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Childlessness intentions of young female researchers in Austria

Intendierte Kinderlosigkeit von jungen Wissenschaftlerinnen in Österreich

Abstract:
According to prior studies, female researchers in Austria exhibit a very high level of childlessness and, consequentially, a low mean number of children. Following up on these studies, we analyse childlessness intentions of young female researchers and compare them to those of other highly educated women in other occupations. We examine factors that are related to female researchers' intent to stay childless. The analysis is based on a survey of 196 female researchers between the ages of 25 and 45 (with the majority being between age 25 and 34). Results indicate that few young, childless researchers plan a life without children: Only 7% intend to stay childless and most of them want to have two children (66%). Their intentions are strikingly close to those of their highly educated peers in other occupations. We discuss three factors that play a role for childlessness intentions of female researchers: work-related conditions (employment uncertainty and work-family reconciliation), personal career orientation, and partnership context.

Key words: Austria, childlessness, female researchers, fertility, intentions

Zusammenfassung:
Bisherige Studien haben nachgewiesen, dass Wissenschaftlerinnen in Österreich sehr häufig kinderlos bleiben und dass daher ihre mittlere Kinderzahl sehr niedrig liegt. Ausgehend von diesen Studien untersuchen wir intendierte Kinderlosigkeit unter jungen Wissenschaftlerinnen im Vergleich zu ebenfalls höher gebildeten Frauen in anderen Berufen. Des Weiteren analysieren wir Faktoren, die mit gewünschter Kinderlosigkeit von Wissenschaftlerinnen in Zusammenhang stehen. Die Studie basiert auf einer Befragung von 196 Wissenschaftlerinnen im Alter von 25 bis 45 Jahren (die Mehrheit ist 25 bis 34 Jahre alt). Die Ergebnisse verweisen darauf, dass nur wenige junge, kinderlose Wissenschaftlerinnen ein Leben ohne Kinder planen: Nur 7% wollen kinderlos bleiben und die meisten wünschen sich zwei Kinder (66%). Ihre gewünschte Kinderzahl ähnelt in hohem Maß jener ihrer hoch gebildeten Vergleichsgruppe außerhalb der Wissenschaft. Wir diskutieren drei Faktoren, die wesentlich für gewünschte Kinderlosigkeit von Wissenschaftlerinnen sind: berufliche Bedingungen (prekäre Arbeitsverhältnisse, Vereinbarkeit von Familie und Beruf), persönliche Karriereorientierung und Partnerschaftssituation.

Schlagwörter: Fertilität, Kinderlosigkeit, Kinderwunsch, Österreich, Wissenschaftlerinnen

1. Introduction

Female researchers in Austria exhibit a very high level of childlessness and a low mean number of children. Previous studies estimate final childlessness (for cohorts that have completed childbearing) among female researchers and professors in Austria to be around 45% (Buchholz 2004; Fieder et al. 2005), which is about three times higher than among the total female population in similar birth cohorts (1955-60). But even compared to highly educated women in general, this is a very high figure: 30% of university graduates remain childless (Prskawetz et al. 2008). Within the scientific community, large fertility differentials prevail by educational field: Permanent childlessness was highest among women educated as social scientists, amounting to almost 40%. It was close to one third among women trained in humanities and one quarter among women trained in natural sciences (Neyer 2009)[1].

With the goal of understanding childlessness among female researchers more closely, we analysed their fertility intentions at a young age to uncover whether or not their exceptionally high levels of childlessness were intentional. Childless researchers fall into three categories: they either adhere to life plans that do not involve having children (possibly due to their career aspirations); they do wish to have children but change their plans over the course of their lives; or they are unable to realize their goal of having children.

Our analysis is based on a sample of 196 female researchers surveyed in 2009 with the support of the Austrian Academy of Sciences. The women were between the ages of 25 and 45, but most were between 25 and 34. Eighty percent of the sample was employed at universities in pre- and post-doctoral positions; the others were employed at public or private research institutes.

First, we drew a comparison between childlessness intentions of these female researchers and other highly educated women working outside of research (e.g. as teachers, doctors, pharmacists, lawyers, psychologists, social workers, journalists or accountants). This allowed us to compare women who have similarly advanced degrees but differ with respect to their occupations. Based on the observed gap in final childlessness levels between female researchers and other highly educated women in earlier cohorts (as stated in the introductory paragraph), we can also expect differences in childlessness intentions. Secondly, we identified which factors are related to childlessness intentions for female researchers and included such factors as work characteristics, personal career orientation, and partnership context.

While several studies have examined the fertility of female researchers (for Austria: Buchholz 2004; Fieder et al. 2005), few have explicitly considered the role of childbearing intentions (Kemkes-Grottenthaler 2003; Mason/Goulden 2004; Lind 2008a, 2008b, 2010) and our study addresses this research gap. Analysing intention is of great relevance as it is a close determinant of future childbearing, even though the intended number of children is on average higher than the actual one in western societies (Philipov 2009). Several studies have explained this gap by identifying the obstacles that prevent couples and individuals from fulfilling their intentions (e.g. Adsera 2006; Spéder/Kapitány 2015).

1 This study analysed childlessness levels in 60 fields of education and concluded that women trained as social scientists had the highest childlessness level of all of them (Neyer 2009).

