneurship, as "the impossible thing"
4. Inflexible academic entrepreneurs, "not without domestic partnership and family"

All four types are fundamentally CONCEIVABLE FOR WOMEN AS WELL AS MEN. The typologies are often not to be found in a pure form, and in the course of a career one can change from one type to another. With Type 1, it is often the case that the partner and any children also go abroad and subordinate her/his own career to that of the interviewee. Type 2 either plans to start a family later, is doing without a partner for the moment, or the family and/or partner stay behind, creating a situation of "living

apart together”, in which the interviewee does not bear family responsibilities. Type 3 is marked by approaches toward, attempts at and considerations about a dual-career entrepreneurship, but at the same time witnesses its impossibilities and difficulties, such as broken relationships or the impossibility of planning two uncertain careers together. Type 4 characterises those academics who are not prepared to forego social integration. They adjust their mobility plans, undertake mobility in limited form or forego academic mobility altogether.

The first two types tend to correspond to a “MALE” PATTERN of structuring life plans according to the requirement for internationality, while the last type belongs rather to a “FEMALE” PATTERN. These two gender-specific types have different consequences for the shape of a family and the professional trajectories of academics and their partners. The forms that are available and open above all to men allow them to better connect an academic career with geographical mobility, without having to give up the social connection of a domestic partnership or starting a family in the long run. Women, by contrast, face a dilemma, according to our surveys, since they cannot count on a partner who would support their flexibility by fitting his career trajectory to the demands of her academic career and who would play a central role in the (organising of) childcare, taking over the responsibilities and investing the time.

The lesser degree of willingness amongst male partners to be geographically mobile for the sake of a woman’s career can also be seen in other, quantitative investigations. Female academics more frequently move with their partner to another place of employment than the male interviewees, who show far less willingness to follow their partner (Ledin, Bornmann, Gannon and Wallon 2007, 985; Romanin and Over 1993). In the study by Romanin and Over (1993), the proportion of mobile women academics (including mobility from city to city) is higher than that of men.

Shauman and Xie (1996) have investigated whether the dual-career configuration, in comparison to the one-career configuration, has effects on geographical mobility, including different gender effects, and how children influence the mobility of women and men. For the first two questions, they find no effects. Children, however, reduce the likelihood of mobility amongst men as well as women, although the effect is stronger for women than for men. The greatest effect of gender difference occurs when children are of school age.

Based on our results, we can see a central mechanism at work which prevents women, more so than men, from following the rules of the game in the academic field and demonstrating geographical and social independence. The greater discrepancy between internationality and family in a woman’s career leads women more frequently to doubt whether they can cope or to declare that these requirements are something they can or want to fulfil only in limited form. As a result, they may build up less academic capital and have more limited opportunities in the search for positions.

Internationality is described in the academic field – which also encompasses research funding by the SNF – as an objective and socially neutral criterion aimed at achieving success in academic careers. Through geographical mobility, men and women are (supposedly) detached from their different gender-specific social connections and responsibilities to domestic partnership and family. This uprooting supports the ideological perpetuation of a “pure” pursuit of knowledge, “unsullied” by social and daily relations, which in turn prevents recognising that both the starting points and processes of elimination involve gender-specific differences.

#### 7.4. Summary

Academic job markets are internationally oriented. In Switzerland, too, geographical mobility (*incoming, outgoing, returning*) is an important structural condition of the academic field.

The academic influx of emerging researchers from abroad has radically increased since the 1990s, if one takes the absolute or relative proportion of doctoral graduates with a Master's degree from abroad as an indicator. In the hard and natural sciences especially, as well as in the technical sciences, this *incoming* mobility has led to a considerable increase in the proportion of women amongst doctoral graduates. In the habilitation phase, there are also indications that the increased proportion of women is due in part to influx, above all in the subject area of medicine and pharmacy.

If we look at *outgoing* mobility in gender-specific terms, we find no indications of gender difference in the five years after the doctorate. With controls for subject areas, it turns out that women have undertaken a research period at an institution abroad in the same proportion as men in these first five years. A further influence on *outgoing* mobility which does have gender-specific traits is the social bondedness of emerging researchers to domestic partnership and family. Many men as well as women are not prepared to forego living with their partner in the medium or long term. Children and family planning complicate mobility plans even further. Those who have children are less likely to go abroad, while those who are geographically mobile (temporarily) forego having children.

However, the starting point for men (linked with women who tend to have lower professional qualifications) is not the same as for women (linked with men who tend to have the same or higher professional qualifications). Men tend to have the option of combining an academic career with geographical mobility without having to give up their social connection to a domestic partnership or starting a family in the long run. Women frequently face a dilemma, since they cannot count on a partner who would support their flexibility by fitting his career trajectory to the demands of their academic careers and who would play a central role in the (organisation of) childcare, taking over the responsibilities and investing the time.

Most emerging researchers, especially those with a Master's degree from Switzerland, wish to return after a period abroad, and they try to find a permanent position in Switzerland in the medium term (*returning* mobility). But they are confronted with the fact that the academic job market in Switzerland is very small and that there is not always a suitable position available in the near future. If one's partner is also pursuing an academic career, then planning a dual-career path poses nearly unresolvable difficulties.

