

# **The ‘Leaky Pipeline’ in Switzerland: What is causing women to drop out of academic research and careers at senior levels?**

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## **Abstract**

The disproportional loss of qualified women out of research and academic work is a well-known phenomenon and metaphorically termed ‘The Leaky Pipeline’. In this study, commissioned by the Swiss National Science Foundation, we analyze three potential factors that may lead to the gender-specific drop out rates, namely research funding, aspects of integration into the scientific community, and domestic factors. Using a supplementary module included in the second 2007 wave of the Swiss Graduate Survey, as well as in-depth interviews with a selected group of young researchers, we identify two core problems leading to the disproportional loss of women: First, female post-docs experience poorer integration into the scientific community. Second, women following academic and research career paths typically encounter more difficulties in combining scientific work and family. Our results do not indicate, however, gender-specific differences in research funding that may relate to the leaky pipeline.

## 1 Introduction

A loss of qualified people at each stage of an academic career is intended and part of an elite recruitment process. The respective losses are socially legitimate if they are based on achievement and not on ascription criteria (Merton 1973 [1942]). Contrary to this universalistic norm in modern societies, cross-sectional analyses of academic career paths indicate for all countries in Europe a disproportional loss of women on their way to a full professorship, a phenomenon that is metaphorically termed as “The Leaky Pipeline” (European Commission 2008, 16ff.).

Despite having achieved a significant improvement in the equality of men and women in professional and social life over the last decades (Hausmann, Tyson, Zahidi 2008), Switzerland is still characterized by a substantial amount of gender inequality in working life in general, and in academic career trajectories in particular. The aim of this paper is to shed light on the major reasons behind the leaky pipeline as observed in Switzerland. We focus on the interrelated contexts of research funding, aspects of integration into the scientific community, as well as domestic factors in order to better understand the causes of high gender-specific drop out rates for women in academic careers.

The paper is based on our study “Gender and Research Funding”, commissioned by the Swiss National Science Foundation (SNSF).<sup>1</sup> The analysis is based, on the one hand, on records about individual educational career paths, drawn from the Swiss Higher Education Information System of the Swiss Federal Statistical Office, to obtain a clearer picture of the leaky pipeline inside the Swiss university system. On the other hand, we investigate possible reasons behind the leaky pipeline – in particular the question of access to research funding, the likelihood to get approved funding by the SNSF, the role of academic integration, and the dimension of reconciling family and research all in the perspective of gender inequalities. For this purpose, we questioned in 2007 a number of university graduates who were awarded their PhD in 2002 about the course of their academic career paths – as part of the Swiss Graduate Survey in cooperation with the Swiss Federal Statistical Office. Furthermore, the research group evaluated the first-time applications submitted to the SNSF in the researcher’s own name between 2002 and 2006

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<sup>1</sup> See [http://www.snf.ch/SiteCollectionDocuments/wom\\_ber\\_gefo\\_synthesis\\_report\\_e.pdf](http://www.snf.ch/SiteCollectionDocuments/wom_ber_gefo_synthesis_report_e.pdf) for a more detailed description of the research project and an overview of the results. Project leaders: Regula Julia Leemann and Heidi Stutz. Project participants: Regula Julia Leemann, Andrea Keck, Sandra Da Rin, Susan Gürber (University of Teacher Education Zurich); Heidi Stutz, Philipp Dubach, Jürg Guggisberg, Gesine Fuchs, Silvia Strub (Centre for Labour and Social Policy Studies (BASS), Berne); Katrin Schönfisch, Sabina Schmidlin (Federal Statistical Office), Neuchâtel); Irène Schwob, Shams Ahrenbeck, Karin Müller (Service de la recherche en éducation, (SRED), Geneva); Stefan Boes (Socioeconomic Institute, University of Zurich)

for project funding or an SNSF professorship, based on data from the application administration system of the SNSF. Additionally, we conducted in-depth interviews with a selected group of young researchers from various disciplines.

The paper is structured as follows. After a theoretical framing and description of the empirical design and the two datasets (Sections 2 and 3), we will draw a rough sketch of the leaky pipeline inside the Swiss university system and give a brief summary of the results for research funding by the Swiss National Science Foundation (Sections 4 and 5). We then consider the two core problems leading to a disproportional loss of women in academic careers: The worse support of young female researchers by mentors (Section 6), and their greater difficulties in combining research and family duties (Section 7). The paper ends with some concluding remarks and provides an outlook for further research required in this area (Section 8).