Based on our results for childlessness intentions, we also briefly discuss the gap between intentions and behaviour for female researchers and women in other occupational fields, respectively. By focusing on childlessness intentions among a group of work-centered women, this study builds on previous research, which revealed that childlessness is more prevalent – and family size is smaller – among work-centered women than it is among home-centered or adaptive women (Hakim 2003; Vitali et al. 2009). As a sociological ideal-type, work is the main priority for work-centered women. They are highly committed to their careers and fit family life around their work. Many female researchers fit this mold in that they hold higher degrees, are working long hours, and are attached to their work. Less is known, however, about fertility *intentions* of work-centered women: do they intend to stay childless in their early childbearing years because of their career aspirations? This paper takes another step forward by capturing young researchers' intentions before they start (or do not start) a family or leave a career in academia. By focusing on childlessness intentions early in the childbearing years, we are thus able to add another dimension to the debate.

Understanding childlessness intentions and behaviour for the group of female researchers is particularly relevant because they are exposed to various "risk" factors for childlessness. First, researchers spend many years completing PhDs. This is followed by an uncertain period of temporary employment, during which they establish their careers. Childbearing is frequently postponed during these phases, which results in a shortened interval for childbearing at later, less fertile ages. Second, the scientific profession is known to be difficult to combine with family life. It is competitive and characterized by long working hours and mobility demands (traveling for research and/or moving for a new position). Researchers are expected to continuously invest in their human capital and to network at the national and international level (Kreetz 2004; Buchmayr/Neissl 2006). Kemkes-Grottenthaler describes a scientific career as a path of "endless qualification, publication pressure and time-consuming research" (2003: 214). In addition, most female researchers live in dual-earner couples with an equally well-educated spouse (sometimes another researcher) (Rusconi 2013), and face difficulties combining two careers with raising children. On the other hand, conducting (non-experimental) research is flexible in terms of time and place, which may facilitate a work-family life balance. Some of these factors are considered in our analyses.

The structure of the paper is as follows: First, we provide insights into the career trajectory at Austrian universities, with particular focus on women's positions. We then give an overview of prior empirical studies on childlessness (intentions) of female researchers and discuss reasons for their high level of childlessness. We then present the data, measures, and models, before turning to the descriptive and multivariate findings. The conclusion summarizes the main results.

2. Career trajectory at Austrian universities

Compared to other European countries, women are underrepresented in research in Austria. In 2012, the percentage of female PhDs was relatively low (42%), ranking 27th among EU-28 countries. Austria also reported one of the lowest proportions of women re-

searchers (29%). Only five countries ranked even lower: the Czech Republic, Germany, France, the Netherlands, and Luxembourg. However, the gap is diminishing quickly: the growth rate for female researchers in Austria was almost double the European average and one of the highest across Europe between 2005 and 2011 (European Commission 2016). With regard to the proportion of women among full professors, on the other hand, Austria was very close to the EU-28 average (20%). A horizontal divide is characteristic in that higher proportions of women work in the social sciences, humanities, and medical sciences while men prevail in the natural sciences, as well as in engineering and technology (European Commission 2016).

Since a significant percentage of researchers in Austria and the majority of our sample are employed at universities, this section will focus on an academic's career trajectory at universities. Over the last fifteen years, universities have been confronted with a number of major changes (Pechar/Wroblewski 2012). Under a law passed in 2002, universities are no longer state agencies but autonomous. Rectors are becoming university managers and hold significantly more responsibility. In addition, the Bologna Process was implemented, general tuition fees were introduced (and later redesigned to apply only to a minority of students), and the private university sector was established.

The career trajectory at Austrian universities – which was substantially altered in 2009 – is particularly relevant as a background for this study. The Austrian university system has been described as a synthesis of the German-speaking "habilitation" model (untenured assistant positions, reluctance to appoint insiders), the American tenure-track system (tenure track positions), and the Western European tenure system (senior lecturer, senior scientist) (Kreckel 2013).

Early-career positions at universities are temporary without an option for tenure: PhD positions are usually contracted for four years and post-doctoral positions for six years. In addition, pre- and postdoctoral researchers are employed on project funds. (The majority of the researchers in our sample hold one of these three positions.) Transitions between these positions are restricted by the maximum cumulative duration of fixed-term contracts of six years (in effect since 2004). In this system, researchers often remain in uncertain, temporary contracts until their late thirties. In 2009, several permanent positions were created, which typically begin at the senior post-doctoral level. Tenure-track positions begin as assistant professorships. If the scholar receives positive evaluations, the position can transform into an associate professorship, but not into a full professorship, as is the case in other countries. Senior lecturer (a teaching-oriented position) and senior scientist were also established in 2009.

Table 1 shows the relative distribution of employees by position and the percentage of women in 2009 (the survey year) and 2015 (the latest year available). It tries to assign positions in both the old (pre-2009) and new systems, by showing them below each other (e.g. associate professor and university docent). The female share was still rather high (42-44% in 2009) in the pre-doctoral or post-doctoral stage among academic associates with independent teaching or project workers, while it dropped to less than half this value among professors and university docents (18-21%). However, the trend is moving toward increasing equality in higher positions. This is clear when looking at the numbers for 2015. Changes are taking place even at the highest levels of academia. In 2007, the first female rector was elected at an Austrian university, and as of winter term 2015, eight of

the 22 public universities were headed by female rectors and 40 of the 78 vice rectors were women (Fritsch 2015; uni:data 2015).

