Should I stay or should I go? Contrasting self- and external perceptions of the academic careers of female and male early-career researchers in a German mathematical cluster of excellence

Anna Ransiek* & Anina Mischau

Freie Universität Berlin, Department of Mathematics and Computer Sciences, Workgroup Gender Studies in Mathematics

Corresponding Author* Contact: anna.ransiek@gmx.net
ORCID: Ransiek & Mischau

ABSTRACT
Gender equality in mathematics in the German academic system has not been fully achieved. While the proportion of women and men is relatively balanced among first-year students, the number of female mathematicians decreases from one qualification/career level to the next (Destatis, 2024; GWK, 2024). This article aims to provide explanations for this so-called "leaky pipeline" in a specific environment: a mathematical cluster of excellence. First, it will provide insight on the perspectives of early-career researchers who work in research projects and/or the mathematical departments or research institutes associated with the cluster, examining their mathematics career paths and goals. Second, it will focus on the gendered external perceptions of researchers in leadership positions in research projects in the cluster who are responsible for their career development.

The Open University

The results are based on 20 semi-structured interviews with male and female PhD students and postdocs and 45 semi-structured interviews with those in leadership positions, whom we conceptualize as gatekeepers. By highlighting the tension between early-career researchers' self-perceptions of their careers and the external attributions made by researchers in leadership positions regarding reasons for drop-out and retention it will be shown how external attributions, rather than individual preferences, sustain gender inequality in career trajectories.

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INTRODUCTION

In Germany, the proportion of women and men is relatively balanced among first-year students in mathematics, but female mathematicians remain significantly underrepresented in professorships (Destasis, 2024; GWK, 2024). Our study will show how external patterns of interpretation– rather than individual preferences– sustain these gendered inequalities in academic career trajectories. Several reasons have been discussed for the existing underrepresentation of women in academia, and we particularly address those situated on the level of exclusionary academic environments shaped by gendered perceptions, as well as those located at the level of female mathematicians themselves.

Previous studies focusing on gendered perceptions as reasons for the exclusion of women suggest that women's contributions and performance tend to be valued less than men's, regardless of their objective quality (e.g. described by Rossiter, 1993 as the Matilda Effect). These differences have been identified, for instance, in the recognition of performance in publications (Knobloch-Westerwick et al., 2013), in selection for awards (Popejoy & Leboy, 2012), in the assessment of application material (Moss-Racusin et al., 2012), or in writing letters of recommendation (Madera et al., 2019). Moreover, studies show that academic performance is evaluated not only in terms of output but also based on gendered attributions of an "inner attitude" or motivation to be a "24/7 scientist" (for Germany, see Beaufaÿs, 2003; Beaufaÿs & Krais, 2005). One criterion for demonstrating such motivation is the expectation of complete self-sacrifice to the profession, which goes hand in hand with requirements for high mobility (i.e., capacity to frequently relocate for work) and the demand for extensive time commitment (for Germany, see Metz-Göckel, 2016). Dedication to science, however, is often perceived as incompatible with care responsibilities. In addition, successfully reconciling family and academic work in the German university system continues to be regarded primarily as a task and desire attributed to women (Paulitz et al., 2015).

Existing studies in Germany that have analyzed professors' or university lecturers' gendered perceptions of early-career researchers show that these researchers hold gendered patterns of interpretation regarding motivation to pursue the academic career path and character traits that qualify for an academic career (Kahlert, 2013; Klammer 2020). Women are perceived as generally less interested and less motivated to pursue an academic career (e.g., Kahlert, 2013). Moreover, researchers in these studies describe women as less self-confident and less willing to take risks when dealing with the unpredictable conditions of academic career paths (Kahlert, 2013; Klammer, 2020). In contrast, perseverance, risk affinity, and the aspiration for prestige are character traits and motivations typically ascribed to men (Kahlert, 2013; Klammer et al., 2020). These traits are also considered qualities that qualify (men) for an academic career (Carli et al., 2016; Van Veelen & Derks, 2022). Furthermore, researchers interviewed in these studies perceive the

incompatibility between an academic career and having children as one of the main reasons women decide against pursuing an academic career (Kahlert, 2013; Klammer, 2020). These gendered perceptions are one central focus of this article. These gendered perceptions influence academic success, particularly when these perceptions are held by individuals in positions of power within a hierarchically structured and selection-based academic system (Kahlert, 2013; Van den Brink & Benschop, 2014; for mathematics, see Mischau & Ransiek 2024). Although it is not in the focus of this article, it is important to recognize that gatekeepers and early career researchers act within an academic and disciplinary context that has already been shown to be gendered not just by its male-domination but also by preexisting disparities embedded in the academic organization that disadvantage women (for mathematics, see Hottinger, 2016; Shulman, 1996). Ultimately, this means that individuals in positions of power can influence the access of other researchers to academic positions and resources, facilitate the establishment of academic networks (for the importance of networking, especially for women, see Sagebiel, 2018), and therefore contribute to the advancement of researchers (Kahlert, 2013). We thus understand people with such power to be 'gatekeepers'. Moreover, in supervision situations gatekeepers may influence PhD students' and postdocs' (collectively referred to as early career researchers in this study) choices regarding their academic career paths, thereby playing an important role in accompanying status transitions (e.g., from PhD to postdoc) (Mischau & Ransiek, 2024; Kahlert, 2013).
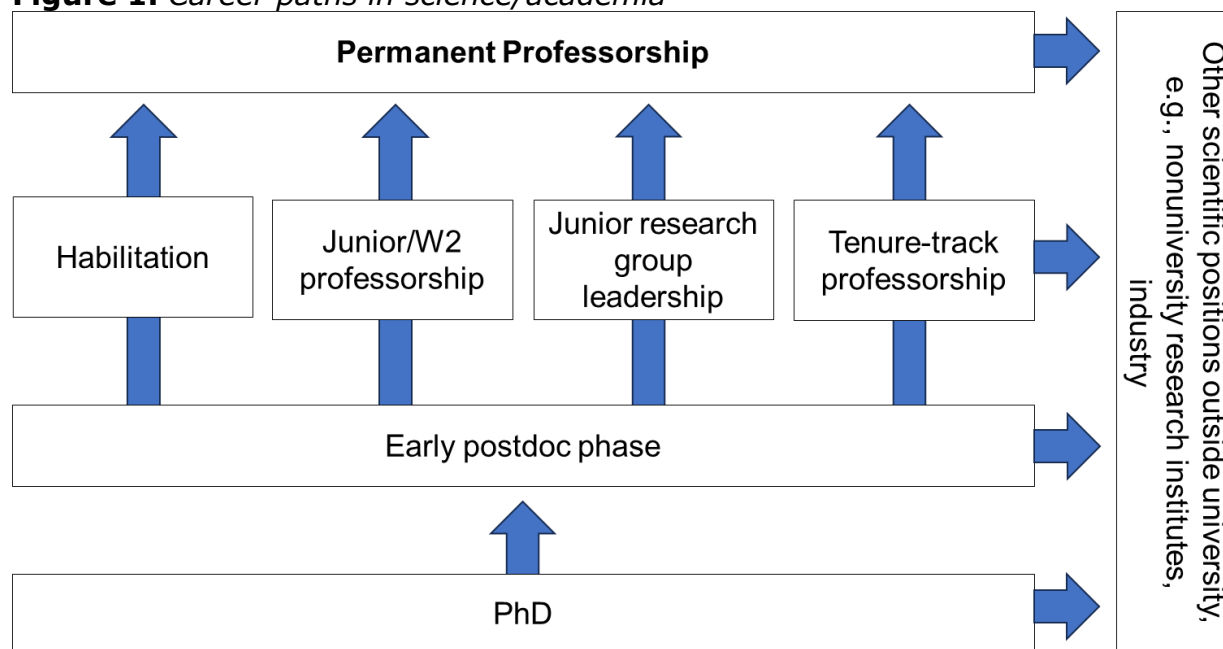
Studies that focus on the perspectives of early-career researchers in mathematics, their reasons for becoming mathematicians and for pursuing or forgoing an academic career have identified various factors that influence these decisions. These factors include self-identification as a mathematician, the development of a sense of belonging or a mathematical habitus, and discipline-related self-confidence (Good et al., 2012; Herzig, 2010; Lahdenperä & Nieminen, 2020; Solomon et al., 2016). Lahdenperä and Nieminen (2020) found that interpersonal relationships and self-perceived competence strengthen one's sense of belonging in mathematics. Good et al. (2012) showed that in environments where mathematical ability is viewed as fixed and women are assumed to be less capable, women's sense of belonging in mathematics, as well as their motivation to pursue it, tends to decline. Solomon et al. (2016) demonstrated that identifying as a 'woman in mathematics' is not an unproblematic or uncontested process. Rather, women in mathematics must continuously negotiate their position and construct a female mathematical self-identification within a male-dominated field. In this regard, insecurities about one's own performance and male-connotated images of mathematicians make it difficult for women to identify with the discipline (see also Hall & Suurtamm, 2020; Nosek et al., 2002; Piatek-Jimenez, 2008). For other contexts, studies have shown that awareness of and experiences with unequal treatment or discrimination in the workplace are likewise cited as influencing women's decisions to pursue or abandon an academic career (Britton, 2017; Moss-Racusin et al., 2018; for mathematics, see Langfeldt & Mischau, 2018). In summary, these studies suggest that while self-identification as a mathematician and a sense of belonging to the field are crucial for pursuing an academic career, they are shaped by gendered dynamics that lead to different experiences and outcomes for women and men.