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

In recent years, a number of studies have been carried out which usefully apply Bourdieu's concepts of (academic) field and habitus, doxa and illusio, symbolic power and different forms of capital (Bourdieu 1986, 1990; Bourdieu and Wacquant 1992; Bourdieu, Passeron, de Saint Martin 1994) to the unequal integration of women and men into the scientific community (Krais 2000, Engler 2001, Beaufaÿs 2003). This theoretical perspective is guiding our own research and empirical analysis.

Krais (2000, 2002) posits that, within the "agonal structure" in academia, 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 (symbolic power). As a result, they withdraw from the game, in which they have never been taken seriously as players.

Furthermore, the norms and values of the academic field (doxa) require and demand of academics the adherence of their whole life to academic work (academia as a form of life). As a result, all other parts, especially family life and children with their not always predictable demands, are set apart and the support of an academic career by the partner and/or the family is just taken for granted (Hochschild 1975, Krais 2008). As most of the women are still responsible for childcare duties and cannot rely on a partner who is willing to cut back on his own career in favour of her career, female academics are in a disadvantage.

In order to conceptualise the dimension of reconciling family and academic career we draw on the analytic framework of linked or coupled lives by Krüger and Levy (2000,

2001), which is linked to partnership and marked by gender inequalities through various connections to family and career. The authors point out that different dimensions have to be taken into account to capture the full complexity of life courses: (a) life courses are not individual projects but projects of family members and partners, (b) aspects of simultaneous social participation of the partners in different social fields are important characteristics, (c) institutionalisation has, beneath its cultural dimensions, also structural roots or organizational forms (e.g., opening hours of day-nurseries), (d) gender as a master status structures the life course unequally for men and women.

### **3 The data**

#### *3.1 The survey of 2002 university PhD graduates (panel 2003/2007)*

With the data from the Swiss Graduates Survey regularly carried out by the Swiss Federal Statistical Office we are able to examine and to explain various factors for the higher exclusion rates of female academics in the postdoctoral period. All university graduates awarded a PhD in 2002<sup>2</sup> were questioned in 2003 and 2007 on their career developments, professional training, family situation, social background and other socio-economic factors. In the wave of 2003, there was an additional module inserted in the context of evaluating the Swiss Federal Equal Opportunity at Universities Programme with questions on support at universities and on participation in different promotion programmes during the doctoral period. A supplementary module was also included in the 2007 wave in the context of our study on topics of academic career. In particular, we have collected data on academic integration (networks, mentors) and achievement (applications to research funding institutions, publications).<sup>3</sup>

Compared to the initial population of PhD graduates in 2002 (N=1689), there were 538 people in the second wave with valid entries for both surveys, which yields a total return rate of 31.9%. Since not all of the people who were surveyed filled out the

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<sup>2</sup> With the exception of a) the University of St. Gallen and the University of Basel, which did not supply the addresses of doctoral graduates to the Federal Statistical Office and b) the areas of “medicine and pharmacy”, which 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 (due to the different significance attributed to the doctorate in medicine). The results from this disciplinary field are therefore invalid and will not receive further comment.

<sup>3</sup> Inserted by the authors in the context of the study “Geschlecht und Forschungsförderung (GEFO)” (Gender and Research Funding). The questionnaires of both waves are available online under:

[http://www.bfs.admin.ch/bfs/portal/de/index/infotehk/erhebungen\\_\\_quellen/blank/blank/bha/02.html](http://www.bfs.admin.ch/bfs/portal/de/index/infotehk/erhebungen__quellen/blank/blank/bha/02.html) (Panel of the University Graduates in 2002).

particular supplementary module, however, the available number of observations for the analyses comes down to 470 people (total return rate: 27.8%).<sup>4</sup>

The analyses are weighted. The weighting factor provided by the Swiss Federal Statistical Office indicates the inverse probability that a particular observation based on the sampling design will be contained in the sample. Since scientific careers take different institutional forms according to discipline and language region, the multivariate analyses control for subject areas and the German as opposed to the French speaking part of Switzerland. All calculations are carried out in Stata (Version 10).

### *3.2 Interviews with young researchers from different disciplines*

In addition, we conducted 45 in-depth interviews with a selected group of researchers who either had graduated with a PhD in 2002 or had submitted their first application for a research funding to the SNF between 2002 and 2006. The aim of the interviews was to evaluate subjective experiences, motivations, and reasons for undertaking academic career paths, or for leaving the academic/university sector.