To conclude, in the Austrian university system, researchers often face employment uncertainty until they reach higher reproductive ages and women are clearly underrepresented at tenured and higher positions. Although permanent positions were created in 2009, those are still generally held by a small number of the university staff. Uncertain career prospects and the stability needed to start and raise a family are therefore in conflict.

Table 1: Scientific staff at Austrian public universities by position 2009 and 2015 (winter term)

	% of staff		% women		Tenure
	2009	2015	2009	2015	
Professor	8.5	9.1	17.7	21.7	Yes
Untenured professor (up to 6 years)	0.6	1.4	33.1	28.8	No
University docent	13.0	9.3	20.7	23.6	Yes
Associate professor		2.6		29.2	Yes
Assistant professor		2.7		38.4	No[1]
Senior scientist		3.0		40.6	Yes/no[2]
Senior lecturer		4.0		52.4	Yes/no[2]
Academic associate with independent teaching	25.3	5.1	42.3	42.5	Yes/no[3]
University assistant (pre- and post-doc)		20.6		45.8	No
Academic associate without independent teaching	13.9	2.9	47.1	53.6	Yes
Researcher (project based)	38.7	39.3	44.3	38.9	No
	100.0 (n=24,084)	100.0 (n=23,551)	38.8[4]	38.1[4]	

Notes:
1 Option for tenure as an associate professor if evaluation is successful.
2 Usually untenured in the first years, then option for tenure.
3 Includes both untenured (in the new system: university assistant pre- and post-doc) and tenured positions.
4 Weighted average.

Source: uni:data (2015)

3. Childlessness of female researchers

Austria is characterised by high levels of childlessness and large educational differences in childbearing behaviour (Spielauer 2005; Sobotka 2011). Childlessness was 14% among women who completed basic education or at most lower secondary education, but 30% among university graduates (cohorts born from 1955-60) (Prskawetz et al. 2008). The high degree of childlessness of female researchers needs to be understood against the backdrop of this steep education gradient. This gradient is, however, not apparent in fertil-

ity intentions. Sobotka (2009) demonstrates that the percentage of Austrian women between the ages of 26-30 planning not to have children varies little between educational groups (6.7-8.6%) (data obtained upon request). However, highly educated women are more likely than their lower educated peers to revise their childbearing intentions downwards (Heiland et al. 2005) or to fall short of them. Researchers have theorized about why this high level of childlessness for highly educated women exists (for an overview, see Merz/Liefbroer 2011). These women's opportunity costs – in terms of foregone wages and career prospects – are higher if they interrupt their careers after childbirth (Becker 1993). Highly educated women often prefer a more autonomous lifestyle. Their lives are more likely to be focused around their careers than those of their lower educated counterparts (Hakim 2003). In addition, they invest more time in their children, therefore children are more "costly" for them (for Austria, see Berghammer 2013). And because childbearing has been postponed (leaving women to attempt conceiving at later reproductive ages), these women are more likely to run into problems of decreasing fecundity.

The cultural and economic reality of any given country matters when discussing the relative importance of these arguments. Austrian family policies are only partly supportive of work-family balance. The leave period is flexible (with shorter, highly-paid and longer, low-paid options) but remains very unequally divided between mothers and fathers. In 2014, only 4% of recipients of childcare allowance were men (Statistics Austria 2015b). There is a severe shortage of childcare spots – particularly in full-time and for children below age three – and mothers of all educational levels are inclined to return to their workplace on a part-time basis (Berghammer 2014). Correspondingly, large parts of the population hold negative attitudes about mothers' full-time employment when their children are young (Wernhart/Neuwirth 2007; Steiber/Haas 2010). This implies that gender roles are fairly traditional and that mothers, especially when they are highly educated, face high opportunity costs (foregone wages and career prospects) in the Austrian system.

Childlessness levels of female researchers exceed those of tertiary educated women by a large margin. An Austrian study found that 43% of all female professors between the ages of 41-50 remained childless (Buchholz 2004). Another study based on the employee database of the University of Vienna indicated that 43% of all women (and 25% of men) aged 40-54 in the highest status category (including full professors and associate professors) at the University of Vienna will never have children (Fieder et al. 2005). Young female researchers therefore work in an environment where their female superiors have often remained childless. They have few models of how to combine scientific work and childrearing. In Germany, final childlessness among female researchers and professors is even higher than in Austria, ranging from 50 to 60% (Krimmer et al. 2004; Auferkorte-Michaelis et al. 2006; Metz-Göckel et al. 2014). In contrast, 30 to 40% of male researchers and professors will never have children (Metz-Göckel et al. 2014: 103). Both Germany and Austria share key institutional characteristics, including the family policy set-up and the existence of a "habilitation system" where contracts below a professorship tend to be fixed-term and renders long-term employment uncertain. The elevated childlessness levels in Germany and Austria, however, seem to be exceptional. Childlessness among female professors in Poland is close to 25%; it is close to 20% in Sweden and around 10% in France and Spain (Lind 2008b).

Little research explicitly deals with fertility intentions of female researchers. Studies by Kemkes-Grottenthaler (2003) and Lind (2008a, 2010) constitute notable exceptions, although they are restricted to specific German universities or departments. They find that childlessness intentions are far below the actually observed levels of fertility and that ideal numbers of children are rather high – around two. That said, women rated the chance of realizing these numbers as low.