Although previous studies have emphasized the importance of analyzing the interrelations between different influencing factors (e.g., Langfeldt et al., 2014), the perspectives of researchers in leadership positions and early-career researchers have not yet been systematically contrasted for mathematics yet. This paper directly addresses this research gap. Our study involved interviews with both researchers in leadership positions and early-career researchers. The 6-year duration of the overall project makes it possible to systematically relate findings from various phases of data collection and analysis and thereby gain deeper insight into the interdependencies of different factors and mechanisms that reproduce gender disparities in the research context. To conduct this comparison in this article, we partly refer to results from our research project that have already been published. These include findings concerning gendered perceptions held by researchers in leadership positions (Mischau & Ransiek, 2024, Ransiek & Mischau, 2024) as well as the motives of early-career researchers for leaving academia (Ransiek & Mischau, 2025). This re-examination extends beyond the previously published papers because it systematically focuses on the interrelations between these two perspectives.

Academic and Scientific Careers in Germany

To better understand the specifics of the context and the participants perspectives on (their) career paths, we provide an overview of the structural characteristics of the German academic system (see Figure 1).

Figure 1. *Career paths in science/academia*

The overall academic trajectory in Germany is primarily structured around the goal of obtaining a professorship and is characterized by a predominance of fixed-term employment contracts. An academic career typically begins with doctoral studies (PhD) and continues with a postdoctoral phase, which can be subdivided into an

early-career and a later-career stage. A professorship can be achieved by habilitation (that is, qualify for a professorship by writing a habilitation thesis) and/or taking up a W2 professorship, a junior professorship, or a junior research group leadership, all of which are temporary appointments. A secured pathway to a professorship, such as a tenure-track position, remains the exception rather than the rule.

Some of the positions described above are located within university departments or institutes, and often include teaching responsibilities. Positions that involve research only are typically funded by third-party grants and are therefore also temporary. Research in mathematics is not confined to universities: industry and non-university research institutes also offer research opportunities, some of which are permanent and better paid than comparable academic positions at universities.

In our research context (described below), different potential career pathways are available to mathematicians. One option is a university career, typically oriented toward obtaining a professorship, while other options involve research positions at non-university research institutes or in industry. To distinguish between these options, we use the term "academia" to refer to the university context and its associated career path toward professorship, whereas we use the term "science" to refer to research conducted outside the university.

Theoretical Framework and Study Focus

The topic is examined from a social constructivist (Berger & Luckmann, 1966) and interactionist (Blumer, 1969) perspective. In line with one of the basic premises of social constructivism– "that reality is socially constructed and that the sociology of knowledge must analyse the process in which this occurs (Berger & Luckmann, 1966, p.13)– we assume that (gendered) knowledge is constructed by subjects. Moreover, we assume that study participants bring their (gendered) patterns of interpretation to interactions (Blumer, 1969), thereby contributing to the reproduction of gender disparities (West & Zimmerman, 1987). From this perspective, interpretations and actions are inseparable and mutually constitutive.

The context in which the study participants act follows organizational- and discipline-specific rules and power dynamics, and researchers have to follow these institutional logics. To analytically frame the organizational- and discipline-specific conditions in which the researchers act, we additionally draw on field-theoretical considerations according to Bourdieu (1992), who links the structural conditions of science with the individual knowledge production. Moreover, he conceptualizes the scientific field as a space where researchers strive for dominance and recognition according to the rules accepted in their disciplines (Bourdieu & Wacquant, 1996).

Perspectives on academic careers therefore depend on the interrelation of:

- the interpretations that the actors bring to the field,
- the interactions that the actors engage in within the field, and
- the internal logics and rules of the field in which the researchers interact.

Based on this theoretical framework, we assume that neither researchers in leadership positions nor early-career researchers are merely confronted with social realities; rather, they (re)produce these realities– in our case, gender relations

within a mathematical cluster of excellence– which can influence dropout and retention in career path in mathematics. They do so from different power positions and through their interpretations of interactions in the field, for instance, in everyday working situations. Moreover, the scientific and mathematic fields can be understood as already gendered, meaning that preexisting inequalities create unequal access and conditions for success, thereby shaping the opportunities available to early-career researchers (Beaufaÿs, 2003).

To gain insight into the ways in which gendered knowledge is reproduced within a hierarchical scientific field, we analyze the patterns of interpretation of both those pursuing an academic career and those in positions to support them. For this purpose, we conducted qualitative interviews with early-career researchers and researchers in leadership positions (gatekeepers).

Building on the theoretical assumptions outlined above, this article compares the motives of female and male early-career researchers in a mathematical cluster of excellence for remaining in or leaving academia with the (gender-specific) motives ascribed by gatekeepers. The gatekeepers, whose perspectives we examine, all hold leadership positions in research projects within the cluster and are involved in career development in multiple settings. They recruit early-career researchers for their projects, provide financial support, supervise qualification processes (in our context, especially for PhD students), impart knowledge relevant to academic advancement, assess the potential of early-career researchers to progress in academia, and facilitate further career steps. In this context, early-career researchers must establish themselves as researchers and mathematicians, relying on the access and support provided by gatekeepers. As a result, they must navigate the (potentially gendered) perceptions and practices of gatekeepers when interacting with them, establishing their position in the field, and pursuing their career goals.

This article primarily focuses on the (attributed) reasons for female mathematicians to remain in or leave academia. However, it also incorporates findings from interviews with male early-career researchers to highlight areas where the gender differences assumed by gatekeepers are not confirmed. This article addresses the following research questions:

> **RQ1:** What gender differences do researchers in leadership positions perceive regarding the dropout and retention of female and male early-career researchers? How do these gendered perceptions exclude women?
> **RQ2:** How do the early-career researchers perceive their own careers, and are there gender differences in their narrations?
> **RQ3:** How do the perspectives of researchers in leadership positions and the perspectives of early career researchers interrelate?

Examining the interplay of these perspectives allows for a deeper understanding of the factors that influence the dropout or retention of (female) mathematicians within the specific context of a mathematical cluster of excellence.

Research Context: A Mathematical Cluster of Excellence

The study was conducted in a mathematical cluster of excellence. A cluster of excellence is a research context in which researchers from different disciplines, universities, and institutes work together on a field of research. The cluster being considered in this study is funded by the German Research Foundation for a period of 7 years.

The results presented in this paper are part of that bigger study which was initiated by the cluster itself as accompanying research on the existence and mechanisms of gender disparities in career path in the cluster. The project was divided into a quantitative part (realized by our cooperation partners and not in the focus of this article) and a qualitative part. Results discussed in this paper are part of the qualitative project, in which we specifically focused on possibilities and conditions for successful status transitions and the interrelations between drop-out and disciplinary and/or organizational exclusion. It was the first time a mathematical cluster was analyzed by sociologists in Germany.

The existence of our research project served as one argument for the uniqueness of the cluster in the German Research Foundation funding application. The researchers involved in the project come from the fields of sociology and gender studies (with a focus on STEM). The project serves two functions. First, the accompanying research project is part of the equality initiatives that are being undertaken and funded by the cluster itself. The project team has made the findings available to the cluster for the purpose of implementing and developing equity measures by the cluster. Second, it functions as an independent research project doing research on the cluster; therefore, it functions as a project that is also intended to raise the profile of the project team within its own research community.

The cluster itself is a cross-institutional research alliance and contains the mathematical departments of 3 universities, 2 research institutes and one graduate school. The cluster offers a centralized structure under which research and the support of early-career researchers can be carried out. At the same time, those involved in the cluster are also integrated into the work areas of their respective institutes or departments at the universities. Excellent mathematical research, career development, and support of excellent national and international early-career researchers are defined as important goals by the cluster. Within the different research areas, various scientific status groups are present: professors, PhD students, and postdocs. The research projects are usually planned for two or three years and offer postdocs and PhD students opportunities to gain additional work experience or formal qualifications. The PhD students are usually also part of the graduate school of the cluster. Research is conducted in research projects in different application-oriented, interdisciplinary research areas, as well as via collaborations with other academic disciplines and practitioners outside academia (e.g., from industry).