The interviews were carried out across Switzerland (via personal interviews) and abroad (via telephone interviews). The interviewees were chosen to reflect as broad and comprehensive an image as possible of the various career and private life (family) realities in the different disciplines. At the current stage of our analysis, 15 interviews are subjected to more in-depth analysis using Strauss and Corbin's Grounded Theory model. We explored the meanings of different topics in an academic career (research funding, mentoring, geographical mobility, etc.) for the self-conception of the upcoming researchers, for the process of becoming an academically recognised personality, for the formation of their own academic career trajectory, for their positioning in the academic field, or for their withdrawal from academia.

## **4 The leaky pipeline inside the Swiss university system**

An analysis of the leaky pipeline in Switzerland shows that at the relevant transition points of doctorate and habilitation, a disproportionately large number of women drops out of the academic system in comparison to men.<sup>5</sup> Furthermore, the results indicate that we have to consider discipline-specific differences while referring to the picture of the

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<sup>4</sup> A comparative analysis of the two samples shows no significant differences in the distribution of gender, region, and disciplines. Therefore, we deem it reasonable to assume a random drop out of PhD Graduates from the survey.

<sup>5</sup> These analyses are based on statistical data about individuals in the Swiss university system, the "Swiss Higher Education Information System".

leaky pipeline. Without the academic inflow of women from abroad at the doctoral level and later, the potential pool of young female researchers in the Swiss higher education system would turn out to be even smaller, especially in those disciplines with a low proportion of women.

In general, over the study period of about twenty years, a convergence can be seen in gender-specific doctoral completion rates. This, however, can predominantly be ascribed to the fact that the number of men who complete a doctorate has been decreasing over the long term, especially in law, humanities, social sciences, and natural sciences.

We only provide a very brief sketch of the results here, focusing on the most relevant details for our analysis below. For more details about the leaky pipeline in Switzerland, we refer to Dubach (2009).

## **5 Applications for research funding to the Swiss National Science Foundation**

Funding for an academic career path is provided by universities and third-party sources, with the latter becoming increasingly important (Enders 1996, 105f.). In Switzerland, unlike other countries, there are relatively few alternatives to supporting one's research through the SNSF. In our study we investigate two questions: do female upcoming researchers apply for research funding at the SNSF and at other funding institutions as often as male researchers? Do they have equal chances to get a funding approved?

The analyses reveal that in the phase between the PhD graduates' Master's Degree up to five years after the doctorate, women submit applications for individual and project funding to the SNSF just as frequently as men do. Moreover, they participate as junior researchers in a research project funded by the SNSF as often as men do.<sup>6</sup> Among those researchers between 2002 and 2006 who submitted applications for project funding by the SNSF or an SNSF professorship for the first time, women did not submit fewer applications than men, and they received equal amounts of money and had the same chances of success.<sup>7</sup> Therefore, on the bases of the quantitative data, we find no indications that women have to overcome greater hurdles in order to submit a funding application, to gain access to research projects funded by the SNSF, or to get approved project funding or a SNSF professorship.<sup>8</sup> Nevertheless, as the interviews show, women encounter subtle dimensions of gender specific exclusions and barriers in relation to

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<sup>6</sup> For more details, see Leemann, Keck and Boes (2009).

<sup>7</sup> For more details, see Stutz, Guggisberg, Strub and Fuchs (2009).

<sup>8</sup> For further results on the effect of research funding on academic career paths see Leemann, Keck and Boes (2009), Boes and Leemann (2009a).

research funding, e.g. they do have more problems to be geographically mobile and to stay abroad with a fellowship from the SNSF.<sup>9</sup>

## **6 Mentoring and support for emerging researchers**

One of the crucial factors of integration in the academic field is the support by mentors. For that reason, we explore in this chapter the topic of mentoring. First, we illustrate the importance of having a mentor for a successful academic career and show the different dimensions that constitute mentoring by referring to our interviews. Second, on the databases of the survey of PhDs we investigate if there are gender differences in the probability of being mentored in the postdoctoral phase.

### *6.1 Subjective importance of mentoring*

The in-depth interviews with emerging researchers reveal that mentoring by an established academic has a decisive influence on the academic career 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)

This support and promotion can 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, other forms of support were mentioned, such as the willingness to write recommendations or to make a phone call in order to establish an important contact.

Female mentors who themselves have been able to reconcile an academic career and a family can be important role models and orientation points for young female 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,

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<sup>9</sup> In detail, see Leemann and Da Rin (2009).



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)

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)

If there is no sufficient support by a mentor, then this will often have a negative career effect. 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.