The *return* after a research period abroad is not equally assured for all researchers. Some have a position funded by a professorial chair and can return to their place in the university, while others are more uncertain and have less support. It can be assumed that women, who receive less support and – as other studies show – are more dependent on third-party funding, must cope with greater uncertainties in terms of returning from a research period abroad.

The longer it continues, the more internationality becomes an added dimension of the researcher's capital base and serves to set one apart in the competition for university positions and academic recognition. Women are much more likely than men to face the dilemma of either giving up partnership and children so as to fulfil career demands, or giving up mobility for the sake of a family and hence not fulfilling career

prerequisites. The SNF must take this into careful consideration when it explicitly requires internationality through research support forms and assessment criteria that are based on mobility.<sup>24</sup> Any considerations about how to improve the situation of female emerging researchers have to aim at providing the kind of support for female applicants which allows them to include children and partner in their geographical movements.

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<sup>24</sup> The new individual funding programme Ambizione, for advanced researchers, represents an exception. Here the condition that one must have spent a 12-month research period abroad is qualified with “as a rule”. The only mandatory requirement is that the applicant has spent 12 months at a university other than the one that awarded his/her doctorate. According to the SNF equality officer, Maya Widmer, the proportion of women submitting applications in the first round was relatively high (cf. FemWiss 2008, 14).

## 8. Academic networks: Social and Symbolic Capital

According to the literature, integration into academic networks and the development of social and symbolic capital in the academic field are more difficult for women than for men and thus represent a considerable barrier in the academic career trajectory. In three substudies we analysed whether such differences also hold true in Switzerland for emerging researchers between being awarded a doctorate and acquiring a professorship. The *survey of PhDs (Substudy Report 2)* systematically documents the contact network of this group in Switzerland and abroad (8.1). The *in-depth interviews with emerging researchers (Substudy Report 5)* outline the subjective significance of integration into the academic community (8.2). In the *content analyses of SNF application files (Substudy Report 4)* the same questions are investigated for the relatively established group of applicants for SNF research funding (8.3). A summary follows at the end (8.4).

### 8.1. The academic network of doctoral graduates in Switzerland and abroad

When we consider the extent of academic contacts amongst doctoral graduates, we find clear, stable and statistically verifiable GENDER DIFFERENCES TO THE DISADVANTAGE OF WOMEN. This can be seen from the *survey of PhDs (Substudy Report 2)* five years after the doctorate.<sup>25</sup> Female academics are more poorly networked not in Switzerland but rather abroad. They have fewer contacts than men to professors as well as to peers at research institutions abroad. Since the creation and pursuit of an academic career are not single-person projects, and emerging researchers are increasingly dependent on being connected to the international academic community, we locate at this point a crucial moment of disintegration. Because women are more likely to lack the international social capital that is important for an academic career, they have fewer opportunities for research collaboration and co-publications and more limited chances of going abroad for shorter or longer periods to gain further qualifications, or of acquiring a permanent position abroad. This leads very subtly over the long term to women not being as competitive in recruitment and selection processes, so that in the final stages they hit up against the glass ceiling which blocks their access to a professorship.

Numerous studies confirm that female emerging researchers have more difficulties finding collaboration partners and are more often excluded from networks and academic associations than their male colleagues (Lang and Neyer 2004, Leemann 2002, Wimbauer 1999, 137, Kyvic and Teigen 1996; Sonnert and Holton 1995, Long 1990, 131ff., McDowell and Smith 1992, Fox 1991, 197f., Bochow and Joas 1987). Moreover, women find it more difficult to build up collaborations with researchers abroad and produce co-publications (Lewison 2001). Even if today female academics are outwardly successful and recognised in their disciplines, they often feel isolated from their colleagues (Baus 1994, 128) and believe that women are less well integrated into important informal networks than men (Yimmer et al. 2007, 165).

The *survey of PhDs (Substudy Report 2)* also shows that the academic network grows more extensive the older one gets. Older people have been able to build up a large

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<sup>25</sup> A synoptic overview of the results of the estimated models can be found in the appendix (Table 6).

network of contacts during the time they have spent in the academic field. RESEARCHERS WITH MASTER'S DEGREES FROM ABROAD are also better networked abroad, which is not surprising. COMING FROM AN ACADEMIC FAMILY MILIEU increases the likelihood of contact with peers at home and abroad, but it decreases the chances of being mentored by professors and having academic contact with them. This could possibly be explained by the fact that such academics are less dependent on mentors, because they have greater confidence in negotiating the academic field. In the estimated models LANGUAGE REGION and SUBJECT AREA were held constant (i.e., were statistically controlled).

INTEGRATION DURING THE DOCTORATE is also very important to having an academic network after the doctorate. If one is already integrated during the doctoral phase, then s/he has access to a larger academic network. CAREER-SPECIFIC SUPPORT significantly increases the academic network, while PARTICIPATION IN A GRADUATE COLLOQUIUM makes it possible to build up academic contacts abroad. Moreover, the probability of building up a comprehensive academic network is determined by OTHER ASPECTS OF INTEGRATION AFTER THE DOCTORATE. This refers to positions in the academic field on the one hand and to graduate colloquia and mentoring programmes on the other.