4. Reasons for high childlessness among female researchers

We discuss four key factors that may play a role in the high level of childlessness observed among female researchers: employment uncertainty, work-family balance, work orientation and partnerships. These are tested later in the models. The following description obviously presents an idealized picture of scientific work that is not representative of all scientific positions, types of institutions, workplaces or fields (Comer/Stites-Doe 2006).

Researchers tend to face a comparatively long period of *employment uncertainty* starting with their PhD studies (Brechelmacher et al. 2015). In Austria in 2012-2013, the median age at PhD completion was 31 years for women and 32 years for men (Statistics Austria 2015a: 65). Compared to other countries, career prospects at Austrian universities are rather poor since a high share of young researchers hold fixed-term contracts without longer-term prospects (Janger et al. 2013; Baierl 2016). This means insecurity with respect to one's economic future, the possibility for a career in research and the need to move for a job (Kreetz 2004).

The difficult *reconciliation between family life and scientific work* poses obstacles to fulfilling fertility desires (Buchmayr/Neissl 2006). Long working hours are frequent in research and work spills into free time and blurs the boundaries between the two (Buchinger 2006). This is due to the nature of academic work: "There are always articles to read, papers to grade, syllabi to update, and proposals to write. Work never ends in terms of quantity" (Ward/Wolf-Wendel 2004: 245). Notwithstanding, the work schedule is generally flexible, as is the workplace in many (non-experimental) disciplines, which facilitates combining work and family duties (Buchinger 2006). Geographic mobility, e.g. for research stays or extended education, is increasingly expected from researchers, but difficult to realize with a family (Fritsch 2014). Generally speaking, a scientific career follows a continuous model. Up-to-date knowledge is essential. Ideally, the publication record should have no gaps and tenure-track is designed to be continuous (Ward/Wolf-Wendel 2004; Buchinger 2006). This expected continuity is at odds with breaks or reductions of working hours after childbirth. Career interruptions are most detrimental in disciplines where knowledge renews the fastest (McDowell 1982). Demands tend to be highest for researchers in early stages of their career when working towards tenure, which is exactly the period when women's biological clocks are ticking away.

A strong *intrinsic work orientation* is typical in research. The scientific profession allows a high degree of autonomy, is challenging, demanding and provides opportunities for learning. The majority of researchers therefore perceive their tasks as interesting and enjoyable (Lind 2013). These characteristics may explain why researchers have a strong

work ethic. A strong identification with the job may, however, lead women to adapt their childbearing plans to their career aspirations (Ward/Wolf-Wendel 2004) and to show a high willingness to postpone motherhood (Kemkes-Grottenthaler 2003). This means that they often have fewer children than intended or stay childless.

Being in a *partnership* has different implications for male and female researchers. Female researchers are frequently partnered with equally educated men who pursue their own careers and who are rather reluctant to take breaks or reduce their work hours when a child arrives. This is different from male researchers whose wives often work part-time and act as the primary caregiver (Rusconi 2013). This type of arrangement enables mostly men to live out the "myth of a scientist" (Buchinger et al. 2004; Wyer et al. 2010). According to this "myth", a researcher can fully devote his life to science and can move from country to country without social or relational constraints. This might explain the fact that male researchers have lower childlessness rates than their female counterparts.

The expected or experienced inability to combine a family with a scientific career not only results in low fertility among women who stay in research, but also leads women to leave the profession (Fritsch 2014). Female researchers with children face a number of negative consequences for their scientific careers: limited time for research, restricted opportunities for conference participation, and constraints of getting a job elsewhere (e.g. Allmendinger et al. 1999; Buchholz 2004; Lind 2010). The difficulty of reconciling work and family was in fact regarded as the number one explanation for the underrepresentation of women among professors in a survey of professors in the natural sciences in Germany (Hachmeister 2012).

5. Data, measures and method

Survey of female researchers

The analysis is based on a sample of 196 female researchers between the ages of 25-45, who were interviewed in 2009 using Computer Assisted Personal Interviews (CAPI) that were carried out by Statistics Austria. As there is no representative nationwide data on researchers available that would allow us to study fertility intentions, we rely on a self-collected sample. With the financial and institutional support of the Austrian Academy of Sciences (AAS), we surveyed women who had applied for grants at this institution. In total, 247 women participated, which meant a response rate of 22%[2] (Buber 2010). In this study, we restricted our sample to the 196 women who worked in science and research at the time of the survey.[3]

2 First, letters were sent out, followed by emails if the letters garnered no response. Invalid postal as well as email addresses reduced the number of women who were contacted. It is also likely that our request for participation did not reach every woman (due to invalid addresses). Since it is not known how many women could definitely be reached, our response rate can be regarded as minimum.

3 Many international studies on researchers are based on similarly small samples and are mostly non-representative (Romanin/Over 1993; Kemkes-Grottenthaler 2003; van Anders 2004; O'Laughlin/Bischoff 2005). Some reported response rates of around 20% (van Anders 2004; Lind 2010).

It is a limitation of this study that the sampling design was non-random and thus the sample cannot be taken to be representative of (young) researchers in Austria. We acknowledge that the sample might be selective in a number of ways. First, the range of grants offered by the AAS shapes our sample. Grants are geared towards PhD students and post-doctoral researchers. Most grants are open to applicants from all disciplines and to both sexes (one grant is restricted to historians and another to women in natural and technical sciences; joint applications are possible in one grant dedicated to doctoral students). Altogether, the female researchers applied to five categories of grants. Secondly, successful applicants and women who applied between 2005 and 2007 are overrepresented (Buber 2010), because their willingness to participate in the survey was higher and their contact details (as procured from the administers of the grants) were more up-to-date. This is reflected in the young age structure. Thirdly, we expect that a selection is due to more family-oriented researchers who are more open to participate in a study on family-related topics (this is a general concern of thematic surveys). Although we cannot generalize our results to young researchers in Austria, we are able to indicate general patterns of fertility intentions and suggest several important factors that may drive the high childlessness of female researchers.