Sometimes the actions of supervisors aroused a certain degree of ambivalence, although the positive, supportive dimension was accentuated. Mentors require 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)

As catalysts for attributing and recognising achievement, mentors can help people develop and demonstrate 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 accurately:

"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>10</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)

Beaufaÿs and Kraiss, in their observations of and interviews 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, even 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.

We can conclude 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 of 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.

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<sup>10</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.

## 6.2 *Mentoring in the postdoc phase*

In the second wave of the Swiss Graduate Survey (2007), PhDs were asked if they have received decisive support and promotion during their postdoctoral period by somebody whom they would call a mentor. Three categories of mentors were possible: (1) professors, (2) senior research associates (peers) at universities and other research organisations, and (3) academics outside of the scientific community. The respondents had to indicate the exact figure of mentors for each category (0, 1, 2, ...).

67 academics did not answer this question. We assume that these respondents either did not pursue an academic career anymore after their PhD graduation (and therefore were not addressed by the question), or they had not had a mentor but did not mention it by filling in a “naught”. Because the exact reasons cannot be traced, we estimate two different models. In the first model (Model A) these 67 persons are set as missing values meaning they are not included in the analyses. In the second model (Model B), these cases are treated as if they had not had a mentor in their post-doctoral phase. If the effects of the independent variables in the two models are the same, it is reasonable to assume that the results do not depend on this 67 “unclear” cases. We will only show the estimation results of Model B (see Table 2) and report possible differences between Models A and B in the text.

We constructed two different *dependent variables*:

- 1) *Mentoring by professor(s)*: During the postdoctoral period, the respondent has had at least one mentor who is a professor at a university or at another research organisation: Yes (1)/No (0).
- 2) *Mentoring by peer(s)*: During the postdoctoral period, the respondent has had at least one mentor who is a senior research associate (peer) at a university or at another research organisation: Yes (1)/No (0).

The third category – academics outside of the scientific community – is deemed irrelevant for our topic because we are interested in the support obtained within the scientific community as factor contributing to a successful development of an academic career.

Table 1 gives an overview of the coding and size of the different categories of the dependent variables. If the respondent had at least one mentor in the respective category, the variable is coded as 1. Otherwise, it is coded as 0.

Table 1: Coding of the variables “mentoring”

	%	Model A	Model B
Count of mentors (professors at universities or at other research organisations)		<i>Mentoring by professor(s): (dummy variable)</i>	<i>Mentoring by professor(s): (dummy variable)</i>
Missing values	13.9		0
0	52.3	0	0
1	21.6	1	1
2	9.8	1	1
3 and more	2.3	1	1
Total	100.0		
Count of mentors (senior research associates at a university or at another research organisation)		<i>Mentoring by peer(s): (dummy variable)</i>	<i>Mentoring by peer(s): (dummy variable)</i>
Missing values	13.9		0
0	71.8	0	0
1	8.2	1	1
2	4.5	1	1
3 and more	1.6	1	1
Total	100.0		

Source: Swiss Graduates Survey (Federal Statistical Office), own calculations.

In order to investigate the chance of being mentored after the PhD, we included several explanatory and control variables which cover sociodemographic as well as academic factors (see Table 2). First consider the likelihood of being *mentored by a university professor*. We observe that *female* upcoming researchers have a significantly smaller chance – less than half of the chance of male researchers<sup>11</sup> – of finding a professor in the postdoc phase who will rigorously support and foster them in a mentoring relationship. This result is equally valid for models A and B. This result is consistent with a number of studies documenting that women are less likely able to count on an academically established person who will provide support and promote their careers (Siemianska 2007, 263; Zimmer, Krimmer, Stallmann 2007, 122f.; Ledin et al. 2007, 985; Allmendinger, Fuchs, von Stebut 2000; Grant and Ward 1996; Bagilhole 1993; Geenen 1994, 91).

We do not find evidence that *age* and *former academic mobility* affect the likelihood of having a mentor. It seems that older academics and academics from abroad do not encounter higher barriers in finding support and promotion by mentors. Our results

<sup>11</sup> Model B:  $\exp(-0.964) \cdot 100\% = 38\%$ , Model A:  $\exp(-0.901) \cdot 100\% = 41\%$ .

suggest that young researchers with an *academic family background*<sup>12</sup> are less likely to report a mentor. A priori, we expected that they receive more recognition as promising future researchers due to their greater familiarity with the academic field. One reasonable explanation for the negative sign, however, could be that the support and promotion they get is taken for granted (and maybe obtained through their parents) and therefore not valued as “support”. The *language region* has been controlled for in order to account for potential differences in the university systems in the German speaking and the French speaking part, but it does not show any relevance. Because economics and the technical sciences are more connected to the private and public sectors (industry, financial institutes, or state departments), important and relevant mentors in these *subject areas* can also be found outside the academia.