The instruments for INDIVIDUAL FUNDING at the SNF and other institutions make it possible to build up and maintain academic contacts, especially abroad. SNF PROJECT FUNDING, by contrast, tends to better support academic networks within Switzerland. However, PARTICIPATION in a research project funded by the SNF – in comparison with those funded by other research funding institutions at home and abroad – is not particularly beneficial for academic networking. These results must not be read as one-directional; rather, it can be assumed that a larger, more international network also leads to increased opportunities in research funding at home and abroad. Nonetheless, it remains to be asked how emerging researchers who are in the process of building up academic networks can be better supported by project funding at the SNF.

## **8.2. Integration in the academic community – a potential safety net**

As we saw above, women are not as well integrated into academic networks as men. In this section, we will show, based on the *in-depth interviews with emerging researchers (Substudy Report 5)*, the significance of integration into the academic community. As a result of the poor integration of women into academic networks, they are more likely than men to lack the social and symbolic capital necessary for a career, which leads to a slow “cooling out”.

The interviews make it clear that it is of central importance to researchers to make themselves known in the academic community, achieving visibility and building up a network of personal contacts which in turn enable collaborations and references later in their career.

“Another important aspect is also, comes precisely at the start of your career. For one thing, you can increase your prominence through such contacts. For another, you have people who can work as referees for you. (...) when you apply to positions, at least to postdoc positions, the more referees you have whose names you can provide, the more they're known, internationally as well, and the more different countries they come from, the better it is. That helps in this context, too. If you've worked with them, then these referees are naturally

in a better position to judge your work and they can say, 'Yes, we worked together on project x and y. And in the process this person provided such and such important ideas and did totally fantastic work' or some such thing. If you have referees that really only know you from your CV, then you have the problem that they can judge only the publications themselves and they don't know what you yourself contributed". (Hard and Natural Sciences, Woman 1, 733-747)

Through integration into research projects and research groups, especially during periods spent abroad, emerging researchers become acquainted with other researchers and academically important institutions. They build up a network of contacts that they can profitably draw on later in their academic career and tap as resources. Sometimes, even without their explicit knowledge, people from these networks intervene on their behalf.

The interviews show that most researchers place great importance on networks and accordingly invest time in maintaining personal contacts and participating in informal and formal networks (e.g. management board of academic associations, informal networks about questions of content or methodology). In this context, women with children say that they have less time and flexibility, in comparison with their earlier career phases, to travel to conferences and maintain their contacts. Several interviewees are more reticent and engage only selectively in networks. With them it is clear that they do not see the academic field as a social field in which a personal network should be developed out of social relationships.

There is often an interrelation between personal networks and mentoring. Through the personal networks, emerging researchers become acquainted with potential mentors who are interested in their academic work and willing to support them. At the same time, the mentors can also help further extend their academic contacts in the sense that they take on the role of *gatekeeper*. In such a network, an emerging researcher can be "stabled in friendly stalls" and "handed on", as one interviewee succinctly put it.

The importance of the personal network of academic contacts can be expressed metaphorically. It serves as a safety net or a net between missing rungs on the career ladder, which means that these contacts can help to bridge periods of insecurity and uncertainty.

### **8.3. Symbolic and social capital in the SNF application files**

The *content analyses of the SNF application files (Substudy Report 4)* collected data on symbolic and social capital as measured in the form of being a referee or expert for research funding institutions, having a role in discipline-specific associations, being co-editor of journals, being integrated in research groups beyond one's current project, and/or receiving awards and distinctions. The results indicate EXTENSIVE DISCIPLINE-SPECIFIC DIFFERENCES when it comes to gender. In two of the disciplines investigated, women perform worse than men (medicine, law), while in the two others the opposite is true (physics, linguistics and literature). The women in the latter are by far more well established. This has to do on the one hand with a high proportion of foreigners, who come into contact with the SNF later in their careers, often only once they have attained a professorship, as is particularly true of linguistics and literature. In physics, on the other hand, it could be that the lower number of women



who are competitive in this field already represents the select few, which is not necessarily the case in law and medicine.

#### **8.4. Summary**

Like many other studies, our investigations also show that female emerging researchers are more poorly integrated into contact networks in the academic community. This holds, however, only for contacts with professors and peers at research institutions abroad, and not for contacts in Switzerland. The development of a network in the course of one's academic career is one of the factors that determines whether a career is successful or comes to an end. This is because social contacts which are built up and maintained over time represent a kind of capital investment and safety net. They can lead to further acquaintances and collaborations, which increase visibility, reputation, integration and productivity, and so generate cultural, symbolic and even economic capital. In the meantime, international social capital is becoming ever more important. Periods spent abroad, publications in international journals or research collaborations with foreign institutions serve as a means of distinguishing oneself in the symbolic contest for recognition and self-demarcation (Bourdieu 1992, 187). Here we are able to locate a further central factor that leads to a subtle, disproportionate loss of women from the academic career trajectory.

The fellowships provided by the SNF help to develop and maintain academic contacts abroad, whereas SNF project funding allows applicants to become better integrated into academic networks in Switzerland. Simply participating in a research project funded by the SNF, however, is not particularly conducive to networking. Since many people complete their doctorates within the framework of an SNF funded project, this raises the question for the SNF of how to better incite project leaders and participants to build up the latter's international networks, and how to support them in doing so. The decisive point would be to make a concerted effort to include female emerging networkers in this process.

