The precarity paradox

Experiences of female PhD holders across career stages in STEM fields

Katalin Tardos and Veronika Paksi

Abstract

This article investigates precarious working conditions and their effects on female academics working in STEM fields (science, technology, engineering and mathematics) in Hungary. We aim to show how precarity in different formats, such as contractual and economic precarity combined with gender-based discrimination, is present through career stages based on twenty-six individual and group interviews conducted with female PhD holders, including both researchers at the early and mature stages of their careers. The results confirm a precarity paradox whereby those with the highest level of education experienced fixed-term contracts, low incomes and gender-based discrimination over time at different career stages, and junior and senior female teachers and researchers suffered significant impacts at the personal, job, career and organisational levels, undermining their research excellence, well-being and career progress.

Keywords

career stages, fixed-term contracts, gender-based discrimination, PhD holders, precarity, research, development and innovation (RDI), STEM, women

Both neoliberalisation and precaritisation processes have filtered into the academic sphere in Hungary, as in other Western countries (Harley et al. 2004). However, female academics are also exposed to unique elements of precarity that are rooted in the Central-Eastern European (CEE) context. The rapidly changing research, development and innovation (RDI) system, as well as still prevailing traditional norms and a low level of gender equality, can all serve as solid grounds for the emergence of a gendered academic precariat and women's abandonment of academia. Despite the significant

Volume 17, Issue 3, Winter 2024: 58–80 © The Author(s)
ISSN 1755-2273 (Print), ISSN 1755-2281 (Online)

extent of precarious contracts in the country, neither quantitative nor qualitative research has examined the characteristics of precarity, its intersection with gender and its consequences for academic careers. To overcome this research gap, the present article investigates precarious working conditions and their effects on the lives of Hungarian female academics who teach and research in STEM fields. We conceptualise and examine the notions of precarity and uncertainty among researchers in academia based on three dimensions: (1) fixed-term contracts; (2) low income, leading to economic precarity; (3) gender-based discrimination. The questions underlying the research are as follows: What are the specificities of the precariousness of careers in academia across career stages in Hungary, especially in the field of STEM; and how do they impact the life and career of female academics? Our qualitative empirical research is based on individual and group interviews conducted with PhD holders.

The article first introduces the concept of precarity as it is employed in academia and then examines its relevance in the Hungarian context. After describing the sample and the applied methodology, the main findings of the research will be presented and discussed. Finally, the article ends with a conclusion that includes some suggestions for future research and policy action.

Precarity in academia

The notion of the academic precariat emerged from the phenomenon of the global precariat. From the 1970s onwards, global neoliberal economic and political processes started to filter into the labour market with an incredible upsurge of insecure flexible work practices. A new global class structure emerged, which included a new group of precarious workers that consisted of millions with uncertain employment conditions (Standing 2011). The phenomenon of the precariat appeared in academic discourse in continental Europe in the 1980s–1990s, and the argument continues as to whether the precariat can be considered a new, independent class (Kalleberg 2009; Kalleberg and Vallas 2018). Based on the widely cited scholarly works of Guy Standing (2011, 2012), the precariat is a class that is currently still forming (a class-in-the-making), but is not yet a class-of-itself, as its members 'have precarious jobs, without a sense of occupational identity or career in front of them, [and] they have no social memory on which to draw, no shadow of the future hanging over their relationships, and have a

limited and precarious range of rights' (Standing 2012: 591). Representing another stream of thought on precarity, Judith Butler (2009) postulates that precarity is a universal phenomenon and writes 'lives are by definition precarious'. Butler further explains: 'To say that life is precarious is to say that the possibility of being sustained relies fundamentally on social and political conditions, and not only on a postulated internal drive to live' (Butler 2009: 21).

Neither insecure career paths nor precarity are new phenomena in higher education. However, these factors have been distinctly amplified by the spread of neoliberalism. The process of neoliberalisation has fundamentally changed the nature of work and working conditions of universities (Davies et al. 2006). The phenomenon involves, among other factors, the commodification of education, cuts in budgets and reliance on external funding systems and private resources (Harley et al. 2004). It is also a consequence of the process of neoliberalisation that academic work is increasingly undertaken in a competitive environment, and thus the evaluation of actors relies heavily on productivity and profitability, creating an audit culture in public universities and normalising precarity (Barry et al. 2012; Loher et al. 2019; Shore and Wright 2016). These changes have generated the need for more flexible and less costly academics employed under easily modifiable conditions (Hill 2005; Ryan et al. 2013). These precarious jobs are often described as uncertain, irregular, short-term and lower-paid (Ivancheva et al. 2019), and involve employees being less likely to receive standard forms of employment-related protection, including health security and union-related benefits (O'Keefe and Courtois 2019).