The research projects are led by professors or senior researchers from the mathematical departments or the research institutes. These are the researchers in leadership positions that we focus on. The research context of research projects within this cluster of excellence provides specific conditions that enable us to address our research questions. At the organizational level, there are supportive

conditions for female researchers to establish themselves in the scientific system as the cluster aims to promote equality, increase the proportion of women within it, and improve opportunities for them in their future career paths. To achieve these goals, different support measures (e.g., networking events or scholarships targeting women) were implemented within the cluster. A strong research focus can contribute to establishment of early-career researchers in relevant mathematical communities. The inter- and transdisciplinary and application-oriented direction of the cluster creates opportunities for cooperation and networking outside academia. These related career opportunities may influence the decision to pursue a career outside academia. Moreover, the attribute of 'excellence' to the cluster may provide beneficial career opportunities and employment prospects in various fields for mathematicians from the cluster. Therefore, we interviewed early-career researchers who, by undergoing a recruitment process into the cluster, have proven themselves to be excellent mathematicians and have high chances of successfully establishing themselves in both academia and non-university research.

DATA AND METHODS
Participants
The findings are based on 45 semi-structured interviews (Hopf, 2000) with researchers in leadership positions in cluster research projects and 20 semi-structured interviews with PhD students and postdocs who work in these research projects or in the working areas associated with the cluster (65 interviews total). Information about the participants is presented in Table 1 (research leaders) and Table 2 (early career researchers). Our project was announced by the cluster's Executive Board. To find participants, our interview call was sent out via the Executive Board who stressed the importance of participation. All persons we contacted knew about our research project and its aim to analyze potential gender disparities in the cluster. All potential participants were informed that all results would be anonymous. There were two phases of data collection. In the first phase we interviewed 45 (out of 49) researchers in leadership position in research projects (29 men and 16 women); as noted above, these individuals are likely to be in the position to actively support career paths and therefore influence the decisions on dropout or retention of early-career researchers in the cluster. Six of the interviewees had a different primary disciplinary assignment (e.g., physics, engineering, computer science).

In the second phase we interviewed 20 PhD students and postdocs (13 men and 7 women). A first call was sent to 225 PhD students and postdocs, and just 13 responded to that call. We recruited seven further participants (4 women) personally, such as via cluster events. Although we could not find out why there was such a discrepancy in the response rate, it is remarkable that there seems to be a difference in interest or willingness to provide insight for our research. This may in part be explained by potential perceived disadvantages: the participants were aware that our research topic was on gender dynamics in the cluster. PhD students and postdocs may have been concerned about sharing insights on this topic, given their position and dependency on researchers in leadership positions in the cluster. Taken together, this prior knowledge and perceived potential disadvantage may have influenced their willingness to participate as well as their answers. Against this background it is interesting to note that the researchers in

leadership positions were presenting themselves as very open to our project; in contrast the female early career researchers appear the most reluctant to talk about the existence of gender differences in the cluster.

Table 1. *Researchers in leadership positions (n = 45) by career level*

(n = 45)		Career level	
Gender		Professorship	Senior researcher*
Men	29	24	5
Women	16	9	7
Non-binary	0	0	0
Total	45	33	12

* Including, for example, junior research group leaders or researchers with permanent positions.

Table 2. *PhD students and postdocs* (n = 20) by career level and origin**

(n = 20)		Career level		Origin	
Gender		PhD	Postdoc***	National	International
Men	13	2	11	5	8
Women	7	2	5	3	4
Non-binary	0	0	0	0	0
Total	20	4	16	8	12

*The postdoctoral status was assigned by the authors from the date of submission of the dissertation, **Defined by place of study or place of further qualification (e.g., PhD). National: studies and/or further qualification in Germany, international: studies and/or further qualification outside of Germany. Origin was specified based on the assumption that internationals have already made other career decisions than nationals (especially the mobility decision to go to Germany for further qualification), which may indicate their motivation to pursue an academic career. Additionally, they often already have a degree from a renowned university and are therefore among those who are already well qualified,***At the time of the interview, two of the interviewees had been appointed to professorships. They had previously worked as researchers in the cluster context and are therefore subsumed under the category postdoc.

Data Collection

The following topics were addressed with all participants in the semi-structured interviews: career biography, ideas regarding who is (potentially) successful in science/academia/mathematics, and barriers to a scientific/academic career. For example, career biography, was addressed via the following question: "When you look back on your scientific career so far, what were the decisive factors that influenced this path positively and negatively?".

In addition, the researchers in leadership positions were asked about their perspectives on and experiences with early-career researchers (especially in supervision and recruitment situations). For example, researchers were asked about how they recruit staff for research projects. The interviews with the early-career researchers also focused on their perceptions of themselves in the academic field, perspectives on supervision and their career goals (e.g., "Where do you see

yourself in a few years?"). We asked about gender-specific aspects (such as assumed differences between men and women regarding career choices) for all abovementioned topics.

The interviews were conducted in German and English, were audiotaped and lasted approximately 60 minutes. For the purposes of this article, we translated the German quotes. We smoothed all interview passages slightly but retained grammatical errors (most of the interviewees were not native speakers) to avoid unnecessary interpretation by the translators. Moreover, the text passages were anonymized. The exact origins of the passages are available to the authors.

Data Analysis

The audiotaped material was transcribed and coded with qualitative content analysis (Mayring, 2021) in MAXQDA using the following steps:

1. Deductive assignment of passages from the transcript to matching topics (e.g. motives for drop-out, gendered ascriptions)
2. Inductive analysis of the assigned topics: The passages were abstracted using categories to identify central patterns of interpretation and their interrelations. That means in this step the categories were derived from the material itself and were not assigned beforehand.

The empirical categories we derived from the interviews were discussed within the research team or with different researchers (e.g. our collaboration partners) during work meetings. The categories were (re)aligned if necessary and the coding scheme was adjusted to ensure agreement across the research team. As this is a qualitative study, it does not claim to be representative. Its aim is to find patterns of interpretation not frequencies (for the basic principles of qualitative research, see Rosenthal, 2018).

RESULTS

Researchers in Leadership Positions Gendered Explanations about Dropout and Retention of Early-Career Researchers

Regarding dropout and retention, researchers in leadership positions distinguish between two main factors as reasons for dropout vs retention: (1) difficult career conditions in the academic system and (2) general motivations and ways of dealing with said conditions.

Regarding the first factor, researchers in leadership positions see the career conditions of an academic career as unattractive for all early-career researchers, regardless of gender. In particular, the lack of a predictable path to a professorship is seen as unattractive for all early career researchers

> *That's always the uncertainty, and there are simply too few permanent positions* (B43, male professor).

A lack of work–life balance is also described as an unattractive career condition. In this context, the need to have a certain tendency toward self-sacrifice and passion for an academic career is mentioned

> *So if you want to do science, it's a form of self-exploitation, and you have to push yourself to do it, and that only works if it's also fun* (B22, male professor).

Regarding the second factor, researchers in leadership positions described differences in motivation and ways of coping with career conditions, and how these may relate to motives for dropout vs retention. As exemplified by the following quotes, researchers in leadership positions appear to assume gender differences in these motivations.

> *I always have the impression that they [women] are perhaps too realistic sometimes. For men, a PhD is perhaps an award somehow: I want to have a doctorate. That's great somehow. I'm better than the other guy or something like that. But for women, around this time when a decision is perhaps to be made, that perhaps the personal is much more important than the professional. […] you have to be more convincing, and yet they still drop out when the next step is to do a PhD […] even if they are very, very good. […] and then you think […] Why don't you take the next step too? […] especially at the moment, when I think that once you have a PhD and are actually already quite well established. Then I think the chances are not so bad for female researchers at the moment, but even then, many drop out.* (B36, male professor)

> *[…] female candidates who realize that they are good are very likely to become professors in the current system. And they somehow know that […]. But they know that the path is long, complicated, time-consuming and that the job at the end is not exactly attractive. Especially not when you think about the compatibility of family and career. That's why many of the good female candidates decide against pursuing this career. Not because they have doubts about [...] being able to do it but because they have doubts about whether they should make it.* (B03, male professor).

In line with other male and female researchers in leadership positions, the first scientist assumes that women have a lower motivation to pursue an academic career. He explains this perceived lower motivation is because of a preference to maintain a personal life especially regarding family. It is suggested in the quote that the context in which women want to sacrifice themselves is not academia; instead, a preference for the family is assumed. He also attributes a higher intrinsic motivation to pursue an academic career to men and believes that they have an affinity for challenge and competition at work. The second scientist perceives women as more realistic with regard to the assessment of an academic career and dealing with its difficulties (we will return to this later).