*Career-oriented support during doctorate* generates further support for young researchers by a professor. This effect, known as ‘cumulative advantage’, stems from the fact that, in the form of a self-fulfilling prophecy, those doctoral candidates who were considered to have promise and above-average academic talent by mentors also receive more recognition and support after completing their doctorate (Cole 1979; Merton 1985 [1968]).

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<sup>12</sup> It is likely that in the case of a mother who graduated from university also the father has a university degree.

Table 2: Determinants of mentoring after PhD (logistic regression models)

	<i>Mentoring by professor(s)</i> (Model B)	<i>Mentoring by peer(s)</i> (Model B)
Socio-demographic factors		
Woman	-0.964*** (0.361)	0.267 (0.391)
Age	-0.0355 (0.0493)	-0.0122 (0.0697)
Masters Degree abroad	0.437 (0.355)	-0.129 (0.389)
Father university degree (academic background)	0.223 (0.364)	-0.582 (0.438)
Mother university degree (academic background)	-1.033** (0.496)	0.645 (0.613)
University factors		
French-speaking part of Switzerland	0.174 (0.370)	-0.368 (0.437)
Disciplinary field (natural sciences = base category) <sup>13</sup>		
Social sciences and humanities	0.376 (0.460)	-1.163** (0.565)
Economics	-2.020** (0.833)	-1.466 (1.159)
Law	0.520 (0.635)	
Medicine/pharmacy	-0.729 (0.837)	-1.149 (1.096)
Technical sciences	-0.982** (0.434)	0.0294 (0.416)
Integration during the doctorate		
Subject-specific support during doctorate	0.0234 (0.110)	-0.184 (0.142)
Career-oriented support during doctorate	0.678*** (0.242)	0.434 (0.283)
Integration after the doctorate		
Employment directly after doctorate (not in academia = base category)		
Position in academia	1.240*** (0.344)	0.463 (0.439)
Others (training, unemployed, travelling, ...)	0.674 (0.475)	-0.484 (0.612)
Employment five years after doctorate (not in academia = base category)		
Position in academia	1.142*** (0.331)	0.781** (0.376)
Others (training, unemployed, travelling, ...)	0.601 (0.711)	0.484 (0.743)
Participation in a postdoctoral programme <sup>14</sup>	0.432 (0.717)	0.314 (0.721)
Mentoring programme after doctorate (only women)	0.982 (1.142)	0.415 (1.032)
Constant	-1.009 (1.886)	-1.161 (2.714)
Number of observations	346	320
Value of the log-likelihood	-170.6	-132.9
Model Chi-squared	58.20***	26.04***
Degrees of freedom	19	18

Effect coefficient (b), Standard errors in parentheses

\*  $p \leq .10$ , \*\*  $p \leq .05$ , \*\*\*  $p \leq .01$ 

Source: Swiss Graduates Survey (Federal Statistical Office), own calculations.

As one would expect, PhD graduates who are straight after graduation and five years later still in academia (*position in academia*) have more often an academic mentor. The causality between these two variables – remaining in academia and being mentored – is

<sup>13</sup> “Law” is omitted due to missing variation (i.e., cells without cases or perfect prediction).

<sup>14</sup> In German: Graduiertenkolleg.

ambiguous, however, because not being supported by a mentor can result in withdrawing from an academic career trajectory.

Noteworthy are the insignificant effects of *postdoctoral and mentoring programmes*<sup>15</sup> after the doctorate on the likelihood to have a mentor in the postdoctoral phase. Our results raise the question about the efficacy and quality of the mentoring programmes of the first generation established by the Swiss Federal Equal Opportunity at Universities Programme. It can be assumed, however, that the first generation of programmes mainly attracted female academics who were poorly integrated in academia. Furthermore, it might be too early to measure the effects of the programme, and we therefore do not find the expected positive effect in our data.

With regard to *peer mentoring* we do not find significant effects, except for the differences in fields of study and the academic position after the doctorate. Since we have no academics in the law discipline in our data who are mentored by peers, we drop this category from the analysis. Compared to the natural and technical sciences, the likelihood of having a peer as mentor in the social sciences and medicine/pharmacy is substantially smaller. Compared to mentoring by a university professor, we do not find gender differences in peer mentoring, nor differences in the other sociodemographic factors. There is also no evidence that the integration in the scientific community during the doctorate affects the likelihood of having a peer as mentor.