Consequently, the process of neoliberalisation has produced a new type of labour – the academic precariat (O'Keefe and Courtois 2019), the members of which are often considered second-class citizens of academia (Le Feuvre 2015; Sümer et al. 2020). The academic precariat is highly gendered (Morris et al. 2022). While precarity can easily affect male employees, women, particularly mothers, are prone to being employed in precarious positions as their social status as women or mothers is usually associated with unconscious bias related to lower levels of availability and overall competence in the workplace. Kathleen Lynch (2014) argues that views about an ideal worker, who is not constrained by caring duties and thus is flexible and always available for the organisation, create expectations that precarious workers can hardly meet. Since care work largely remains women's responsibility, the latter are even less likely to meet these demands

of neoliberal universities. In sum, this leads to a catch-22 situation: women are already often considered second-class citizens of academia based on their gender and are devalued by employers and colleagues as well, easily pushing them into a state of precarity and thus further exacerbating their already disadvantageous position (Manchester et al. 2013). They suffer 'labour-led contractual precarity' and experience 'care-led affective precarity' (Ivancheva et al. 2019). Precarious workers have less chance to take part in negotiations with employers and other stakeholders at the university, and might face heavier workloads involving more teaching than research tasks, particularly in the case of early career teachers, who are also charged with undertaking the bulk of administrative work (Klentzin and Bucci 2012). Precarious workers in academia are stuck in the academic hierarchy and have little or no opportunity for career progression (Steinþórsdóttir et al. 2019). They tend to worry more about their job security and future, and this 'future-anxiety' creates various forms of strain in their life (Read and Leathwood 2018).

In STEM fields, spreading neoliberal values in academia are often coupled with prevailing hegemonic masculinity in highly gendered organisations (Acker 1992), which can amplify gender-based discrimination against female professionals (Maxmen 2018). Job insecurity, long-hours culture and limited policies aiming for a better work–life balance all contribute to the growing instability and uncertainty in STEM fields as well, reproducing gender disadvantages (Bozzon et al. 2017). Furthermore, as Jacqueline Wilson and colleagues (2010) have highlighted, younger women with precarious working arrangements might struggle due to amplified indirect sexism as a price for maintaining their job positions. Experiencing gender-based discrimination and precarity could also contribute to the 'chilly environment' that women face in male-dominated departments (Maranto and Griffin 2011), and these gender-based obstacles may even entirely discourage female graduates – and also those with postdoctoral positions – from pursuing teaching or research careers in STEM fields (Xie et al. 2015).

It is a paradox how severely academics with the highest level of education on the labour market struggle with the nature of their employment and with working conditions in higher education. According to the statistics, the proportion of researchers with a fixed-term contract in higher education (9 per cent) is only slightly lower than among all employees in the EU 27 (12.1 per cent) (European Commission 2021; Eurostat 2022). As precarity was originally identified among various vulnerable groups on the

labour market such as migrants and agency workers, we propose considering the precariousness of the most educated a 'precarity paradox'. Existing literature identifies several facets regarding how the paradoxical nature of precarity in higher education may manifest. Ryan and colleagues (2017) emphasise the new public management paradox resulting in tensions between efficiency and effectiveness, as the growing number of casual academics in Australia, mostly on teaching-only contracts, are excluded from formalised university policies ranging from recruitment, selection and onboarding to training and performance management, despite the fact that teaching is the main revenue-generation resource for universities. Moreover, these authors also demonstrate how the growing number of casual academics threatens the core academic workforce by transforming the traditional Humboldtian notion of a university responsible for the creation and dissemination of knowledge for the public good. The organisational paradox can manifest itself in paradoxical vicious cycles for organisational members, both for precarious academics and precarious students (Schraedley et al. 2021). Paradox theory stipulates that tensions between opposing forces and competing requirements within organisations (such as low cost versus high added value, managing today's assets while building capabilities for the future) can lead to positive outcomes if managed well (Schad et al. 2016). However, regarding the tensions of precarity versus the high social prestige of researchers or the need for value-added knowledge creation, positive organisational outcomes are increasingly being questioned (OECD 2021). Examining the potential future evolution of universities, Allen Alexander and Constantine Manolchev (2020) argue that employing academics on precarious contracts will not be the solution for classic research-intensive universities to adapt to uncertain times and transition to new, more agile higher education models. On the contrary, research-intensive universities have to develop the openness and ability to attract and retain new types of professionals, such as entrepreneurial academics, as well as late-to–career academics (those transitioning to academia from other industries or returning after a longer break) and practice-oriented research staff.