Besides the selectivity of the sample, the data is limited due to its cross-sectional nature, i.e. we do not follow cohorts over time. When comparing different cohorts, we must consider that a process of leaving the profession had been taken place over the life-course, rendering older cohorts more selective than the young.

The female researchers were interviewed in the context of the Austrian "Generations and Gender Survey (GGS)" – a representative survey of the Austrian population in the 18-to-45-year-old age group, fielded in 2008/09 – using the same questionnaire and applying the same field work procedures. The sample of female researchers was thus a specific additional sample of the Austrian GGS. Focusing on childbearing and partnership, the GGS contains information on intended and realized fertility, ideal family size, attitudes towards childbearing, childcare arrangements, partnership history, and gender relations. In addition to the core GGS questionnaire, we included questions specific to scientific work that we posed exclusively to the female researchers. Throughout this paper, we compare the female researchers with a representative sample of 354 highly educated women (i.e. holding a university degree) in the same age range delineated in the core GGS who work in other occupations. Analyses for highly educated women are weighted.

Table 2 provides a description of our sample. It includes many young researchers who are at the beginning of their scientific careers. Two thirds of the researchers are below age 35. The vast majority (80%) are employed at universities in various capacities: mostly, they are pursuing a PhD, employed in a post-doctoral position or working on a project. Remarkably, 74% of researchers hold temporary contracts (and among women below age 35, this number climbs as high as 86%). The female researchers represent different scientific fields, including humanities and arts, social sciences, law and natural sciences.

Table 2: Sample characteristics of female researchers sample (in percent)

	All ages (25-45 years)	Young ages (25-34 years)
Age group		
25-29	31.6	48.8
30-34	33.2	51.2
35-39	18.9	–
40-45	16.3	–
Highest education		
MA	42.4	59.1
PhD	57.7	40.9
Institution		
University	80.1	80.3
Extra-university	19.9	19.7
Discipline		
Humanities and arts	36.1	28.0
Social sciences	12.4	13.6
Law	4.6	3.2
Natural and technical sciences	39.2	48.8
Others	7.7	6.4
Position at university[1]		
Professor, associate professor, docent	13.5	1.0
Assistant (post-doc)	13.5	7.9
Assistant (pre-doc)	9.0	12.9
Researcher (post-doc)	25.0	26.7
Researcher (pre-doc)	26.9	39.6
Lecturer	5.8	5.0
Other	6.4	6.9
Contract type[2]		
Temporary (up to 2 years)	31.7	36.9
Temporary (3 years or more)	42.2	49.5
Permanent	26.1	13.6
Total	*196*	*127*

Notes:
Missing values are negligible and not shown.
1 Includes only women working at universities (n=156 and n=101).
2 Includes only employed women (n=161 and n=103).

Measures and method

We study lifetime childlessness intentions and the certainty of those intentions based on the following questions. The number of (additionally) intended children was measured with: *"How many (more) children in total do you intend to have?"* This question was posed to respondents who answered that they (probably or certainly) wanted a child during the next three years or, if they did not, they (probably not, probably yes or certainly yes) wanted a child later in their lives. Respondents who certainly did not want a child

were coded as intending to stay childless. We based our analyses on the certainty of childlessness intentions on the following question: *"To what degree does the following statement apply to you personally: I want to stay childless. Definitely not, probably not, probably yes, definitely yes."* At one point in the analysis, we contrasted the intended number with the ideal number of children, as measured by: *"For you personally, what is the ideal number of children you would like to have or would have liked to have?"* The ideal number of children reflects personal ideals without figuring in constraints. When reporting fertility intentions, respondents do generally take their circumstances into account, rendering the responses more concrete and realistic (van Peer 2002).

In the descriptive part of the study we compared childlessness intentions and the certainty of those intentions among female researchers and highly educated women working outside research. Young, childless researchers below age 35 are at the centre of our interest and we provide separate results for this group.

In order to explore the characteristics of researchers that intend to remain childless, we estimated a logistic regression model. We split the categories for certainty of childlessness intentions into (a) "definitely not" and "probably not" versus (b) "definitely yes" and "probably yes". We included the following six independent variables: age (in years), partnership status (married or cohabiting; living apart or no partner), discipline (natural and technical sciences; social sciences and humanities; other), and three questions that captured employment uncertainty, work-family balance, and personal career orientation. Employment uncertainty was measured with the question: *"How secure or insecure was your job during the past three years? 1=very secure, ..., 5=very insecure."* Work-family balance was measured by asking: *"For you personally, how easy or difficult do you anticipate balancing your professional aims with family life will be? 1=very easy, ..., 5=very difficult."* Finally, the question representing personal career orientation was: *"How important is/was your career in your decision to have a child? 1=not important at all, ..., 4=very important."* All three were used as continuous variables.