## **7 Reconciling Career and Family**

We now examine the gender-specific impact of having a family on the leaky pipeline phenomenon in academic careers. In the survey of PhDs, the respondents were asked about their family situation (children, domestic partnership) as well as the division of labour among couples who have children five years after the doctorate. In the interviews, we asked the respondents if they accept compromises or face any difficulties in reconciling private and professional life.

### *Domestic Partnership*

In contrast to the results of other studies, which investigated the family situation of professors – some of them focused in particular on the first generation of women professors – (Onnen-Isemann and Oßwald 1991; Zimmer et al. 2007), the young female researchers we questioned have a domestic partner nearly as often as their male colleagues.

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<sup>15</sup> As our data reveals, only women took part at mentoring programmes.



### *Children*

The problem arises once children enter the picture. As we can see in Table 3, doctoral graduates who were 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. Just 43% of all male academics have children, whereas the proportion of doctoral graduates who have children and are employed in other fields is 57%.

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

	Men		Women	
	Academic field	Other fields	Academic field	Other fields
Children Yes	43%	57%	32%	38%

Source: Swiss Graduates Survey (Federal Statistical Office), own calculations.

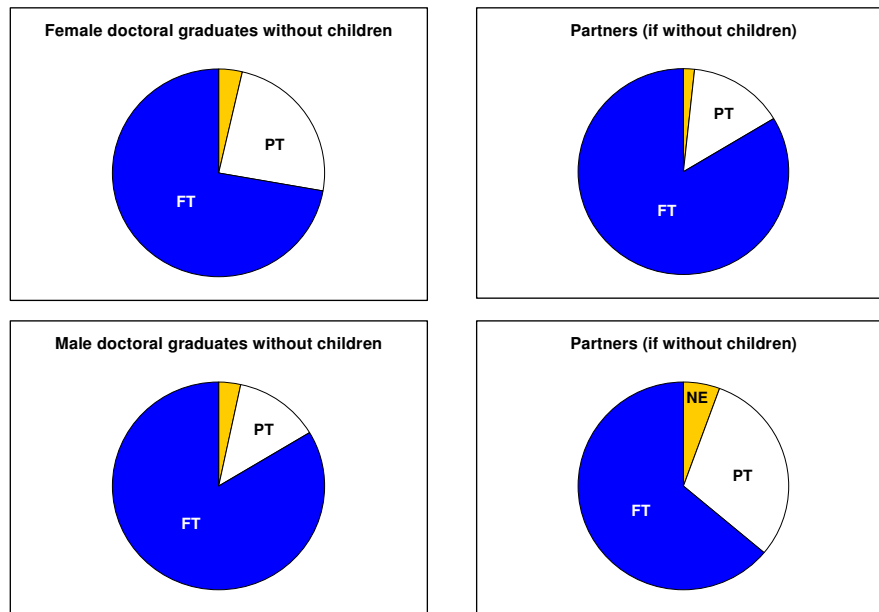
The same significant difference holds for women, although less marked (32% in academia as opposed to 38% with children in other fields). These results suggest that in Switzerland reconciling a family with an academic career is impeded by institutional characteristics of the scientific field and poses problems for women as well as for men.

Moreover, fewer women with doctorates have children than men with doctorates. The obstacles to start a family while pursuing an academic career therefore seem bigger for women than for men. This result is consistent with numerous other studies (e.g., Lind 2008; Zimmer et al. 2007, 147ff.; Mason and Goulden 2004; Leemann 2002). As further analysis shows, women who do not (yet) have children are also less likely to plan having them in the future than men do. The gender gap is thus set to increase further.

### *Employment patterns amongst couples*

If we look at the employment patterns of couples, then we observe that the two couple households share overall similarities, as long as there are no children (see Figure 1), though the female parts tend to be employed part-time or not at all to a greater degree than the male parts.