The Hungarian case

In Hungary, the RDI sector has undergone several major changes after the political system change in 1989, especially in the last ten years. Among

others, the fifteen research institutes that belonged to the Hungarian Academy of Sciences (HAS) were reorganised and put under the control of the Ministry for Information and Technology within a new entity called the Eötvös Loránd Research Network (ELKH), recently rebranded as the Hungarian Research Network (HUN-REN). In 2017, governmental attacks on Central European University (CEU) started. Due to changes in the law on higher education, CEU could not continue its operations in Budapest and decided to relocate to Vienna in 2018. In the same year, following new legislation, the Hungarian Accreditation Committee removed Gender Studies from the list of accredited master's programmes in Hungary. Consequently, the Gender Studies master's programme at Eötvös Loránd University (ELTE), one of Hungary's leading universities, was suspended. More recent changes have transferred the ownership and maintenance of leading public universities from the state to public interest foundations (trust funds) closely controlled by the government, leading to severe controversies with the European Union and the suspension of Erasmus scholarships and Horizon Europe research grants for the universities concerned. These developments have had an impact on the academic environment and raised concerns about academic freedom, and thus have significantly affected the lives of academics, making their career paths and working conditions even more unpredictable and insecure. Hence, the long history of underfunded public universities and the RDI sector have led to a context in which structural and political precarity is combined with economic (low wages) and contractual (short and fixed-term contracts) precarity in Hungary.

In Hungary, empirical research has hardly investigated precarity among academics as a primary focus. A survey of young academics found that one-third of them were employed with fixed-term contracts and almost one-third of the women had experienced negative discrimination due to their parental status (Alpár et al. 2019). Uncertain and lower-paid positions in academia in Hungary have led to academics taking on multiple jobs, but efforts to limit the number of jobs have been strongly contested by researchers themselves (Tardos et al. 2021). Hajnalka Fényes and colleagues (2020) found that precarity (low income and insecurity), especially of young researchers, contributed to the increase in the international mobility of Hungarian researchers. However, many academics who emigrated for work were also employed on fixed-term contracts at the initial stage of their international employment. While the proportion of fixed-term contracts in the labour market has decreased in the last decade, it is significantly higher in the

higher education sector than the national average. Among EU 27 countries, the largest proportion of precarious contracts among women researchers can be found in Hungary (16.2 per cent), a proportion that is almost double the EU 27 average (9.0 per cent), and also that of Hungarian men (9.1 per cent) (European Commission 2021). The proportion of junior academics with precarious contracts represents a critical European problem, but more significantly for Hungary. Moreover, the proportion of precarious contracts is more than five times as high among female senior researchers (28.28 per cent for women compared to 5.48 per cent for men). Central-Eastern European countries are not homogeneous regarding precarity. Apart from Hungary, only Slovakia features a higher proportion of precarious contracts than the EU average (European Commission 2021).

The issue of gender equality has not been properly addressed in Hungary – not by the Socialist party before the political transition, nor by the governments after the political system change in 1989. Recently, both public attitudes towards gender and family roles and selective pronatalist governmental policies have illustrated the domination of traditional social values, even among more highly educated individuals (Szikra and Tomka 2009). Gender-based discrimination also remained unchanged in the last decade (Neményi et al. 2019). The low level of gender equality in the country is mirrored in academia, where gender equality does not constitute an integrated part of organisational policies (Lannert and Nagy 2020). The majority of equality plans in higher education are still only formal documents (Tardos and Paksi 2021).

Precarity is extremely gendered regarding the parental status of academics in Hungary. Childbearing – including the tradition of the very long period of maternity leave in the country – has the greatest negative impact on women's labour market activity in Hungary among the EU member states (European Commission 2019; Nagy 2009). It is a striking finding that while the proportion of single female researchers with children employed on precarious contracts in the EU 27 is only 1.23 per cent, the figure for Hungarian women is 20 per cent. Thus the motherhood burden is greatest for female researchers in Hungary with respect to precarious contracts (European Commission 2021). Based on interviews with young female engineers working in higher education, Veronika Paksi and colleagues (2022) identified strong gender-based contractual precarity of young female engineers as a factor that obstructs reintegration into the labour market after childbearing. The authors concluded that precarity, low income and related

negative discrimination were significantly responsible for women leaking from the academic pipeline in STEM fields.