## 9. Publication Output

Publication output is one of the central performance indicators in the academic field. When one applies to positions or for research funding, publication lists are requested and included in the overall assessment, along with other indices and signs of quality. In certain disciplinary fields there are official rankings of journals (*impact factor*).

Depending on the disciplinary field, importance is given to different types of publications and being the first or last author has different significance. As it was methodologically not feasible to undertake a discipline-specific assessment of the quantity and quality of the publications of emerging researchers, our analyses undertook a simple count of the important kinds of publications (including journal articles, essays and monographs, but not reviews or reports). Through the variable of subject area in the statistical models, we were able to control for discipline-specific variations in publication output.

Publication output was analysed in two studies. The *survey of PhDs (Substudy Report 2)* analysed the number of publications before and after the completion of the doctorate according to possible gender differences (9.1). The *content analyses of the SNF application files (Substudy Report 4)* assessed the number of publications listed by the applicants. A summary appears at the end of the chapter (9.3).

### 9.1. Publication output up to five years after the doctorate

As in many other studies regarding academic careers (e.g., Leemann 2005, Lang and Neyer 2004, Research Corporation 2001, Long and Fox 1995; Long 1990, 1992; Cole 1979), our *survey of PhDs (Substudy Report 2)* also shows, even when controlling for various other factors, that WOMEN IN THE POSTDOCTORAL PHASE PUBLISH SIGNIFICANTLY LESS than men.<sup>26</sup> Up until the completion of the doctorate, no gender differences can be detected; for the period after the doctorate (2003-2007), however, the women have on average just under two thirds as many publications as the men. After a few years, they are thus already lagging behind when it comes to this important measure of performance. Not only gender but also one's SOCIAL BACKGROUND has an affect on publication patterns. Those who come from an academic family milieu are better able to meet the performance norms of the academic field and have 40% more publications than those doctoral graduates who do not have an academically educated father.

By contrast, the BIRTH OF A CHILD does not affect publication output, neither for men nor for women. Although a small child surely places severe limits on the time available for research, the mothers and fathers in our study are no less publication-active. CAREER-ORIENTED SUPPORT during the doctorate has a positive effect on publication output, especially after the doctorate. This can be easily explained, given previous studies regarding academic careers, for the research which leads to earning a doctorate is in many cases published only after the doctorate has been completed. Those people who receive career-oriented support and motivation during the doctorate know how important publications are, and they are better prepared and informed about why and how to publish. In addition, these doctoral candidates profit from co-publications with mentors and from social networks which open up possibilities for

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<sup>26</sup> A synoptic overview of the results of the estimated models can be found in the appendix (Table 6).

further publication. It is not uncommon to submit a publication together with one's supervisor to a highly reputed journal. The chances that the publication will be accepted are higher because of that. INTEGRATION AFTER THE DOCTORATE also proves to be central. In addition to an ACADEMIC POSITION, participation in graduate colloquia and mentoring programmes is also a factor which has a positive impact on publication output.

Those who have had an application for RESEARCH FUNDING in their own name approved, or who have participated in research projects, also have higher publication output. By contrast, fellowships have no sustained effect on publication output. For the purposes of the present study, however, we should note that it is not SNF research funding but rather funding from other institutions that has a positive, statistically verifiable impact. In the case of research applications and fellowships for advanced researchers at the SNF, this could be related to the fact that the respondents are allowed to submit an application to the SNF only after completing the doctorate. The point of data collection in our study is thus set too early to include the upswing in publication output, which experience shows sets in only after the end of a project. The fact that participation in a project funded by the SNF does not produce higher publication productivity after the doctorate could be explained by the fact that this kind of research integration is especially important before the completion of the doctorate and thus does not have any effect on publication output after the doctorate. Nevertheless, it should also be asked whether the participants in such research projects receive sufficient opportunity and support when it comes to publishing their research results. We can also assume that part of the research flows into the doctoral thesis, which in turn would affect the publication output after the doctorate.

## 9.2. Publications in the SNF application files

The number and type of publications in the *content analyses of the SNF application files (Substudy Report 4)* vary significantly by discipline. Output is greatest in physics, followed by medicine. In both disciplines, however, the articles are usually authored by entire research groups. By contrast, publications in law and in linguistics and literature are often written by single authors. Amongst the applicants for research funding, there are NO CONSISTENT GENDER DIFFERENCES. Again, it is noticeable that the performance of the female applicants in physics is higher than that of the men (although this does not hold true for the Swiss women in the group). In linguistics and literature, no gender differences can be detected; however, as discussed above, the women are more senior. In medicine and law the women tend to have published less than the men.

If we take into consideration differences in seniority, then the results seem fully to accord with the conclusion drawn from the *survey of PhDs (Substudy Report 2)* that women have lower publication output.

## 9.3. Summary

Under controls for other factors such as subject area and children, female researchers five years after the doctorate exhibit a significantly lower publication output than male emerging researchers. On average they have only around two thirds as many publications as the men. This result accords with a long line of research findings on the topic. Since the length of the publication list is one of the most important performance indicators in the academic field and is important to applications for posi-

tions and funding, the lower publication output of women is a factor that makes it more difficult for them to prevail against their male rivals in the competition for research positions and research funding.