Figure 1: Employment patterns of couples without children

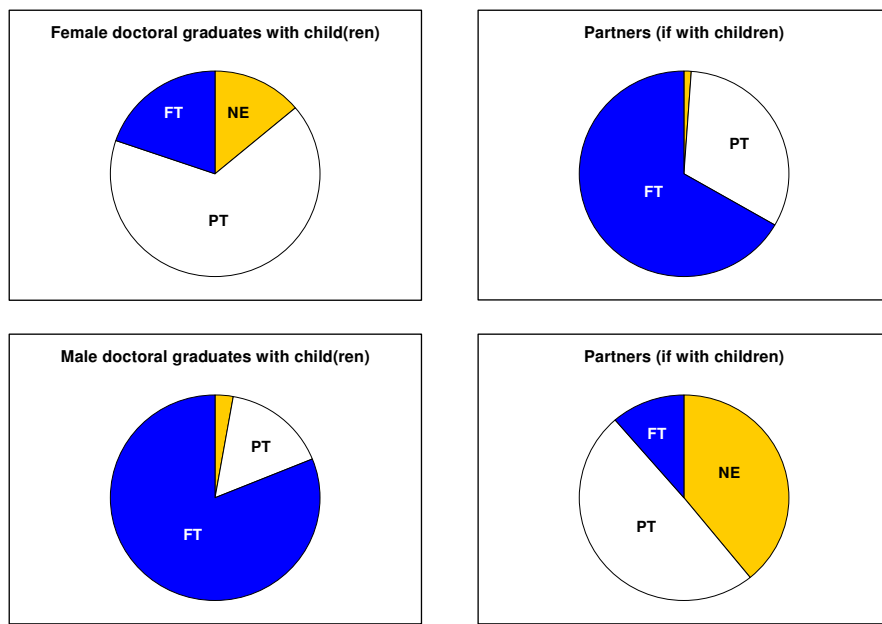


Source: Swiss Graduates Survey (Federal Statistical Office), own calculations.

PT = part-time (white), FT = full-time (blue), NE = not employed (orange).

With the arrival of children, the employment patterns of the couple households change (see Figure 2), producing a known gender-specific pattern even among the group of highly qualified doctoral graduates. Female doctoral graduates with children are for the most part employed, but often part-time only. In around 30% of the cases, their partners are also employed part-time, while the remaining 70% are employed full-time. In contrast to that, if male doctoral graduates have children, then their employment pattern does not change: They continue to be full-time employed. Their partners, however, often reduce their employment to part-time or give up employment altogether. These results are also consistent with those of many other studies (Ledin et al. 2007, 985; Majcher 2007, 313; O’Laughlin and Bischoff 2005, 88 and 94; Mason and Goulden 2004).

Figure 2: Employment patterns of couples with children



Source: The Swiss Graduates Survey (Federal Statistical Office), own calculations.

PT = part-time (white), FT = full-time (blue), NE = not employed (orange).

#### *Distribution of childcare duties among couples*

The distribution of childcare responsibilities (see 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 take over childcare duties and/or arrange the care of the child(ren) with the help of a third person or a childcare institution. Various studies provide evidence of this gender-specific pattern of labour distribution (Lind 2008; Lind and Löther 2008; 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

Who is/was predominantly responsible for the care of your preschool children during the week (Mon-Fri)?		Men	Women
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%
Total		100%	100%

Source: Swiss Graduates Survey (Federal Statistical Office), own calculations.

### *Effects of children on career trajectories*

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 academia and pursuing further qualifications (habilitation, postdoc).<sup>16</sup> 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.<sup>17</sup>

On the other hand, it is worth noting that measureable performance in the form of publication output is not curtailed by starting a family.<sup>18</sup> This result, too, is consistent with various other studies (e.g., Leemann 2005; Romanin and Over 1993; Cole and Zuckerman 1991). Because we only have a small number of mothers, we could not statistically calculate verifiable interaction effects between birth and gender. Therefore, we do not have evidence if this result holds for both female and male academics.

### *Daily research life and family duties*

As the in-depth interviews with emerging researchers 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.

<sup>16</sup> For more details, see Leemann, Keck and Boes (2009).

<sup>17</sup> For more details, see Leemann, Dubach and Boes (2010) and Leemann (2009).

<sup>18</sup> For more details, see Boes and Leemann (2009b).

“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 every-thing done?” (Technical Sciences, Woman)

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

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)

In a comparative study of different universities by Acker and Armenti (2004), accessing day care was not problematic for all women faculty. The authors conclude that the particular institutional context is important in shaping the possibilities for academic careers. Besides the supply of childcare facilities by the universities and communities, cultural norms and values on family life and gender responsibilities are part of this institutional setting. As the next excerpt shows, the ideas and expectations within the

faculty and workplace about one's availability and flexibility are often not compatible with childcare hours and family life. This female academic who has spent time abroad points out that she did not experience the same conflicts at her former university.