Methodology

To explore how different forms of precarity prevail through the career stages of female academics in the STEM field in Hungary, we rely on a series of data collections conducted in 2017 and 2018 among female PhD holders in various STEM fields. We have chosen the STEM field for our research as levels of gender inequality are traditionally more tangible in male-dominated environments, where women face direct discrimination as a result of gender biases and prejudices. The sample was obtained through a combination of purposive and snowball sampling. Overall, our sample included twenty-six female PhD holders comprising both researchers at the early and mature career stages. To differentiate between the early and mature career stages, we used the criteria of age, differentiating between those aged below 40 years and those aged 40 years and older. The junior postdoctoral subgroup comprised fourteen persons, while the senior postdoctoral group included twelve. Whereas the interviewees in the junior postdoctoral group were mostly located in Budapest, with only one person from the countryside, senior postdoctoral group members were more evenly distributed between the capital and two large Hungarian cities (Szeged and Debrecen). Regarding workplaces, nearly three-quarters of the women were teaching in public higher education institutions, whereas a minority of the interviewees held research positions at private companies. Data collection was based on semi-structured individual and group interviews. Among the twenty-six postdoctoral researchers, we conducted a total of seventeen individual semi-structured interviews, and nine researchers participated in focus group interviews. The interviews lasted around ninety minutes and were transcribed. We applied thematic analysis to interpret the data, and coded the interviews with NVivo software.

One limitation of our research was that the original design of the data collection focused on career trajectories, work–life balance, networking, gender-based discrimination and gender differences in researchers' careers in academia, not precarity per se. However, precarity as a significant theme frequently emerged during the interviews, so we decided to re-evaluate our data and explicitly focus on how deeply uncertainty and precarity intersect with the work experience and careers of PhD holders. Nevertheless, this

type of analysis leads to some data limitations. Specifically, we could not focus uniquely on the interviewees' personal experiences of precarity, but we still integrated into the analysis the ways that female researchers in the STEM field perceived precarity in general. Moreover, some of the insights into the precarity of senior postdocs could be related to their experiences at a younger age.

Results

First, we examine the three identified and intertwined dimensions of precarity: fixed-term contracts, low income and discrimination. In the second part of this section we focus on the impacts of these precarious conditions on the individual and academic careers of female doctorate holders.

Precarious employment relationships due to short- and fixed-term contracts

Currently, according to the Hungarian labour code, the duration of fixed-term contracts cannot exceed five consecutive years (Act I of 2012 in the Labour Code 2022). However, the number of times that a fixed-term contract can be renewed is not limited if both the employee's and the employer's legitimate interests are not constrained. In the RDI sector, financing through projects associated with grants can be considered a legitimate interest for the employer (Récsényi Law Firm 2021).

In our research, project-based work was an important employer-driven factor behind the fixed-term contracts among teachers and researchers, especially junior postdoctoral ones. Both the renewal of short- and fixed-term contracts, as well as a reliance on the project-based financing of employment contracts, could be observed, and in most cases this led to a prolonged period of precarity ranging from one to six years, or even longer. One PhD holder stated that 'Contracts of indefinite duration are as rare as white ravens. … Some people don't even get an indefinite contract after many years' (Interviewee #17, senior). Another respondent emphasised the very short and repetitive nature of contracts. Renewing fixed-term contracts multiple times instead of turning them into permanent posts also turned out to be a typical process in higher education institutions.

The precarity paradox among researchers manifested in several ways during the interviews. PhD holders with the highest level of education were

struggling with the nature of the employment relationship made available to them, and this was clearly stated in respondents' reported feelings of injustice and inequality, in one case in comparison to the situation of a bus driver: 'I don't understand why researchers can't sign a contract of indefinite duration if, say, a bus driver can' (Interviewee #17, senior). Another aspect of the precarity paradox in comparison to the modes of entry of young talent into business positions is the length of the so-called probationary period. 'That's what we have in the industry – so, three to six months' probation, and if that's OK, then from tomorrow [the contract] is indefinite' (Interviewee #22, senior). In the public sector, project-based fixed-term contracts may operate as an extremely long probationary period prior to an organisational decision to hire someone directly through a long-term work contract. Moreover, various types of postdoctoral scholarships are combined with project-based contracts, about which PhD holders have to be well informed to be able to choose the best available option at the right time. Finding and coordinating these study and work options is rather challenging, especially in the case of dual careers.

Uncertainty around the renewal of a contract is a huge stress factor, as additional sources of stress may also be associated with moving among departments and offices. Moreover, junior postdocs may experience further stress from explicit organisational pressure to raise the cost of their contracted employment by themselves. 'Even if there is a contract, they (not so) gently nudge you to try to get money from somewhere else [so they can] utilise this money elsewhere. It does not create a sense of maximum existential security' (Interviewee #11, junior). At some organisations a formal, institutionalised system of fixed-term contracts exists as a mode of entry for junior researchers after they obtain a PhD degree.