In our investigations there are no indications that this result has anything to do with a fundamentally lower commitment or less academic interest on the part of women. Nor do family duties have a negative impact on the publication output of women, despite the greater degree of responsibility for childcare and lower degree of support from their partners. Overall, this finding rather points to the poorer integration of women into academic networks and lower levels of support from mentors.

Even when publications are sole-authored, academic performance in the form of publications is never an individual achievement, but is always the result of support and integration (e.g., offers of research participation and publication, help with publication, etc.). It requires (senior) people who are willing to believe in and recognise an academic capability in emerging researchers which can only be developed by providing the certainty and security that is needed for them to produce and submit material for publication.

Neither the individual funding provided by the SNF (e.g., fellowships, participation in projects) nor the project funding it provides has a verifiable impact on the publication output of emerging researchers after the doctorate. In part, this can be explained by the framework of the study and its point of data collection (five years after the doctorate). It can be assumed that the fellowships and project applications, which are normally submitted only after the completion of the doctorate, will come to full fruition only later in the career. Nonetheless, it remains to be asked whether the SNF can exert a positive influence on publication activity during the funding period itself and in the process help female emerging researchers to produce more publications.

## 10. Conclusions and Recommendations for Action

The final chapter provides a short overall summary and outlines points where action is needed, as suggested by our findings.

### 10.1. Overall summary

In recent years, the SNF has spearheaded various efforts at achieving gender equality. These appear to have paid off. An important finding of the present investigation is that, taking other relevant factors into consideration, women do not submit fewer applications to the SNF for individual and project funding up to five years after completing the doctorate. In addition, amongst the researchers who submitted applications for SNF project funding or SNF professorships for the first time between 2002 and 2006, women do not put in fewer applications, receive less money or have lower chances of success.

The crux, however, is that gender-specific leaky pipeline effects continue despite all this. The evaluations of the Swiss Higher Education Information System (SHIS) show that, at all of the transition points under investigation and in all subject areas, women as a rule are disadvantaged in comparison with men. Without the academic influx of women from abroad at the doctoral level and higher, the gender distribution would look even more unequal, particularly in those subject areas with a lower proportion of women. Given that in the most recent (Master's degree) graduation years evaluated by the SHIS the striking disadvantage falls to women in the humanities and social sciences (where their proportion is highest amongst Master's students), it should be clear that the problem will not simply go away with time or because of a higher proportion of women in a course of study.

The survey of doctoral graduates five years after the doctorate illuminates several problems in particular. Firstly, up to this point, women do not leave research more frequently than men, but they do receive support and promotion less often from a professor. It is precisely such mentoring by established university lecturers, however, that arises from the in-depth interviews as being a central factor in career development. Secondly, women with doctorates are less successful at developing an academic network abroad than men. With these findings of poorer support and integration into the academic community, a veiled "cooling out" process begins to emerge. Thirdly, women with doctorates who remain in research have children less frequently than their male colleagues, while both have children less frequently than doctoral graduates who have left research. Fourthly, when researchers do have children, a dependence on traditional roles works to the advantage of men. The amount of time which mothers can spend on academic pursuits is much more limited than that of fathers. For both genders, however, children result in delays and lower chances of success in the first application they submit to the SNF in their own name. For both, children stand in a negative relation to remaining in the academy and gaining further academic qualifications (habilitation, postdoc). Children make it more difficult to undertake networking activities abroad and they reduce the probability of a research period abroad. A fifth problem is posed by the requirements for geographical mobility in the postdoctoral phase, which produces greater conflict for women than for men because of the demands of domestic partnership and family. As

a final point, the quantitative publication output of women five years after the doctorate is lower than that of men.

Our findings provide evidence of the considerable significance that SNF research funding has for academic careers today. The SNF thus has definite opportunities to exert its influence on improving career chances.

It has also been confirmed that an analysis differentiated by disciplinary field is indispensable to the investigation of gender-specific aspects. A broad cross-section often dilutes existing disciplinary differences which determine specific countermeasures. In what follows, based on the results of our study, we will outline the overall points where action needs to be taken by the SNF.

## 10.2. Recommendations for action

This report has found no gender-specific discrimination in the research funding policies or practices of the SNF. Precisely because of this result, which is presumably due to the success of its previous efforts at achieving equality, the SNF today needs to be sensitive to its growing influence as a funder of emerging researchers in Switzerland. As one agent amongst others, the SNF can help to dispel the existing gender-specific barriers on the academic career path by promoting genuine excellence. On the basis of the result of our study, our recommendations for action consist of the following points:

- **Increasing the proportion of women amongst doctoral candidates:** A structured qualification phase after the Master's degree seems to help doctoral candidates. The SNF ProDoc programme already functions in this way. It is important to make use of this programme to increase the proportion of women. In addition, however, one must not forget that many emerging researchers write their doctoral thesis while participating in SNF projects. There is potential here, too, to try to increase equal opportunity chances for women.
- **Strengthening career orientation:** Whoever is not spurred to strive for an academic career by coming from an academic family has to learn early and continuously what the rules of the game are for research careers. The opportunities to learn this through individual mentoring are unequally distributed by gender. The SNF has already taken this into account with its graduate colloquia. It could considerably broaden the effects of its efforts if it were to include fellowship holders and project participants in its offers of career-oriented know-how, experience sharing and networking meetings.
- **Encouraging support for emerging researchers:** As the national institute for research funding, the SNF cannot directly influence the unequal integration conditions experienced by women and men at the universities. It can, however, set standards by means of its funding criteria. Particularly when it comes to project funding, it could require that professors who submit an application also describe their promotion and support practices – including gender-specific criteria. Thus, for instance, they would have to give evidence of how many publications and theses were written by the participants in SNF-funded projects and in what ways they have supported the further career moves of emerging researchers, such as periods spent abroad.
- **Monitoring support for emerging researchers:** It would be helpful regularly to gather and collate available data from universities and the SNF, so as to produce a picture, differentiated by institution and subject area, of the situation for emerging researchers in Switzerland. In general, this would make it easier to identify strengths

and weaknesses, and particularly to trace the development of gender-specific leaky pipeline effects.

□ **Improving recordkeeping:** In order effectively to monitor emerging researcher support, the recordkeeping must be improved. The evaluations carried out here have hit up against limitations caused by data collection. For instance, the University Graduates Survey by the Federal Statistical Office does not ask whether those who have been awarded a Master's degree are doing their doctorate abroad, which is one of the reasons why it has not been possible to document academic outflux. At the SNF, the employment level of applicants (assistantship, senior assistantship, SNF professorship, full professorship, etc.) is not categorised and electronically recorded. Other personal details are neither historically framed nor systematically updated, which means that it is never clear whether they held true at the time of application or still hold true today, which seriously undermines the value of the data collection as a statistical source. The attempt to assess personal details of participants in SNF projects had to be completely abandoned in the present study. And the National Centres for Competence in Research could not be integrated into the evaluation at all because of difficulties with the data.

□ **Undertaking further research:** Even after this study, relatively little is known about the situation and career paths of the emerging researchers in Switzerland who are temporarily supported by the SNF. The slight exceptions are the evaluations of the MHV programme (Belser 2006) and the SNF professorships (Goastellec et al. 2007). It would be helpful (if need be, within the framework of evaluations) to undertake broader surveys of ex-recipients of SNF fellowships for prospective and advanced researchers (cf. Enders and Mgabushaka 2004 for the German Research Foundation) or ex-participants in SNF projects (cf. the German Research Foundation applicants' survey 2002, cited in Hinz et al. 2008, 68f. or Gerhardt et al. 2005). This could generate valuable additional information, particularly about employment situation and effective support for emerging researchers, as well as highlighting any gender-specific differences that persist. It would also be illuminating to undertake representative long-term studies of professional academic careers, which could take place, for instance, in a third survey period under the auspices of the University Graduates Study of the BFS.

□ **Minimising rush-hour effects:** A long period of education, such as is needed for the doctoral and postdoctoral qualifications that precede an academic career, means that the period afterwards, when one has to establish oneself and probably spend time abroad, coincides with the decision to have children, especially for women. This decision often places women in an either-or situation, which comes at a very high cost and is not similarly demanded of men. Now, this moment of coincidence is not constitutive; rather, it is open to influence, for instance by the funding policies of the SNF, which has already recognised its influence when it comes to the issue of age limits. If limitless commitment and accessibility are not to be the dominant criteria of excellence, as this automatically advantages men, then the challenge for the future lies in thinking about how to combine research and family in still more explicit and effective ways.

□ **Reconciling research and family:** It remains taboo to suggest that academic high-flyers have partners and children, whom they take into consideration and for whom they want to make time. Aside from those men who fully (want to) maintain traditional domestic roles, having a child on the uncertain route from doctorate to professorship can cost one one's career goals. Dual-career couples appear in our

data explicitly only at the level of the professorship. They are exotic stars when they manage to geographically coordinate their careers, which is seldom possible. It would be helpful to establish possibilities for dual-career couples earlier, at the point when mobility requirements set in.

Since amongst academics, too, women are more intensely occupied with family tasks than men, they also experience the problems of reconciling family and career more intensely. In the later qualification stages in particular, they often proceed at a slower tempo. Disciplines in which students graduate earlier with Master's degrees and doctorates, and which do not require a habilitation, therefore pose fewer problems of reconciliation for a research career. Earlier mobility also seems to pose fewer problems for women researchers. It is only when one is over 30 that mobility requirements, especially for women, become more problematic.

The SNF has the opportunity not to maintain the taboo status of family duties; rather, it could explicitly recognise and take into account such burdens and specific situations in its funding practices. It already notes, as a new policy, the age of applicants when it allocates fellowships and funding for SNF professorships. This criterion could be extended to take into consideration periods devoted to childcare (e.g., part-time work and parental leave periods) for both genders.

□ **Avoiding disintegration in the demand and support for international mobility:** The SNF is encouraged to use the appropriate instruments to promote internationality – including for dual-career couples – in such a way as to help women (and men) reconcile career, family and domestic partnership. In the process, it must take into consideration gender-specific elimination processes which it, too, promotes through its own criteria and funding instruments based on mobility. Thus, for instance, fellowships that are set up by the SNF for only one year are too short for a making a move with children. The uncertainty and short-term notice of extensions are difficult even for single people or for dual-career couples without children. Moreover, institutional employment conditions in Switzerland are on average worse for female academics, which makes it much more difficult for them to return. The present instruments of the SNF offer few opportunities to confront this set of problems.