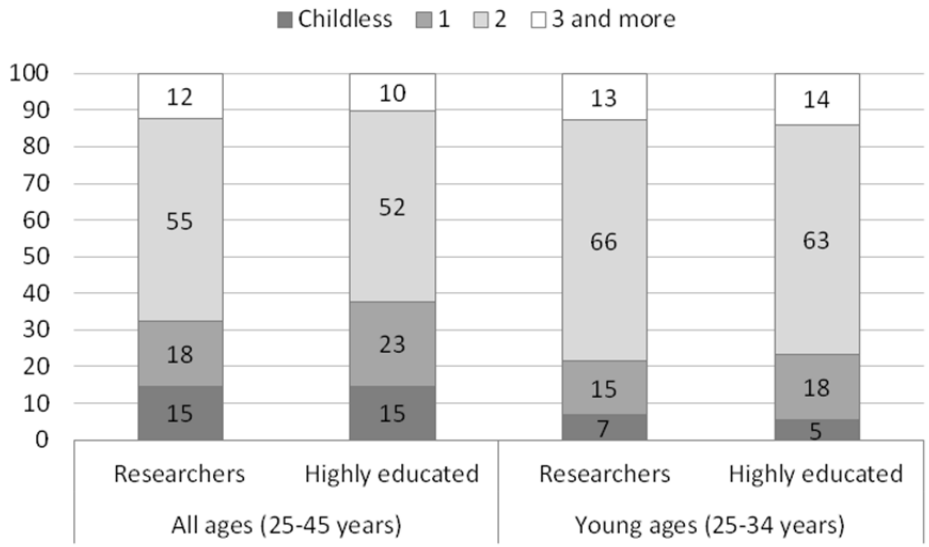
6. Empirical results: Fertility intentions of female researchers

In many ways, the work characteristics of this sample closely tie in with previous studies (see Table A.1). The female researchers interviewed display a strong work orientation: close to 50% of them work more than 40 hours a week; this number is closer to 30% among their highly educated peers who are not involved in research. Both groups are in financially secure positions; they indicate few problems making ends meet. Female researchers report higher workplace flexibility, around one quarter (partly) work from home. They are much more frequently employed on fixed-term contracts: 74% of researchers versus 18% of other highly educated women. The international orientation is characteristic of scientific work. The researchers interviewed frequently stay abroad and regularly attend conferences. They are just as likely as their highly educated peers to have a partner (around 80%), but they more often live in less committed partnerships, i.e. cohabitation or living apart together (LAT). When in LAT relationships, female researchers tend to live further away from their partners (not shown): 39% of them are less than an hour's commute from their partner (versus 66% among their comparison group), and 43%

are in long-distance relationships, where they have to travel two and more hours – often abroad – to see their partner. Around one third of partnered researchers have a partner who also works in research. Large differences are discernible with respect to motherhood status: 29% of the researchers have children, as opposed to 45% of highly educated women (and 16% versus 26% among women below age 35).

We then compared childlessness intentions of childless female researchers and highly-educated women in other occupations. As depicted in Figure 1, family size intentions are almost identical, which is remarkable given the conspicuously higher childlessness among female researchers. Between the ages of 25-34, a low percentage (7%) intend to stay childless (ages 25-45: 15%), and the majority of childless researchers in this sample want to have two children. This result reveals an astonishing gap to the observed childlessness of around 45% among female researchers past their reproductive period as was both reported in the literature for earlier cohorts (Buchholz 2004; Fieder et al. 2005) and found for women aged 40-45 in our sample (not shown).

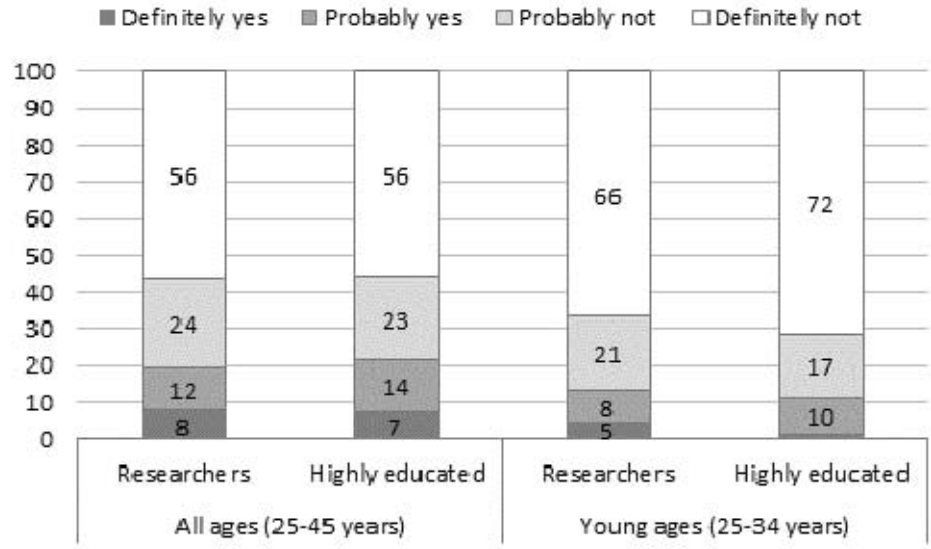
Figure 1: Intended number of children among childless female researchers and other highly educated women (in percent)



With regard to the certainty of childlessness intentions, the plans of the two groups are strikingly similar as well (Figure 2). Only 13% of childless researchers below age 35 state that they probably or definitely want to stay childless, compared to 11% among their highly educated peers. This similarity also holds when considering all ages. Childbearing intentions frequently involve some degree of uncertainty, which explains the difference between 7% when a definite number is demanded (as in Figure 1) and 13% when uncertainty is introduced (Figure 2). In particular, some respondents who had stated that they intended to have one child also responded that they "probably" intended to stay childless.