Low income leading to economic precarity

The low incomes offered to employees in higher education are due to the systematically under-financed public RDI sector in Hungary. Thus, a small personal income is not uniquely an impact of precarity, as seen in other European countries, but an underlying factor that leads to the precariousness of employment.

In the case of a lack of organisational support, PhD holders have to put up the costs associated with international open-access publications by themselves. Paying for prestigious publications is a challenge in academic

careers. Given the fact that the pressure to publish in international publications is growing at most higher education institutions, teachers can be trapped in situations whereby self-financed publishing is the least bad solution in the context of unsupportive institutions. 'So, now I'm forced to pay for it with my own money [just] to have something to write [for the performance review]' (Interviewee #15, Senior).

Promotion, in principle, is a viable strategy for increasing personal earnings. Nevertheless, a typical problem that young academics confront in Hungary that contributes to their economic precarity is the lack of financial resources at the organisational level to support their advancement through the formal hierarchy, even after meeting requirements for the next stage. 'They said, "Well, unfortunately there is no financial budget for it." Then I felt that I had to leave' (Interviewee #15, senior). For more senior professors, accepting leadership positions can also be a strategy for enhancing one's income level. However, becoming a leader or manager can also be a form of 'locked-in' path dependency for academics, especially when people lack leadership skills and the necessary personality. As an investment in the future, an additional long-term strategy for sustaining income levels is to accept unpaid work from industry with a view to later receiving well-paying extra work.

Externally funded projects can significantly increase the financial resources of departments in higher education. Nevertheless, it is a dilemma for workplaces how to allocate these rather scarce resources. Should the resources go to establishing temporary contracts for PhD students and junior postdocs, or should the extra money be a means of complementing the salaries of permanent late-career employees, requiring extra work on their part? Moreover, the careful management of these extra financial resources is also vital for weaving a safety net for researchers on fixed-term contracts for periods when they are not directly involved in other projects.

Discrimination as a source of precarity

Learning and working in STEM fields, our interviewees encountered various forms of gender-based discrimination and a chilly climate that magnified their perceptions of uncertainty. Studying in male-dominated parts of higher education like the STEM field could lead to humiliation, harassment and discrimination against female students, representing a major barrier to

completing university or PhD studies. '[University] tried to break you down, to crush you, and there were quite a lot of obstacles to finishing university. … There were teachers who didn't like girls, for example [saying], "girls shouldn't go into chemistry or study science", it was a general atmosphere there, even on the part of the boys' (Interviewee #4, junior).

Signals from workplaces on the labour market can also clearly indicate a preference for male candidates for STEM-related jobs. The expectation of having male employees in STEM-related jobs could easily lead to discrimination during the hiring process, based on stereotypes and the perception of men's greater competence in this field. The gender bias during the hiring process can be exacerbated by the motherhood burden, too. 'I was told at every place, "darling, when your youngest child is more than three years old, come back"' (Interviewee #21, senior).

Discrimination related to the tasks and jobs that are allocated is also possible, as gendered jobs and tasks based on stereotypes of male and female competencies prevail in the STEM field. A typical area of gender-based discrimination in jobs and the allocation of tasks is routine administration. While women might internalise these 'female tasks' and accept the inequality of the administrative burden that is placed on them in order to be accepted as 'one of the boys', they are aware of the fact that this is not good for their career. 'Nobody likes administration. … They leave it to me, but just to make sure it's done. But they also give me tasks that are very important and professional' (Interviewee #13, junior).

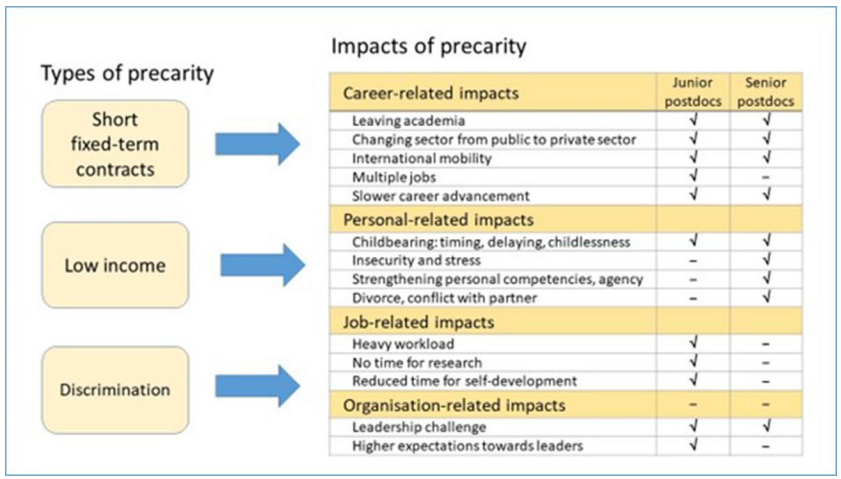
Gender-based career paths are clearly identified by the respondents. Much of the process happens informally, and thus it is difficult to claim discrimination in this regard. Nevertheless, emotional reactions clearly indicate the subtle processes of the preferential treatment of male colleagues. 'At that time we had a male employee, and he was much better supported by our bosses than I was' (Interviewee #21, senior). The lack of organisational support, career advice and mentoring to stimulate the career aspirations of female teachers and researchers in the STEM field could be observed both among junior and senior researchers. In addition to the unequal amount of leadership mentoring, the sharing of personal networks with male colleagues could also lead to significant differences in academic performance. Referring to the 'old boys' club', female academics in the STEM field reported repeatedly experiencing difficulty entering men's networks. 'A girl, a woman, has to really pull her pants up to get into this closed society' (Interviewee #1, junior).