This overarching pattern of attributing a lower motivation to women can also be found in other interviews and it is often linked to a need for security, as well as a preference for privacy. Within this interpretation pattern, childcare in particular is assumed to be a main dropout motive (see Mischau & Ransiek, 2024). These narrations confirm previous studies that found gendered perceptions of ambition: the wish for care responsibility, the impossibility of doing both, and an affinity for

competition on side of men (Carli et al., 2016; Van Veelen & Derks, 2022; Klammer, 2020; Paulitz et al., 2015). Moreover, the decision for dropout is presented by both researchers (and others interviewed) as unrelated to the potential gendered difficulties that the women face. Instead, they refer to two aspects that were also found in other interviews when it came to explaining the dropout of female early-career researchers. The first researcher states that he attempted to keep the female mathematicians in academia; additionally, both researchers assume that the female mathematicians would have had high chances to become professors.

The researchers quoted above believe that women are likely to become professors based on their gender. Here, the idea is introduced that women have high chances to become professors based not only on their performance but also on the fact that they are women (an idea also mentioned by Wolffram, 2018 for gender equality discourses in excellent research environments) and are particularly in demand owing to the low proportion of female professors. In the latter quote women's exit decision or motivation is also presented as an individual decision, despite beneficial conditions.

For the latter quote it is also remarkable that the scientist refers to the attractiveness of the career goal; something which is hardly questioned in other interviews. Based on his statement that "the job at the end is not exactly attractive," the scientist quoted above is an exception. In other interviews, researchers in leadership positions tend to perceive the career path as the main challenge but do not see the professorship itself as part of the problem.

Besides differences in their motivation, women and men gatekeepers attribute gendered ways of dealing with career conditions as contributing factors; this is exemplified by the following quotes:

> There are eight qualified people, and only one of them can make it, and I can understand somehow that I, as a female PhD student, don't take this risk. (B41, female professor)

> These are single cases, but I think that is also an aspect that I have observed—that women in the postdoc phase decide more quickly [...] or don't postpone the decision, so the men postpone it longer. (B33, male professor)

> Men tend to climb the Mount Everest no matter what. It's hard, so I want to do it. [...] Women are more reasonable. They think about it, and maybe that has something to do with the fact that they want to build their nest […]. They think, What's in it for me? Is it nice if I have this? and then realize, Well, it's actually not so nice. Then I won't go there. (B02, male professor)

In these quotes, women are viewed as more realistic and reasonable when dealing with uncertain career perspectives. Men are described as risk takers, postponers, thoughtless, and unreasonable. The fact that being reasonable is attributed to women and being unreasonable and acting emotionally or illogically is attributed to men seems contradictory, considering that being a logical thinker is one attribute that is identified as relevant in male-connotated characterizations of a

scientist/mathematician (Piatek-Jimenez, 2008). Against this background it can be interpreted that to take up an academic career path with all its disadvantages, one needs to be so passionate that one even acts unreasonably— an interpretation that underlines men's dedication to mathematics.

What is absent in the interview quotes is a recognition or discussion of the external barriers and unequal starting conditions inherent in the system that might hinder women's pursuit of an academic career and affect their career choice. Instead, individual factors, such as women's lower intrinsic motivation regarding an academic career, the wish or responsibility for childcare, and a lower tolerance for difficult career conditions, are cited as the main reasons for leaving academia. Additionally, dropout based on these reasons is presented as a decision that is unrelated to potential inequalities (a pattern that was also described by Klammer et al., 2020).

Given the attributed motives for leaving academia, researchers in leadership positions believe that they have little room for action when it comes to keeping women on the academic career path. It can be interpreted that these patterns of excluding women from wanting to pursue the academic career and explain barriers as individual, maintain the possibility of neglecting any responsibility or structural barriers in the field.

Motives For and Against an Academic Career in Mathematics from the Perspective of Early-Career Researchers
To gain deeper insight into early-career researchers' motives for and against an academic career and their connection to the discipline (e.g., regarding self-identification as a mathematician or discipline-related self-confidence), we focused on their reasons to choose mathematics as a discipline. Regardless of the early-career researchers' gender, we found different motives for choosing mathematics as a discipline, as seen in Figure 2. The quotes presented in Figure 2 are based on inductive coding related to reasons to choose mathematics.
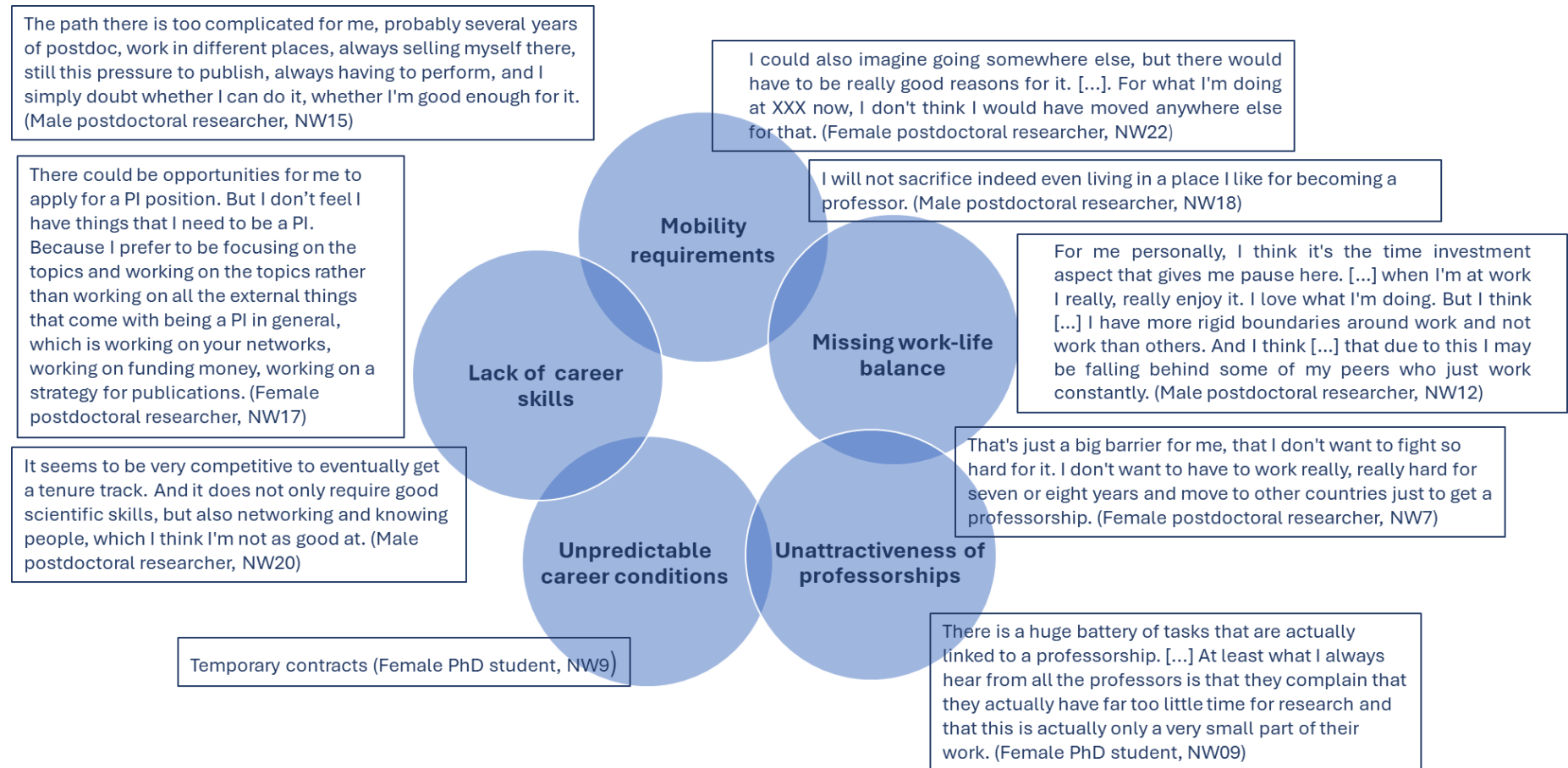
Figure 2. *Reasons for choosing mathematics*