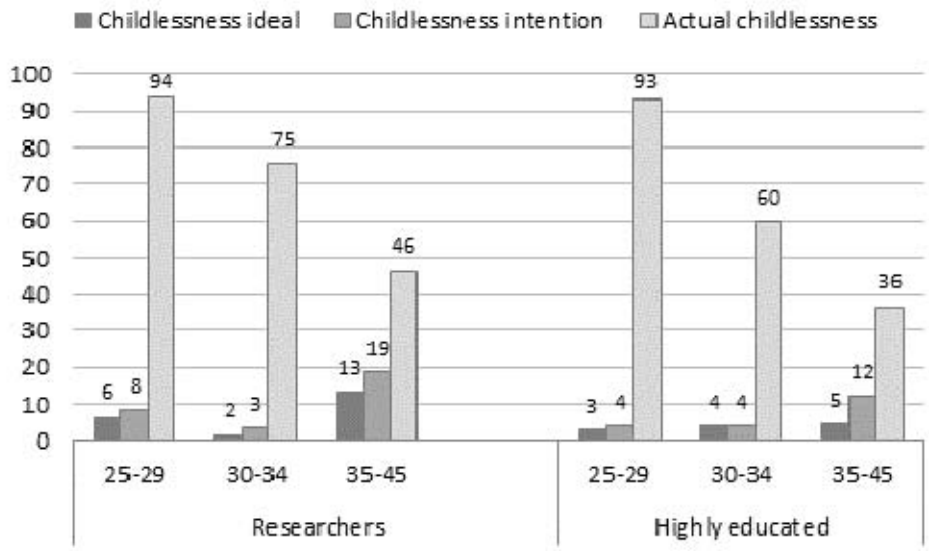
The results in Austria are very close to findings from Germany, which reported 13% childlessness intentions among (male and female) researchers (Lind 2010) and 14% among female academics at the German University of Mainz (Kemkes-Grottenthaler 2003).

Figure 2: Certainty of intention to stay childless among childless female researchers and other highly educated women (in percent)



Differences in childlessness as personal ideal, ultimately intended childlessness and actual childlessness are portrayed in Figure 3. The share of ultimately intended childlessness is computed on the basis of both childless women and mothers (differently from Figures 1 and 2, which were restricted to childless women). We found that in the two younger age groups, childlessness ideals and intentions in this sample were rather low – between 2% and 8% – and similar between researchers and other highly educated women. Childlessness ideals (as the more abstract measure, where constraints are not figured in) remained consistently below intentions and the gap between both measures increased as childlessness intentions started to go up in the oldest age group. This rise is steeper among researchers than among other highly educated women and could reflect several factors: the process of developing different preferences over time; revising intentions downward when the women realize they cannot fulfil their desires (Quesnel-Vallée/Morgan 2003; Liefbroer 2009; Sobotka 2009); or that young researchers with a strong family orientation opt out of science, while those with higher childlessness intentions remain. Most obvious is, however, the growing gap in actual childlessness between female researchers and their counterparts. Researchers frequently postpone childbearing to their late thirties and, in the oldest age group, 46% are childless compared to 36% among highly educated women in other occupations.

Figure 3: Personal childlessness ideal, ultimately intended childlessness and actual childlessness among female researchers and other highly educated women (in percent)



Finally, we display the results of the multivariate model (Table 3). The descriptive findings had already revealed the importance of age in intended childlessness. Women of a higher age in this sample intend to stay childless significantly more frequently. The other findings are not significant – despite (partly) large effect sizes – which may result from the small sample size. The results should thus be interpreted with caution. While they can give first insights into the reasons for voluntary childlessness, firm conclusions cannot be drawn. Voluntary childlessness appears to be associated with not currently having a partner or living apart. In addition, several aspects of the employment situation seem to matter. Researchers who perceive high employment insecurity (frequently caused by temporary contracts) more often intend to stay childless as do those who expect that the work-family balance will be difficult. Personal work orientation also seems to play a role. Researchers for whom their own professional career is more important for the childbearing decision more often want to remain childless.

Table 3: Determinants of intention to stay childless among childless female researchers, logit model

	Odds ratios	Std. error
Age (in years)	1.24***	0.07
Partnership		
Married or cohabiting	1	
No partner or LAT	2.11	1.11
Discipline		
Natural or technical sciences	1	
Social sciences or humanities	0.58	0.36
Employment uncertainty	1.30	0.24
Reconciliation difficult	1.44	0.40
Career important in childbearing decision	1.34	0.48
n	*130*	
R^2	*0.186*	

Notes:
Significance levels: *** p<0.001; ** p<0.01; * p<0.05
"Other discipline" was controlled, but results are not shown.

7. Discussion

We studied childlessness intentions of young female researchers in Austria based on a sample of researchers who had applied for a grant at the Austrian Academy of Sciences. The majority of the women in our sample are childless researchers under the age of 35 who are pursuing their doctoral or post-doctoral studies. Due to the limits of the sample (small size and non-representative), we regard our study as exploratory and refrain from generalizing the results. Our results do, however, reflect several previous studies on actual and intended childlessness (Kemkes-Grottenthaler 2003; Buchholz 2004; Fieder et al. 2005; Lind 2010).