Concerning discrimination in relation to equal access to leadership positions, men are perceived as the natural leaders in organisations, not women. In the case of equal performance and competence, it is more probable that a male candidate will be chosen. Leading research projects is an additional field in which female academics may be disadvantaged, and thus the opportunities for women in STEM to exercise leadership skills and gain the reputational capital essential to future advancement in their careers are diminished. However, with age the sense of being discriminated against or excluded may subjectively decline. 'I feel it less and less … . Now so many people know me, I've put a lot on the table, I've been in many forums, I'm more accepted professionally, but in the beginning, I had to work twice as hard, no question' (Interviewee #21, senior).

Impacts of precarity at different career stages

Precarious contracts, a low level of income, and gender-based discrimination in most cases exert a joint effect that is hardly possible to disentangle. We categorise the types of impact of precarity into four groups: career-related, personal, job-related and organisation-related impacts (Figure 1).

Examining *career-related precarity impacts*, we observe these factors at all career stages. The instability of the contracts offered to the young aca-



Career-related impacts	Junior postdocs	Senior postdocs
Leaving academia	√	√
Changing sector from public to private sector	√	√
International mobility	√	√
Multiple jobs	√	–
Slower career advancement	√	√
Personal-related impacts		
Childbearing: timing, delaying, childlessness	√	√
Insecurity and stress	–	√
Strengthening personal competencies, agency	–	√
Divorce, conflict with partner	–	√
Job-related impacts		
Heavy workload	√	–
No time for research	√	–
Reduced time for self-development	√	–
Organisation-related impacts	–	–
Leadership challenge	√	√
Higher expectations towards leaders	√	–

Figure 1. Types and impacts of precarity experienced by female PhD holders across career stages in the STEM field. Created by the authors.

demics clearly hinders the retention of the new generation, leading to the significant trend of exiting academia completely. The discrepancy between the income levels in the public and private sectors constitutes a major challenge for higher education institutions in relation to retaining talent; thus, another typical option for PhD holders is to shift from the public to the business sector. A third opportunity for Hungarian postdocs is to seek opportunities for international mobility, which can be beneficial regarding building networks, gaining new experience and earning a much higher salary. Another option for interviewees facing a low salary and uncertainty is taking on multiple jobs simultaneously, for example working for two universities.

Experiencing the precarity of short-term contracts and discrimination, especially combined with childbearing, can unmistakeably lead to slower career advancement for women. When a spouse has the same qualifications and works in a similar field, these differences in the speed of development of men's and women's careers can become manifest in a very obvious manner. 'I can see that my husband already has 5–6–7 years of stable work experience, which is not the same for me. So, working here and there for half a year is not the same thing. … I believe that if I had not had so many children at such a young age, I would have had a better career' (Interviewee #2, junior).

Concerning *personal, family- and psychological-well-being-related precarity impacts*, respondents perceived ongoing difficulty with integrating childbearing into their careers at all career stages. Both the decision to become a mother and returning from maternity leave represent major barriers to careers. On the one hand, precarity can lead to a delay in motherhood, or to childlessness. On the other hand, a consequence of childbearing and returning from maternity leave often involve being transferred frequently among jobs and departments, thus creating an involuntary and slower career path.

From a psychological perspective, we found both positive and negative discourses about the personal impacts of precarity and uncertainty. Insecurity and constant stress are typical negative emotions linked to precarity, although less is known about the long-term effects that could lead to self-questioning and self-doubt at later stages. 'Rather, it was a surprise to me [that I had to think about] whether I really belonged here now. [I asked myself,] "what am I really doing here now?"' (Interviewee #17, senior). We also observed the process of respondents internalising precarity and discrimination and developing the opinion and personal perception

that obstacles make a person develop agency and become stronger. Thus, success and personal coping strategies are based on not performing 'feminine' characteristics such as being sad or complaining. Moreover, it was believed that success comes from playing hard, working harder and not giving up. 'I worked twice as hard as [I would have] if [I] were a man' (Interviewee #21, senior). Another strategy for coping with precarity was extreme flexibility. Rapid adaptation on a family or household level was considered a competitive coping strategy.