Enthusiasm
I always wanted to do math. […]. For example, my parents tell me that when I was five or six I would say: "When I am old I want to be a scientist." (Male international PhD student, NW14) There was a lot of subjects at school. […] most of them were boring to me. And I could see myself having fun when I was doing math. (Female international postdoc, NW19)
Enthusiasm + mathematical skills
I always thought math was great at school [...]. It was clear from the 8th, 9th grade that I wanted to study math and then I did it without thinking twice. [...] I think there was only one time in my entire school career that I didn't get an A in math [...]. It was kind of clear that I could do it [...]. I had a math teacher [...] who encouraged […]. But I would have studied math even without him. (Female national postdoc, NW22) I really enjoyed the math modules. And I realized that I was somehow quite good at it. I've somehow always been good at math. And then I thought I'd just give it a try. (Female national PhD student, NW09)
Enthusiasm + inspiration
I've always wanted to go into research. My dad also worked in research. I think that naturally makes it easier to have a role model and I always found the work quite appealing, because as a scientist you work very freely and [...] only strive for knowledge. (Female national postdoc, NW07)
Enthusiasm + lack of alternatives
I somehow slipped into it from school because I didn't really know what exactly I should do. I wanted to study something, and I've always enjoyed math, and then I just tried it out without having any great idea of what you actually do, and it just really excited me [...] and I could always imagine doing a PhD somehow, deepening it. (Male national postdoc, NW15) I always liked math, to be honest. I just enjoyed it. So I though […] if I do a job in something that I like it might be a bit better than doing a job that you don't like. (Female international postdoc, NW23)
Enthusiasm + mathematical skills + support + inspiration
Math has always been something I've been good at […]. I think I mainly found math boring in elementary school. [...] Actually, it was mainly with the XXX [Math club] that I realized, how complex mathematics can become […]. [...] the teacher who drew my attention to the XXX [Math club] that was Ms. XXX [...]. She just had a sense for promoting elites […] and noticed that I had potential there (Male national postdoc, NW11) When I was something around 12 years old, 13 years old I didn't like math that much, because I found them really boring. But then I had a math teacher in secondary school who realized that I was kind of good at it. And he invited me to participate in some contests […]. And then I realized that I actually enjoyed trying to solve puzzles and the excitement of solving a problem and so on. And then I got really, really interested in it. (Male international postdoc, NW10)
Enthusiasm + mathematical skills + inspiration + career perspective
Initially it was something I knew I was good at, but actually I didn't enjoy it very much. And I think a lot of it was because of the instructors […]. None of them were particularly motivated. […] And then when I went to college […] I was interested in a lot of other different topics […]. But I figured maybe math would help me get a job. […] I took a couple more math classes. And I ended up having a professor who was very, very inspiring. […]. And so after having that experience with that professor I decided I wanted to pursue math. (Male international postdoc, NW12)

Enthusiasm for mathematics seems to be a central factor in choosing the discipline, independent of gender. This aligns with the findings from Skultety & George (2019) who found that the attraction to mathematics is one of the main reasons (for underrepresented groups) for getting into the field. As some quotes indicate, this enthusiasm and the wish to strive for deeper knowledge led early-career researchers to pursue the academic career path. Both female and male early-career researchers show intrinsic motivation by emphasizing their enthusiasm, which was often developed during childhood, and some were encouraged to pursue mathematics because of their perceived talent. We also found awareness of and confidence in their mathematical abilities independent of gender. They perceive themselves as competent and talented mathematicians (a self-perception also described by Parson et al., 2021). References to inspirational experiences with academic mathematics, in contrast to school mathematics, indicate the importance of early knowledge about the content of the academic curriculum.

Although the early-career researchers show enthusiasm for mathematics, they present themselves as uncertain or (still) undecided regarding their career perspective(s) or the career goal of professorship; these findings, again, appear to be independent of their gender, something which was also found in studies from Beaufaÿs & Löther (2017) and Best et al. (2016). In this regard, they criticize the career conditions in the academic system, which they consider precarious, and refer in particular to four points that they see as challenging; quotes related to these challenges are presented in Figure 3.

1. mobility requirements
2. missing work–life balance
3. unpredictable career conditions (e.g. temporary contracts)
4. lack of career (not disciplinary) skills
5. unattractiveness of the professorship

Figure 3. *Barriers to a career in academia*

The path there is too complicated for me, probably several years of postdoc, work in different places, always selling myself there, still this pressure to publish, always having to perform, and I simply doubt whether I can do it, whether I'm good enough for it. (Male postdoctoral researcher, NW15)

There could be opportunities for me to apply for a PI position. But I don't feel I have things that I need to be a PI. Because I prefer to be focusing on the topics and working on the topics rather than working on all the external things that come with being a PI in general, which is working on your networks, working on funding money, working on a strategy for publications. (Female postdoctoral researcher, NW17)

It seems to be very competitive to eventually get a tenure track. And it does not only require good scientific skills, but also networking and knowing people, which I think I'm not as good at. (Male postdoctoral researcher, NW20)

I could also imagine going somewhere else, but there would have to be really good reasons for it. [...]. For what I'm doing at XXX now, I don't think I would have moved anywhere else for that. (Female postdoctoral researcher, NW22)

I will not sacrifice indeed even living in a place I like for becoming a professor. (Male postdoctoral researcher, NW18)

For me personally, I think it's the time investment aspect that gives me pause here. [...] when I'm at work I really, really enjoy it. I love what I'm doing. But I think [...] I have more rigid boundaries around work and not work than others. And I think [...] that due to this I may be falling behind some of my peers who just work constantly. (Male postdoctoral researcher, NW12)

That's just a big barrier for me, that I don't want to fight so hard for it. I don't want to have to work really, really hard for seven or eight years and move to other countries just to get a professorship. (Female postdoctoral researcher, NW7)

Temporary contracts (Female PhD student, NW9)

There is a huge battery of tasks that are actually linked to a professorship. [...] At least what I always hear from all the professors is that they complain that they actually have far too little time for research and that this is actually only a very small part of their work. (Female PhD student, NW09)

Mobility requirements

Missing work-life balance

Lack of career skills

Unpredictable career conditions

Unattractiveness of professorships

The first three challenges (mobility, work-life balance, unpredictability) are connected to general academic working conditions on the way to a professorship. The fourth is connected to personal insecurities (lack of skills) and the fifth addresses the career goal itself: attractiveness of the professorship.

Although researchers in leadership positions assume that gender differences guide the ways in which challenging academic career conditions are addressed, no gender differences could be found regarding how the early-career researchers perceive these challenges. Lack of work life–balance, unpredictable working conditions, mobility requirements, and doubts about their own skills (especially regarding networking or dealing with publication pressure) are also challenging issues for male early-career researchers. The barriers mentioned are connected to the career conditions or the career goal and not to the mathematical work itself. Remarkably, the competencies about which early career researchers are insecure relate to career skills (e.g., networking), not mathematical abilities. What is particularly interesting is that women do not feel insecure because of their capability to become academics; instead, findings counter what has been highlighted in previous studies as an assumption on side of the gatekeepers (e.g., Kahlert 2020). Rather, female early career researchers appear uncertain about how the requirements of an academic career may lead to achieving their actual career interest: mathematical research.

This reluctant perception of the requirements of the academic career path leads to a phenomenon that we also found in other interviews. The early-career researchers refer to a contradiction between the challenges of the career path and the (lack of) attractiveness of the career goal (a professorship). What is evident across the interviews is that the interviewees perceive the professorship as a career goal that is not worth striving for. They associate it with tasks such as management, teaching, supervision, administration, and the acquisition of third-party funding. They see these tasks as predominant in everyday work as a professor and as unattractive.

It also becomes evident that early-career researchers remain in academia not because they are striving for a professorship but because despite all the challenges and insecurities, they accept these inconveniences because they love doing mathematics. This pattern that can be exemplified in the following quote:

> I do feel the insecurity. But I consciously chose this path—at least up to this point. And I very, very much like the joy of doing mathematics. So as long as I feel that joy, I think I can take a lot of risks. (NW14, male international PhD student)

The focus of interest for early career researchers is on the mathematical content of the work, not on the activities that go beyond this and are perceived as inevitably associated with a professorship. This pattern contrasts the gatekeepers' gendered perceptions regarding the motivation to pursue a career, the ways of dealing with the unattractive career conditions (especially uncertainty), and the motives for dropout or retention. In this way, although some of the barriers were similar across interview cohorts, the interpretation of their impact appeared different in the narratives provided by gatekeepers vs the narratives of early career researchers.

Triangulating Perspectives: Work–Family Balance from the Perspective of Early-Career Researchers
Researchers in leadership positions see the lack of opportunity to combine children and an academic career as women's main motive for leaving academia. Interestingly, and in contrast to the gatekeepers' perceptions, the female early-career researchers in our sample do not address (in detail) this compatibility or the wish to have children as a topic that concerns them personally or affects their careers. It needs to be noted that the female PhD students and postdocs interviewed have no children (compared to some of the men interviewees) and do not mention wanting to have children. However, this missing negotiation cannot be just explained by the assumption that compatibility is irrelevant to women. In informal conversations with other female mathematicians, they mentioned that compatibility and children are topics that could hardly be discussed in their working environments. The assumption that compatibility is something which cannot be spoken about is strengthened by the fact that the female interviewees can see problems for other women, even if those problems do not directly impact them:

> *If women want to have a family, they have to take a break, which men partly don't have to do. All this care work still lies more with women, even within the scientific community.* (NW09, female national PhD student)

Interestingly, this scientist views the break that women take after giving birth as being imposed and not self-chosen. She thus dismisses the idea that women feel an intrinsic desire for care work and instead views the unequal distribution of care work as problematic.