The results suggest that only a small number of young female researchers without children intend to stay childless: 7% of researchers aged 25-34 do not want to have any children (when uncertainty is considered, 13% definitely or probably want to stay childless). Two thirds of the sample intends to have two children. The Austrian results are in line with findings from Germany that documented similarly low childlessness intentions among scholars (Kemkes-Grottenthaler 2003; Lind 2010). Our results imply that researchers are both work-centered *and* have a clear preference for children. Voluntary childlessness and career aspirations seem to therefore not be as closely related as some of the literature has suggested (Hakim 2003).

We furthermore compared female researchers with highly educated women in other occupations, based on the large gap in observed childlessness between them in cohorts that had already completed childbearing (as shown in the introduction). In contrast to other highly skilled professions, the scientific field is characterised on average by long working hours, geographical mobility and a long phase of employment uncertainty. In view of the large actual childlessness gap, we unexpectedly found that intended childlessness is

very similar in both groups of women. We also observed that female researchers – more than other highly educated women – strongly shift childbearing to later reproductive ages. They often enter motherhood in their mid- to late-thirties and childbearing intentions remain high until the end of their reproductive periods. In addition, we recognized several factors that are related to female researchers' voluntary childlessness, pertaining to work-related conditions, personal career orientation, and partnership context. The results are not significant, but still suggest that female researchers who experience a high level of work precariousness and who expect a family to be difficult to combine with their professional aims are more likely to not want any children. Researchers with a strong career orientation are also more likely to state that they intend to remain childless. The lack of a partner in the household seems to be related to voluntary childlessness as well. A high proportion of the researchers in our sample were partnered (one third with another researcher), however, these were often less committed partnership forms or long-distance relationships.

The low prevalence of intended childlessness in younger cohorts is in stark contrast to the pronounced childlessness level of around 45% among female researchers and professors in previous cohorts (Buchholz 2004; Fieder et al. 2005). Since we focus on younger cohorts, we are unable to determine whether this high level of childlessness in older cohorts includes a high share of involuntary childlessness, whether they had higher childlessness intentions or whether they are a select group that has stayed in research.

This study has underlined that when supporting women in their scientific careers and, in particular, reaching high status positions, the issue of realizing one's family desires is of primary importance. Having children is a key component of a person's life plan; one that is not easily abandoned. If young female researchers rate their chances of realizing their intentions while still performing well in their job as low, they will continue to drop out of research. Others will give up on their childbearing plans. The main contribution of this study is to show that the young researchers interviewed indeed want children and that the high childlessness rates observed may be largely unintended. This finding is significant for understanding the underrepresentation of women in research. In Austria, a large number of measures have been undertaken to raise the proportion of women in research (particularly at universities). Those interventions have been successful: the number of female professors is on the rise and leadership positions are increasingly occupied by women. It remains to be seen, however, whether these women are able to combine their professional ambitions with the family they intend to have – or whether childlessness among female researchers will continue to be a phenomenon seen in future generations.

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Appendix:

Table A.1: Employment and family characteristics of female researchers and other highly educated women

	Female researchers		Highly educated women	
	All ages (25-45 years)	Young ages (25-34 years)	All ages (25-45 years)	Young ages (25-34 years)
EMPLOYMENT				
Employment status				
Employed or student	93.4	93.7	84.6	84.8
Unemployed	2.6	2.4	3.1	3.6
Inactive (maternity leave, parental leave etc.)	4.1	3.9	12.3	11.7
Usual working hours (incl. usual over-time)[1]				
Part time (1-29 hours)	14.7	13.2	24.4	20.4
Full time (30-40 hours)	38.4	36.0	46.5	46.3
Extended full time (>40 hours)	46.9	50.9	29.1	33.3
Make ends meet				
With difficulties (0-3)	17.4	16.7	19.5	16.8
(Very) well (4-6)	82.6	83.3	80.5	83.3
Contract type[1]				
Temporary	74.4	86.7	17.7	22.9
Permanent	25.6	13.3	82.3	77.1
Working from home[1]				
Does not work from home	72.5	73.9	85.2	89.8
Works (partly) from home	27.5	26.1	14.8	10.2
Stays abroad of at least three months				
0 times	43.6	49.6	–	–
1 time	20.7	22.6	–	–
2 and more times	35.8	27.8		
Conference participation during last three years (lasting several days)				
0-9 times	48.9	56.1	–	–
10 and more times	51.1	43.9	–	–
FAMILY				
Partnership status				
Married	25.4	18.6	43.2	25.8
Cohabiting	33.7	41.9	20.9	31.7
Living apart together	22.8	21.8	15.9	19.6
No partner	18.1	17.7	20.1	22.9
Partner works in research[2]				
University	26.1	25.3	–	–
Extra-university	7.8	7.1	–	–
Not in research	66.0	67.7	–	–
Number of children				
0	70.9	84.3	55.3	73.7
1	17.9	11.0	18.7	15.5
2	9.2	3.2	20.6	8.8
3 and more	2.0	1.6	5.4	1.9
Total	*196*	*127*	*354*	*185*

Notes: Missing values are negligible and not shown.

1 Includes only employed women (n=178 and n=115 [female researchers]; n=274 and n=136 [highly educated women]).
2 Includes only partnered women (n=153 and n=99).