Job-related precarity impacts were more typically perceived by junior postdocs. Researchers can try to increase their income level by volunteering to do extra work, thus increasing their workload to a great extent. In Hungary, employees are typically ready to exploit themselves to extremes. However, while these strategies can work out well in the short term, they can be devastating in the longer term, leading to severe health problems. Moreover, overwork and dealing with the negative impacts of precarious working conditions can lead to reduced time for research and self-development, or difficulty meeting performance standards.

Finally, we observed that precarity can lead to additional challenges at the organisational level, too. There may be greater expectations for leaders, and the latter might need to train and mentor female colleagues on assertiveness as a coping strategy. 'I try to educate the girls that if the director of the institute has done something they don't like, we don't [say he's] a stupid jerk, but [we should define it] as something that didn't work out. Then I'll go back for the third or fourth time [to challenge such decisions], and he'll say yes or no' (Interviewee #17, senior). Moreover, leaders have to juggle institutional and project-based financial resources with the human-resource needs of the unit and employment-related expectations of teachers and researchers.

Discussion

Our results highlighted three intertwining dimensions of precarity in academia. Based on the interviews, precariousness of employment contracts was perceived as the most important hindering factor, followed by the phenomenon of low income, and finally cases of discrimination. We have revealed some unique elements of the precarity of female PhD holders in Hungary, which may help with understanding why the largest proportion of precarious working contracts in higher education within the European

Union are associated with Hungarian women (European Commission 2021). The shared experiences of the interviewees reinforce the view that neoliberal academic governance and a neoliberal environment contribute to the emergence of an academic precariat in Hungary, as in Western countries (O'Keefe and Courtois 2019). The procedure of being employed on a few fixed-term contracts prior to tenure-track employment is now a permanent, institutionalised characteristic of an academic career in Hungary. Meanwhile, the women in our research, particularly junior PhD holders, experienced precarity in a new way – in the form of a series of project-based, extremely short-term contracts, without knowing whether these would be prolonged, even a few days before they were due to terminate. Though it is prohibited to renew fixed-term contracts after the fifth year (Récsényi Law Firm 2021), neoliberal governance found a way to overrule this employee protection. In a legally questionable practice, employers tend to move teachers and researchers to different departments with different responsibilities to make them eligible for successive fixed-term contracts. Contractual precarity seems to be a 'pre-doc' legacy, since previous findings from Hungary have also identified it even before obtaining a PhD (Alpár et al. 2019), and specifically in engineering (Paksi et al. 2022). Our research also highlights that the instability of positions is further deepened by the omnipresent restructuring of academic institutions. It is a paradox that the probationary period tends to be almost infinitely prolonged in positions demanding the highest level of education, while in the business sector or in occupations requiring less human capital investment one can receive a permanent contract after only a short three-month period. In this sense, academics on fixed-term contracts are perceived as second-class citizens in their professional environment (Sümer et al. 2020).

Low incomes also increased precarity in this study. Though our interviewees in STEM fields may enjoy more prosperous jobs than in other discipline areas, such as social sciences and humanities (Steinþórsdóttir et al. 2019), this advantage hardly surfaces in our research. Precarity makes both individual and academic life courses more insecure, perhaps prolonging both family and career establishment for young academics. The lack of organisational financial resources – and the shift of responsibility to employees for obtaining funding for the operation of departments and institutions – delay even obtaining the PhD degree. All these elements serve neoliberal governance goals (Harley et al. 2004). Senior teachers had more opportunities to supplement their low incomes, but these alternatives

sapped energy from their professional work, as they were juggling multiple jobs based on their money-generating capacity. This phenomenon is widespread in the Hungarian RDI sector, as Tardos and colleagues (2021) previously revealed. Finally, employees accepting leadership positions to avoid financial vulnerability can often be counterproductive from the perspective of organisations.