In addition, through its funding policies the SNF can assess the functionality and reasonableness of criteria for internationality, and counter senseless norms by implementing other criteria. In this sense, providing alternative forms of funding within Switzerland remains important. Subsidies from the Marie Heim Vögtlin Foundation and the new programme Ambizione, like the subsistence contributions which are no longer supported today, offer greater security over a longer funding period. Women, researchers from lower social classes, parents and people in disciplines with few options for third-party funding (linguistics and cultural studies, humanities and law) are more structurally dependent on such forms of funding.

□ **Preventing women from being pushed out of academic university research:** The recent remit of the (less prestigious) universities of applied sciences to engage in research has led to new forms of the academic career trajectory. Because of the lack of pressure to be mobile, the greater employment security and the lower career-specific performance requirements in these institutions, a certain danger arises that in future women will be more strongly pushed into the universities of applied sciences or will migrate of their own accord. The SNF can react to this danger by applying consistent criteria through its funding practices to ensure the permeability of both systems and by creating as few funding instruments as possible which are ex-



clusively accessible only on the part of the academic universities or the universities of applied sciences.

□ **Continuing to promote equality at the SNF:** There is still a long way to go in the academic field before gender equality is fully realised. Therefore, the SNF, as an important funding agent for emerging researchers and research, has to continue to address the topic of equality. It could prove to be highly counterproductive if the SNF were to rest on the laurels of its initial successes.

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## 12. Appendix

**Table 5: Synoptic overview of the determinants regarding applications for individual funding and for participation in research projects**

	SNF Research fellow- ships for prospec- tive researchers	SNF Research fellow- ships for advanced researchers	Other research fellowships	SNF professor- ships	Participation in SNF research pro- jects	Participation in another research project
Woman	ns	ns	ns	ns	ns	ns
Master's degree from abroad	-	ns	ns	ns	ns	+
Academic family background	ns	ns	ns	+	ns	ns
Birth of child before doctorate	(-)	ns	ns	ns	ns	ns
Birth of child after doctorate				ns		
French-speaking part of Swit- zerland	ns	ns	ns	++	ns	ns
Subject area	Law (-) Med. (-)	Tech - Med. (-)	ns	Econ. (-) Med. (-)	Law -- Tech --	Soc -- Law -- Tech +
Integration during the doctorate	ns	++	ns	+	ns	ns
Integration after the doctorate				ns		
Applications submitted for SNF fellowships			++	++	-	+
Applications submitted for other fellowships	++	++			ns	ns
Applications submitted for SNF project funding				++		

Source: Survey of PhDs (Substudy Report 2); University Graduates Survey (BFS), Computations: PHZH und SOI/UZH

ns = not significant, - = partly verified statistical indicators of negative impact, -- = clearly verified statistical indicators of negative impact, + = partly verified statistical indicators of positive impact, ++ = clearly verified indicators of positive impact. Grey = variable not included.

**Table 6: Synoptic overview of determinants regarding applications for research funding**

	Applications submitted for SNF project funding	Applications submitted for SNF pure research project funding	Applications submitted for projects not funded by SNF
Woman	ns	ns	ns
Master's degree abroad	ns	++	++
Academic family background	ns	ns	++
Birth of child before doctorate	ns	ns	ns
French-speaking part of Switzerland	ns	ns	ns
Subject area	Soc ++ Med. (-)	Soc + Econ. (-) Med. (-)	Tech + Law (-)
Integration during the doctorate	ns	ns	ns
Integration after the doctorate	++	++	+
Applications submitted for SNF fellowships	ns	+	ns
Applications submitted for other fellowships	ns	ns	++
Participation in SNF project	ns	ns	ns
Participation in other project	ns	ns	ns

Source: Survey of PhDs (Substudy Report 2); University Graduates Survey (BFS), Computations: PHZH und SOI/UZH

ns = not significant, - = partly verified statistical indicators of negative impact, -- = clearly verified statistical indicators of negative impact, + = partly verified statistical indicators of positive impact, ++ = clearly verified indicators of positive impact. Grey = variable not included.



**Table 7: Synoptic overview of determinants regarding various academic career indicators**

	Continuation in academy up to 5 years after doctorate		Mentoring after doctorate	Academic network at universities 5 years after doctorate		Research period abroad after doctorate	Publications between doctoral award and 5 years after
	Academic employment	Postdoc	By professors	In Switzerland	Abroad		
Woman	ns	ns	- -	ns	- -	ns	- -
Age	ns	- -	ns	++	ns	- -	ns
Master's degree abroad	++	ns	ns	ns	++	++	ns
Academic family background	ns	ns	-	unclear	unclear	++	++
Birth of child before doctorate	ns	ns					
Birth of child after doctorate	-	-		ns	- -	- -	ns
French-speaking part of Switzerland	ns	ns	ns	ns	ns	ns	ns
Subject area	+ Soc - - Tech	- - Tech	- -Econ. - - Tech	ns	ns	ns	ns
Integration during doctorate	++	+	++	++	++	++	++
Integration after doctorate	++		++	++	++		++
Fellowship from SNF	+	++		ns	++	++	ns
Other fellowship	ns	ns		ns	++	ns	ns
Research application to SNF	ns	ns		++	++	(-)	ns
Other research application	++	++		ns	ns	+	++
Participation in SNF project	++	++		ns	ns	ns	ns
Participation in other research project	++	++		++	++	++	+