Among researchers in leadership positions, the prevalent belief is that women wish to have care responsibility; yet, this belief that women have an intrinsic desire for sole care responsibility is not widespread among male or female early-career researchers. When the interviewees refer to the interpretation pattern that compatibility is a women's wish and responsibility, it is seen as a societal and outdated view and not as an individual or even biological desire of the woman, as evidenced by the following quote:

> *I do think that it can be more difficult for women, because they somehow expect Okay, the woman wants to have children. But so does the man.* (NW04, male international postdoc)

This scientist anticipates negative consequences resulting from the interpretation pattern that attributes (the wish for) care responsibility to women. These perceptions contrast with the perceptions of researchers in leadership positions that primarily women wish for childcare responsibility and questions gatekeepers' narratives about individual aspirations.

Triangulating Perspectives: Experiences of Unequal Treatment
In the narrations of female early-career researchers we found that they hardly discuss personal experiences with unequal treatment. Moreover, they reject the claim that gender played any role in their career path. However, they talk about other women/colleagues who experienced unequal treatment in their working environment but not in the cluster. These results are comparable to findings of

other studies which found that not talking about one's own disadvantage and following the gendered rules is a way of coping with male-dominated environments. It can be interpreted as a way to fit in (as it is done in other studies, see Bird & Rhoton, 2021; Rhoton, 2011) and sustain their position as a member of the cluster (see also Britton, 2017 who interprets these narratives as a way of not being seen as an outsider). Interestingly, at the same time these women maintain the possibility of being generally disadvantaged in the academic system. Regarding the male early-career researchers, we found tendencies to reflect implicit mechanisms that help them in their careers because they are men, as exemplified by the following quote:

> *I would see my privilege because I was comfortable the whole time. […] I never was struggling to find my place. […]. I think that not struggling sometimes also makes students—male students in general— not give up. Because it's easy for them and then you just Okay. Did my bachelor's and it's fun, and it seems easy, so I'll do a master's. And then same thing applies every time. So if at every stage, things are more or less easy or like naturally occurring, you don't really ask yourself, put yourself into question like, Is this really what I want to do? when you see somehow that your peers are achieving their goals. But, on the other hand, if people like you, your models, people around you a few years older that you really appreciate then struggle, then you ask yourself, Do I want to go in the same direction as them? Struggle like them? So you might think beforehand to give up.* (NW04, male international postdoc)

The interviewee refers to a pattern of never really "seeing one's place questioned" and transfers it to the entire career process. To explain the dropout of women (and retention of men), the interviewee refers to additional pressure that women deal with during their careers. While men's presence in academia/mathematics are never called into question because of their gender, women face and must deal with this external challenge. Men have it easier because they have unchallenged role models, whereas women see their role models struggle.

DISCUSSION AND CONCLUSION
In this article, we adopted a contrasting perspective approach, comparing how researchers in leadership positions and early-career researchers explain dropout and retention from academia. This approach revealed both similarities and tensions between these perspectives.

Contrasting Narratives about Dropout and Retention: Gender Differences and Similarities
Both male and female early-career researchers share enthusiasm and comparable intrinsic motivations for mathematics. Both male and female early-career researchers express reservations about the academic career path, particularly concerning mobility, insecurity and lack of work–life balance. Independent of gender, these groups appear to equally contemplate whether to stay or leave academia because of these aspects. Moreover, both groups complain about the limited research time associated with professorships (a phenomenon also described by Müller & Schneijderberg, 2020, who found a preference for research over

academic teaching) and question the attractiveness of the professorship as such. Skultety and George (2019) as well as Parson et al. (2021) already found that a strong interest in doing mathematics appears to function as a central factor for choosing the discipline. Our study expands this finding: enthusiasm for the discipline it is not just a factor related to entering mathematics but also a factor for retention in the academic field despite structural insecurities (see also Ransiek & Mischau, 2025). Additionally, we found that men also refer to insecurities, for instance, related to their ability for self-presentation. These male narratives mirror forms of insecurity stereotypically attributed to women (see also Kahlert 2020, Klammer 2020). Interestingly, they do not specifically show an affinity for risk and competition, as suggested as ascribed gendered career factors in different studies (Carli et al., 2016; Van Veelen & Derks, 2022). Our results clearly show that gender differences in dropout and retention cannot be explained at the level of individual gendered preferences or choices (e.g., the decision to take on care responsibilities). Our study therefore confirms those studies that found no gender differences (Beaufaÿs & Löther, 2017; Best et al., 2016) and challenges perspectives that explain career choices by gender differences in individual preferences.

The narratives of male and female early-career researchers are also especially interesting because they challenge the gendered assumptions voiced by the researchers in leadership positions in the cluster. We found assumed differences among researchers in leadership positions, particularly regarding:

- The motivation to pursue an academic career (they perceive women as less motivated to pursue an academic path);
- Coping with difficult career conditions (they perceive that women prefer family over career, are more realistic and questioning of structural conditions; men are seen as competitive risk takers who do not overthink barriers);
- The reasons for dropout and retention (for women, they assume a desire to take on care responsibilities; for men, they attribute an intrinsic motivation to pursue the academic career path).

These assumptions reproduce gendered narratives of insecurity, ambition, and care, which continue to shape academic cultures (Kahlert, 2020; Klammer, 2020; Paulitz, 2015). Our data indicates that the researchers in leadership positions continue to reproduce and reinforce these gendered narratives even if they are not emphasized by the early career researchers. Furthermore, regarding the interviewees' perspectives on women's reasons for dropping out, a shift can be observed. The reasons for dropout assumed by researchers in leadership positions primarily refer to individual motives, whereas early-career researchers tend to emphasize structural and contextual conditions, including the behavior and expectations of gatekeepers.

Juxtaposing the views of gatekeepers and female and male early-career researchers, demonstrates that gendered dropout patterns are sustained far less by individual choices than they are by persistent stereotypes that frame women and men differently within academic structures.

Constructing Gender Differences in the Hierarchical Field of a Mathematical Cluster of Excellence: Consequences for Female Early Career Researchers

Attention must be paid to the unequal power relations within the academic and scientific field of mathematics. Researchers in leadership positions bring gendered assumptions into everyday working interactions and thereby participate in the reproduction of a gendered and hierarchical scientific field in which researchers struggle for recognition (Bourdieu & Waquant, 1996). In such a field, it is important—yet more challenging—for female early career researchers to be acknowledged as motivated by those in powerful positions (Beaufaÿs, 2003). Interestingly the researchers in leadership positions do not challenge the capabilities or talents of female researchers directly, rather, they maintain the order of the gendered scientific field by questioning women's determination.

As they depend on the acknowledgment of their determination and performance to advance in academia, early career researchers in such a field may feel pressured to adapt to dominant expectations in order to progress. For female researchers it is harder to 'fit in to get up' (Rhoton, 2011). The narratives of the gatekeepers might influence female early career researchers in different ways, such as:

- The gendered perceptions that we found in the narratives of gatekeepers might undermine female early-career researchers' existing identification with mathematics and thereby lower their sense of belonging (see, e.g., Lahdenperä & Nieminen, 2020).
- Bringing gendered assumptions into everyday supervisory and collegial interactions may decrease women's motivation to pursue an academic career (see, e.g., Good et al., 2012).

Last but not least, the individualization of women's dropout motives by gatekeepers contributes to a denial of structural inequalities, as well as to the denial of stereotypical perceptions on the part of researchers in leadership positions. As a result, women are left to navigate unequal conditions on their own and must overcome even more challenges than their male colleagues when they struggle for recognition.

Some consequences of these challenges for female early-career researchers in the cluster were already critically addressed by Ransiek & Mischau (2024). Regarding the self-identification, we found in a previous study, that the female mathematicians we interviewed tend to identify primarily as mathematicians while distancing themselves from being addressed as "woman" (Ransiek & Mischau, 2024). In this regard, it is noteworthy that the results of this article show that female early-career researchers neither point to potential difficulties in their own careers when having children nor speak about personal experiences of unequal treatment in the cluster based on their gender—even if they (and others) recognize disadvantages for women more generally. The absence of open negotiation among female early-career researchers regarding unequal treatment has also been discussed in previous studies as a strategic response to male-dominated academic environments (Bird & Rhoton, 2021; Powell et al., 2009). It can be interpretated that these women deny these inequalities because they wish to uphold their self-identification as mathematicians. Our findings therefore sustain the relevance of analyzing the interactional processes through which gender differences– but also

gender similarities– are constructed between researchers in leadership positions and early-career researchers (see also, West and Zimmerman, 1987). Our study expands the results of other studies, which have mainly focused on women's perspectives; interestingly, our findings indicate that the male early career researchers partly show awareness of their privileges.