“Somehow the favourite time of day for a meeting is after 6:00 p.m., once the nursery 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 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)

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. Only 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).

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 assumption 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.

However, this does not mean that starting a family does not have problematic aspects for fathers, too, with regard to the shape of their career trajectory. But, in addition to a synchronous model (career and family at the same time), men also have the opportunity to implement a diachronic model, which means that they can start a family after reaching a certain point in their careers, particularly after having attained a permanent position (Mason and Goulden 2004). In addition, as our analyses suggest, 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" and to pursue an academic career.

For women, the reconciliation of family and (academic) work is more difficult. They are confronted with the problem of the clashing clocks of biology and tenure (Acker and Armenti 2004) since they cannot arbitrarily postpone childbirth and they do not have strong support for (the organisation of) childcare, especially during periods spent abroad. In the interviews with young researchers, there are several indications that women who do not want to give up having children put in question whether or not to remain in academia, or they already left it. One does hardly find this pattern among men. These findings are largely confirmed by other studies. 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). If women (want to) stay in academia, 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 or not, they may remain childless (see for example Zimmer et al. 2007; Majcher 2007, 313; Auferkorte-Michaelis, Metz-Göckel, Wergen, Klein 2006).

As mentioned before, the reasons for the gender-specific pattern in linking life courses (Krüger and Levy 2000, 2001) can in part be found in the academic field and its culture, symbolic practices, and career constructions itself (Krais 2008). The prevailing work norms (in particular the high number of hours of availability and the 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, age norms) (Dressel and Langreiter 2008; Jacobs and Winslow 2004; Merz and Schumacher 2004; Beaufaÿs 2003, 146ff.), and the view of "academia as a form of life" as a core aspect of the belief system (*illuso*) of an academic habitus (Krais 2008). Consequently, women academics work harder and sleep less with the result of fatigue, stress and exhaustion shaping their daily lives (Acker and Armenti 2004).

Furthermore, childbearing and childrearing are tabooed subjects in academia (Acker and Armenti 2004; Hochschild 1975; Wolf-Wendel and Ward 2003) and they are traditionally not associated with reason and logic (Pillay 2008). This 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 (Rusconi and Solga 2002).

An added institutional factor is that the childcare infrastructure in Switzerland is not tailored to academic careers. In view of the low salaries (except for the professor level), childcare is very costly (Spieler 2004, 64ff). Furthermore, 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, geographic mobility (Lind 2008; O'Laughlin and Bischoff 2005; Romanin and Rover 1993) and leads to problems of compatibility (Spieler 2004; Blake and La Valle 2000, 29).

## **9 Conclusions**

Why do young female researchers, who already gained a foothold in the university system, drop out of academia after their PhD more often than male academics? In this paper, we discuss two core problems that women academics encounter and that have to be explained with reference to the culture and practices of academia itself.

One hurdle is that women miss more often than men the support by a mentor, who fosters and promotes their academic career. In the PhD period, the relation of female to male emerging researchers with an academic mentor is about four to ten. In other words, we may presume that professors value young female researchers not equally promising as they value male researchers. Of course, nowadays no chair would say this frankly, neither in a formal nor in an informal setting. Times have changed since the 1950s, where in a survey prejudices and indignities on women's academic abilities were mentioned without reservation (Anger 1960, cited in Krais 2008). Nevertheless, professors are less willing to give recognition, appreciation and support to female academics. As we have shown, without these little pieces of what is called "mentoring" – knowledge transfer, gate keeping, investment of trust, information giving, functioning as a role model, providing resources, introduction in relevant academic circles, etc. – an emerging researcher hardly can manage to build up an academic career by his or her own.

The other problem women face more than men is the culture at universities and in academia in general that depends on a flexible, disembodied and disembedded individual whose research life is not contaminated by child-rearing, stress, and sleepless nights, or unpredictable absents due to sick children (e.g. Krais 2008; Daston 2003; Merz and



Schumacher 2004). As our data reveal, female academics do not have the same conditions in order to correspond to these values and norms as male researchers have.

If women decide to start a family, then they are confronted with all these demands and cultural beliefs established over the last century in the scientific community that hardly allows to reconcile family and academic work. In particular, in order to fully concentrate on their academic career they often have to forego having children, whereas male emerging researchers can much more rely on a female partner who allows them to dedicate their life to science without giving up the idea of a family. Mentors, who are representatives of this academic culture, know about these conflicts of female upcoming researchers (Krais 2002) and – as we can conjecture on the basis of our data – decide to support women less after PhD graduation than to support men.

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