Source: Survey of PhDs (Substudy Report 2); University Graduates Survey (BFS), Computations: PHZH und SOI/UZH  
 ns = not significant, - = partly verified statistical indicators of negative impact, - - = clearly verified statistical indicators of negative impact,  
 + = partly verified statistical indicators of positive impact, ++ = clearly verified indicators of positive impact. Grey = variable not included.

**Table 8: Factors affecting application patterns and chances of success with submissions by newcomers to the SNF**

Dependent Variables:		Sums requested (OLS)		Sums received (OLS)		Number of applications (Count Model)	
		Total	Average	Total	Average	submitted	successful
Gender (D)	women=1	ns	ns	ns	ns	ns	ns
Age at first submission	in Jahren	ns	ns	(++)	0.01	(-)	(+)
No. of projects as participant		ns	ns	(+)	(+)	ns	ns
Fellowships (D)	yes=1	(+)	ns	(+)	-0.07	(--)	(++)
Academic Degree (D)	professor=1	(++)	(+)	(++)	(++)	(+++)	(+++)
Nationality (D)	foreigner=1	ns	ns	(+)	ns	(+)	(+)
Language region	<i>German speaking Switzerland (reference)</i>						
	(D) French speaking Switzerland	ns	ns	ns	ns	ns	ns
Disciplinary field	<i>Theology (reference)</i>						
	(D) Linguistics and literature	ns	ns	ns	ns	ns	ns
	(D) Sociology/Econ./Law	(+)	(+)	(-)	ns	(-)	(-)
	(D) Hard sciences	(+)	(++)	(--)	(++)	ns	ns
	(D) Natural sciences	(++)	(++)	(--)	(++)	(-)	(+)
	(D) Medicine/pharmacy	(++)	(++)	(--)	(++)	ns	ns
	(D) Technical sciences	ns	(+)	(--)	ns	(--)	(+)
SNSF Division	<i>SNSF Division 1 (reference)</i>						
	(D) SNSF Division 2	(++)	(++)	(+++)	ns	(++)	(+)
	(D) SNSF Division 3	(+++)	(+++)	(+++)	(+++)	ns	ns
	(D) National Research Programmes	(+)	(+)	(++)	(++)	(+)	(+)
	(D) SNSF Professorship	(+++)	(+++)	(--)	(+++)	ns	ns
Number observed		2324	2324	2324	1367	2324	1367
Corr. R <sup>2</sup> (OLS)/ Pseudo-R <sup>2</sup> (Count Model)		0.298	0.418	0.201	0.222	0.057	0.044

Notes:

(D) = Dummy

ns = not significant

Symbols and strengths of the significant effects: (+++)/(---): Value of the standardised coefficient  $\geq 0.2$  (OLS);  $-0.9 < IRR < 1.1$  (Count Model)

(+)(-):  $0.1 \leq$  Value of the standardised coefficient  $< 0.2$  (OLS);  $1.1 < IRR < 1.2$  bzw.  $-0.8 < IRR \leq -0.9$  (Count Model)

(+)(-):  $0.0 <$  Value of the standardised coefficient  $< 0.1$  (OLS);  $IRR \geq 1.2$  bzw.  $IRR \leq -0.8$  (Count Model)

IRR: incidence rate ratio

Notes: ns = not significant.

Source: Evaluations of the SNF application administration system (Substudy Report 3); excerpted from SNF administration system; Computations: BASS/GEFO

**Table 9: Factors regarding type of first-time application to the SNF in one's own name**

		Co-investigator vs. Principal investigator	SNSF professorship vs. Principal investigator	SNSF professorship vs. Co-investigator
Gender (D)	women=1	ns	ns	ns
No. of projects as participant		(+)	(+)	ns
Fellowships (D)	yes=1	(--)	(++)	(+++)
Age at first submission	years	(-)	(-)	(-)
Nationality (D)	foreigner=1	(-)	ns	ns
Language region	<i>German speaking Switzerland (reference)</i>			
	(D) French speaking Switzerland	(+)	(+)	ns
(+++)/(---) Relativ Risk $\geq 4$ bzw. $\leq 0.25$				
(++)/(--) Relativ Risk between 2 and 4, or 0.25 and 0.5				
(+)/(-) Relativ Risk between 2 and 1, or 0.5 and 1				
Number observed	2325			
Chi <sup>2</sup> -Likelihood-Ratio-Test	570.4 > Chi <sup>2</sup> <sub>(24, 0.01)</sub>			
Nagelkerke-R <sup>2</sup>	0.25			

Note: The year of submission was controlled. It was not possible to control for subject area, as the relevant information was not available for the SNF professorships.

Source: Evaluations of the SNF application administration system (Substudy Report 3); excerpted from SNF administration system; Computations: BASS/GEFO