Researching Male Reasons for Dropout and Retention and Challenges for Female Role Models

Despite the absence of gender differences in career perceptions among early-career researchers, statistics for Germany show (GWK, 2024) that men continue to be overrepresented in professorships. If we assume that the insecurities and reservations outlined in this article are not solely specific characteristics of our sample, the question arises as to why men are more likely to remain on the academic career path. This perspective also shifts the analytical focus from asking why women leave toward analyzing why men stay (see Penner & Willer (2019) as an example of such rare research). Our study contributes to this question by analyzing both male and female career narratives. We found that one reason the male early-career researchers themselves talk about is that they are not personally affected by unequal treatment in their working environment, such that their belonging and identification as mathematicians are rarely questioned (a pattern also described by Damarin, 2008).

The persistence of gender stereotypes among both male and female gatekeepers furthermore complicates the potential of role models to foster equality. Although previous studies have shown that role models can positively influence academic career development (Gladstone & Cimpian, 2021; Stout et al., 2011), addressing the problem of stereotypical thinking that negatively shapes women's career trajectories appears more challenging. As Cheryan et al. (2011) demonstrate, women's belief in their potential for success is shaped by the stereotypes endorsed by their role models, regardless of the role models' gender. The mere presence of female role models, therefore, does not necessarily challenge or transform the gendered scientific field (something which is often suggested in German equal opportunity discourses as a solution to overcome gender disparities in academia). Added to this challenge is our finding that both male and female gatekeepers rarely engage in self-reflection about their own role in reproducing gender disparities.

Limitations, Implications and Further Research

Further research is needed to determine whether the findings are transferable to other disciplines, institutions, or countries. This notwithstanding, the results redirect attention from gendered individual preferences as explanations for the "leaky pipeline" toward the interrelations of gendered perceptions and interactional mechanisms that shape career trajectories. The results also emphasize the relevance of a broader discussion on what Britton described as the "chilly climate" (Britton, 2017), the subtle and implicit mechanisms of exclusion operating within a gendered scientific field.

For gender equality policy, our results call for systematic reflection among researchers in leadership positions. In this regard, gender bias trainings (as it is already done in the cluster) may be useful tools to make implicit assumptions explicit and to foster greater awareness of their roles as gatekeepers about how

their gendered expectations and everyday practices contribute to the reproduction of gender disparities. Regarding the career structures, it is important to reconsider the alignment between expected qualification/career steps, such as demonstrating excellent research performance, and the actual everyday tasks of a professorship, including teaching and administration. Moreover, being a scientist/mathematician and pursuing an academic career appear to involve two partly divergent logics: disciplinary and career-related. Our results indicate that it may be important to distinguish more clearly between disciplinary (in this case, mathematics-related) and career-related aspects (e.g. working conditions in the academic system) when investigating dropout and retention in academia. Further research should also explore whether this ambivalence toward academic careers is specific to the analyzed field—an application-oriented, inter- and transdisciplinary research context in which researchers with excellent research profiles also have attractive opportunities outside academia.

ENDNOTES

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REFERENCES

Beaufaÿs, S. (2003). *Wie werden Wissenschaftler gemacht? Beobachtungen zur wechselseitigen Konstitution von Geschlecht und Wissenschaft* [How are scientists made? Observations on the reciprocal constitution of gender and science] (1st ed.). transcript Verlag.

Beaufaÿs, S., Krais, B. (2005). Doing science – Doing gender. Die Produktion von Wissenschaftlerinnen und die Reproduktion von Machtverhältnissen im wissenschaftlichen Feld. *Feministische Studien, 23*(1), 82–99. https://doi.org/10.1515/fs-2005-0108

Beaufaÿs, S. & Löther, A. (2017). Exzellente Hasardeurinnen. Beschäftigungsbedingungen, und Geschlechterungleichheit auf dem wissenschaftlichen Arbeitsmarkt [Excellent Hasardeurs. Employment conditions and gender inequality on the academic labor market]. *WSI-Mitteilungen, 70*(5), 348–355. https://doi.org/10.5771/0342-300X-2017-5-348

Berger, P.L. & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Doubleday.

Best, K., Wangler, J., & Schraudner, M. (2016). Ausstieg statt Aufstieg? Geschlechtsspezifische Motive des wissenschaftlichen Nachwuchses für den Ausstieg aus der Wissenschaft. [Exit instead of career advancement? Gender-specific motives of early career researchers for leaving academia]. *Beiträge zur Hochschulforschung, 38*(3), 52–73. Retrieved from: https://www.bzh.bayern.de/archiv/artikelarchiv/artikeldetail/ausstieg-statt-aufstieg-geschlechtsspezifische-motive-des-wissenschaftlichen-nachwuchses-fuer-den-ausstieg-aus-der-wissenschaft

Bird, S.R. & Rhoton, L.A. (2021). Seeing isn't always believing: Gender, academic STEM, and women scientists' perceptions of career opportunities. *Gender & Society, 35*(3), 422–448. https://doi.org/10.1177/08912432211008814

Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. University of California Press.

Bourdieu, P., & Wacquant, L. J. D. (1996), *Reflexive Anthropologie* [Reflexive anthropology]. (1st.ed.). Suhrkamp.

Bourdieu, P. (1992). *Homo academicus*. Suhrkamp.

Britton, D.M. (2017). Beyond the chilly climate: The salience of gender in women's academic careers. *Gender & Society, 31*(1), 5–27. https://doi.org/10.1177/0891243216681494

Carli, L.L., Alawa, L., Lee, Y., Zhao, B., & Kim, E. (2016). Stereotypes about gender and science: Women ≠ scientists. *Psychology of Women Quarterly,* 40(2), 244–260. https://doi.org/10.1177/0361684315622645

Cheryan, S., Siy, J.O., Vichayapai, M., Drury, B. J., & Kim, S. (2011). Do female and male role models who embody STEM stereotypes hinder women's anticipated success in STEM? *Social Psychological and Personality Science, 2*(6), 656–664. https://doi.org/10.1177/1948550611405218

Damarin, S.K. (2008). Toward thinking feminism and mathematics together. *Journal of Women in Culture and Society, 34*(1), 101–123. https://doi.org/10.1086/588470

Destatis (2024). Studierende in Mathematik, Informatik, Naturwissenschaft (MINT) und Technik-Fächern [Students in mathematics, computer science, natural

sciences (STEM) and technical subjects]. Retrieved from
https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Hochschulen/Tabellen/studierende-mint-faechern.html

Gladstone J.R. & Cimpian A. (2021). Which role models are effective for which students? A systematic review and four recommendations for maximizing the effectiveness of role models in STEM. *International Journal of STEM Education*, *8*(59). Advanced online publication. https://doi.org/10.1186/s40594-021-00315-x

Good, C., Rattan, A., & Dweck, C.S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, *102*(4), 700–717. https://doi.org/10.1037/a0026659

GWK [Joint Science Conference] (2024). Gleichstellungsmonitor Wissenschaft und Forschung. 28. Datenfortschreibung (2022/2023) zu Frauen in Hochschulen und außerhochschulischen Forschungseinrichtungen. [Equality Monitor Science and Research. 28th report (2022/2023) on women in universities and non-university research institutions]. Heft 91. Retrieved from https://www.gwk-bonn.de/themen/weitere-arbeitsgebiete/chancengerechtigkeit

Hall, J. & Suurtamm, C. (2020). Numbers and nerds: Exploring portrayals of mathematics and mathematicians in children's media. *International Electronic Journal of Mathematics Education, 15*(3), Article: em0591. https://doi.org/10.29333/iejme/8260

Herzig, A.H. (2010) Women belonging in the social worlds of graduate mathematics. *The Mathematics Enthusiast, 7*(2), 177–208. https://doi.org/10.54870/1551-3440.1183

Hopf, C. (2000). Qualitative Interviews—ein Überblick [Qualitative interviews—An overview]. In U. Flick, E. v. Kardorff, & I. Steinke (Eds.), *Qualitative Forschung* [Qualitative research] (pp. 349–360). Rowohlt.

Hottinger, S.N. (2016). *Inventing the mathematician: Gender, race, and our cultural understanding of mathematics*. SUNY Press. https://doi.org/10.1353/book45135

Kahlert, H. (2013). Geschlechterkonstruktionen von Hochschullehrenden: Gatekeeping für Chancengleichheit in der Wissenschaft? [Gender constructs of university lecturers: Gatekeeping for equal opportunities in academia?] In U. Pascher & P. Stein (Eds.), *Akademische Karrieren von Naturwissenschaftlerinnen gestern und heute* [Academic careers of female scientists yesterday and today] (pp. 193–220). Springer.

Kahlert, H. (2020). Gatekeepers' gender constructions: A contribution to stability and/or change in the gendered university. In S. Strid, D. Balkmar, J. Hearn, & L. Morley (Eds.), *Does knowledge have a gender? A Festschrift for Liisa Husu on gender, science and academia* (pp. 280–304). Örebro University. https://www.diva-portal.org/smash/get/diva2:1511237/FULLTEXT02.pdf

Klammer, U., Altenstädter, L., Petrova-Stoyanov, R. & Wegrzyn, E. (2020). *Gleichstellungspolitik an Hochschulen. Was wissen und wie handeln Professorinnen und Professoren?* [Gender equality policy at universities. What do professors know and how do they act?]. Verlag Barbara Budrich. https://doi.org/10.25656/01:20640

Knobloch-Westerwick, S., Glynn, C.J., Huge, M. (2013). The Matilda effect in science communication: An experiment on gender bias in publication quality

perceptions and collaboration interest. *Science Communication, 35*(5), 603–625. https://doi.org/10.1177/1075547012472684

Lahdenperä, J. & Nieminen, J.H. (2020). How does a mathematician fit in? A mixed-methods analysis of university students' sense of belonging in mathematics. *International Journal of Research in Undergraduate Mathematics Education*, *6*(3), 475–494. https://doi.org/10.1007/s40753-020-00118-5

Langfeldt, B. & Mischau, A. (2018). Change and persistence of gender disparities in academic careers of mathematicians and physicists in Germany. *International Journal of Gender, Science and Technology, 10*(1), 147–170. https://genderandset.open.ac.uk/index.php/genderandset/article/view/475

Langfeldt, B., Mischau, A., Reith, F., & Griffiths, K. (2014). Leistung ist Silber, Anerkennung ist Gold. Geschlechterunterschiede im beruflichen Erfolg von MathematikerInnen und PhysikerInnen [Achievement is silver, recognition is gold. Gender differences in the professional success of mathematicians and physicists]. In B. Langfeldt & A. Mischau (Eds.), *Strukturen, Kulturen und Spielregeln*. *Faktoren erfolgreicher Berufsverläufe von Frauen und Männern in MINT* [Structures, cultures, and rules of the game. Factors of successful career paths for women and men in STEM] (pp. 76–111). Nomos Verlagsgesellschaft.

Madera, J.M., Hebl, M.R., Dial, H., Martin, R. & Valian, V. (2019). Raising doubt in letters of recommendation for academia: Gender differences and their impact. *Journal of Business and Psychology, 34*(3), 287–303. https://doi.org/10.1007/s10869-018-9541-1

Mayring, P. (2021). *Qualitative content analysis: A step-by-step guide.* SAGE Publications Ltd.

Metz-Göckel, S. (2016). Der perfekte Lebenslauf: Wissenschaftlerinnen auf dem Weg an die Spitze [The perfect CV: Women scientists on their way to the top]. In J. Reuter, O. Berli, & M. Tischler (Eds.), *Wissenschaftliche Karriere als Hasard. Eine Sondierung* [Academic career as a hazard. An exploration] (pp.101–128). Campus Verlag. https://doi.org/10.2307/j.ctvddzz1j.12

Mischau, A. & Ransiek, A. (2024). Gendered gatekeeping in the recruitment and support of (prospective) PhDs and postdocs in a mathematical Cluster of excellence. *International Journal of Gender, Science and Technology, 16*(1), 71–99.
https://genderandset.open.ac.uk/index.php/genderandset/article/view/1458

Moss-Racusin, C.A., Sanzari, C., Caluori, N. & Rabasco, H. (2018). Gender bias produces gender gaps in STEM engagement. *Sex Roles: A Journal of Research, 79*(11–12), 651–670. https://doi.org/10.1007/s11199-018-0902-z

Moss-Racusin, C.A., Dovidio J.F., Brescoll V.L., Graham M.J., Handelsman J. (2012) Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences of the United States of America, 109*(41), 16474–16479. https://doi.org/10.1073/pnas.1211286109

Müller, L., & Schneijderberg, C. (2020). The emergence of the organizational academic profession: vertical differentiation of German universities and the research-teaching nexus. *Higher Education Forum, 17*, 43–68. https://doi.org/10.15027/48954

Nosek, B.A., Banaji, M.R. & Greenwald, A.G. (2002). Math = male, me = female, therefore math ≠me. *Journal of Personality and Social Psychology, 83*(1), 44–59. https://psycnet.apa.org/doi/10.1037/0022-3514.83.1.44

Parson, L., Steele, A. L., & Wilkins, E. (2021). A gendered "ideal?" discourses that characterize the ideal scientist. *International Journal of Gender, Science and Technology, 13*(1), 64–85. https://genderandset.open.ac.uk/index.php/genderandset/article/view/735

Paulitz, T., Goisauf, M., & Zapusek, S. (2015). Work-Life-Balance + Wissenschaft = unvereinbar? Zur exkludierenden Vergeschlechtlichung einer entgrenzten Lebensform [Work–life balance + science = incompatible? On the exclusionary gendering of an unbounded way of life]. *GENDER—Zeitschrift für Geschlecht, Kultur und Gesellschaft, 7*(2), 130–144. https://doi.org/10.3224/gender.v7i2.19317

Piatek-Jimenez, K. (2008). Images of mathematicians: A new perspective on the shortage of women in mathematical careers. *ZDM Mathematics Education*, *40,* 633–646. https://doi.org/10.1007/s11858-008-0126-8

Penner, A. M., & Willer, R. (2019). Men's overpersistence and the gender gap in science and mathematics. *Socius: Sociological Research for a Dynamic World*, 5. https://doi.org/10.1177/2378023118821836

Popejoy, A.B., & Leboy, P.S. (2012). Is math still just a man's world? *Journal of Mathematics and System Science, 2*(5), 292–298. https://awis.org/wp-content/uploads/JMSS-is-math-still-a-mans-world.pdf

Powell, A., Bagilhole, B., Dainty, A. (2009). How women engineers do and undo gender: Consequences for gender equality. *Gender, Work and Organization, 16*(4), 411–428. https://doi.org/10.1111/j.1468-0432.2008.00406.x

Ransiek, A. & Mischau, A. (2025). Perspektiven von exzellenten Nachwuchsmathematiker:innen auf ihre wissenschaftlichen Karrieren [Perspectives of outstanding early-career mathematicians on their scientific careers]. *Zeitschrift für Hochschulentwicklung, 20*(2), 95–112. https://doi.org/10.21240/zfhe/20-2/06

Ransiek, A. & Mischau, A. (2024). Being a woman or being a mathematician: Self and external perceptions of female early career researchers in a mathematical cluster of excellence. *Current Sociology,0*(0). https://doi.org/10.1177/00113921241298699

Rhoton, L.A. (2011). Distancing as a gendered barrier: Understanding women scientists' gender practices. *Gender & Society, 25*(6), 696–716. https://doi.org/10.1177/0891243211422717

Rosenthal, G. (2018). *Interpretative social research. An introduction.* Göttingen University Press.

Rossiter, M.W. (1993). The Matthew Matilda Effect in science. *Social Studies of Science,* 23(2), 325–341. http://www.jstor.org/stable/285482

Sagebiel, F. (2018). Gender and network awareness in/for successful leadership in academic science and engineering. *International Journal of Gender, Science and Technology, 10*(1), 24–51. https://genderandset.open.ac.uk/index.php/genderandset/article/view/519

Skultety, L. & George, C.E. (2019). "I'm in the mathematical sciences because..." Examining underrepresented students' motivations for pursuing math. *Journal of Women and Minorities in Science and Engineering, 25*(1), 25–52. http://dx.doi.org/10.1615/JWomenMinorScienEng.2018020357

Solomon, Y., Radovic, D., & Black L. (2016). "I can actually be very feminine here": Contradiction and hybridity in becoming a female mathematician. *Educational*

Studies in Mathematics, 91, 55–71. https://doi.org/10.1007/s10649-015-9649-4

Stout, J.G., Dasgupta, N., Hunsinger, M., & McManus, M.A. (2011). STEMing the tide: Using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology, 100*(2), 255–270. https://doi.org/10.1037/a0021385

Shulman, B. (1996). What if we change our Axioms? A feminist inquiry into the foundations of mathematics. *Configurations*, 4(3),427–451. 427-451. https://doi.org/10.1353/con.1996.0022

Van den Brink, M. & Benschop, Y. (2014). Gender in academic networking: The role of gatekeepers in professorial recruitment. *Journal of Management Studies, 51*(3), 460–492. https://doi.org/10.1111/joms.12060

Van Veelen, R. & Derks, B. (2022). Academics as agentic superheroes: Female academics' lack of fit with the agentic stereotype of success limits their career advancement. *British Journal of Social Psychology, 61*, 748–767. https://doi.org/10.1111/bjso.12515

West, C., & Zimmerman, D. H. (1987). Doing gender. *Gender and Society*, *1*(2), 125–151. https://doi.org/10.1177/0891243287001002002

Wolffram, A, (2018). Excellence as a gender-biased concept and effects of the linking of excellence with gender equality. *International Journal of Gender, Science and Technology, 10*(1), 88–107. https://genderandset.open.ac.uk/index.php/genderandset/article/view/374