Discrimination in STEM fields is well documented in scholarly work (Xie et al. 2015), but precarious working conditions were found to be embedded in the STEM context and were closely interlinked with discriminatory processes in our research. Biased practices, and a less supportive and often hostile chilly environment, penetrated the academic careers of our interviewees – as described, among others, by Maranto and Griffin (2011). Importantly, the competencies needed in the STEM field are traditionally perceived as inborn male competencies; thus, proving oneself to be competent can be much harder for women than for men. Organisations sent signals to female candidates that they expected men to apply and work for them. Humiliation and harassment were experienced more frequently at earlier career stages in our research, a result that reinforces the findings of Wilson and colleagues (2010). However, discrimination prevails at later career stages during the hiring process, in the gender-based distribution of tasks and in leadership applications, which further reproduce gender disadvantages in STEM fields (Bozzon et al. 2017; Maxmen 2018).

The three dimensions of precarity discussed above tangibly influenced women's academic advancement. The four groups of impacts of precarity we identified (career-related, personal, job-related and organisation-related) are deeply intertwined. Fixed-term contracts and low incomes (contractual and economic precarity) coupled with structural and political precarity clearly have a powerful effect on major career decisions, while discrimination is often found to be an underlying cause and a reinforcing, contributing factor of precarity. Leaving academia could be one of the worst scenarios both from an individual and an organisational perspective, although intersectorial and international mobility can also be considered an abandonment of science, particularly in the CEE context.

Nevertheless, precarity vitally affects not just junior but also senior professionals' careers, albeit differently. While career- and organisation-related impacts were present among both groups, the job-related impacts (heavy workload, lack of time for research and self-development) seemed to be manifested more among junior postdocs. The fact that the childbearing-

related impacts of precarity prove to be one of the strongest forms of impact, besides career-related ones, involves care-led affective precarity (Ivancheva et al. 2019) and the phenomenon of postponed childbearing due to work–life imbalance (Paksi et al. 2022). Personal impacts (childbearing, stress, partner conflict) meanwhile appeared among more senior colleagues. Self-questioning and self-doubt at later stages clearly refer to earlier negative experiences and also to psychological conditions that may be linked to the *future anxiety* identified by Read and Leathwood (2018).

Conclusion

This research investigated the phenomenon of precarity in academia in the Central-Eastern European region, represented by Hungary, and focused on precariousness across the junior and senior career stages of women with a PhD degree in the field of STEM. Based on twenty-six interviewees' testimonies, our research findings confirm that uncertainty stemming from precarious working conditions surpasses the early stage of teachers and researchers' careers in Hungary, and fixed-term contracts, low wages and discrimination based on gender and motherhood maintain and reproduce uncertainty at later career stages, too. We named this phenomenon of precarity intersecting with the careers of those with the highest level of education on the labour market the 'precarity paradox'. Precarity is significantly responsible for the loss of top talent and the slower career advancement of women and their abandonment of science, and also partly for the brain drain that characterises the Hungarian context (Fényes et al. 2020).

Our research results highlight the need for future policy action in Hungary, as the attractiveness of careers in research has considerably decreased, especially for women. More research is necessary to compare the nature of precarity among different scientific disciplines and across different regions within the European Union. Moreover, research that targets the organisational level, such as decision-making bodies and stakeholder positions, is also needed. Interestingly, the EU does not include guidelines about precarity in the suggested toolkits for Gender Equality Plans (Morris et al. 2024). Later research may explore this gap and develop tools accordingly.

Acknowledgements

This research was supported by the Hungarian National Research, Development and Innovation Fund (NKFIH K 116102).

Katalin Tardos is a sociologist, professor at the International Business School, Budapest and senior research fellow at the HUN-REN Centre for Social Sciences, Institute for Sociology. She holds a PhD degree from the Hungarian Academy of Sciences; her dissertation examined the relationship between working conditions, health status and labour market exclusion. Her research topics include social inclusion and exclusion on the labour market, workplace equality and diversity management practices, and gender equality in academia. She has published several books and articles, the latest book publication being *Academic Careers at the Beginning of the 21st Century*.
Email: tardos.katalin@tk.hun-ren.hu; ORCID: 0000-0002-9770-5167.

Veronika Paksi is a sociologist, research fellow at the HUN-REN Centre for Social Sciences, Institute for Sociology. She teaches at the University of Szeged and is a board member of the Association of Hungarian Women in Science (NaTE). She obtained her PhD degree at the Corvinus University of Budapest; her dissertation focused on the work–life balance of female engineers. Her main research topics include women in science (STEM), gender and precarity, personal professional networks, fertility and childbearing. Her current main project is implementing gender equality plans in agriculture and life science universities in Central and Eastern Europe.
Email: paksi.veronika@tk.hun-ren.hu; ORCID: 0000-0003-3912-1048.

References

Acker, J. (1992), 'From sex roles to gendered institutions', *Contemporary Sociology* 21, no. 5: 565–569. https://doi.org/10.2307/2075528.

Alexander, A. and C. Manolchev (2020), 'The future of university or universities of the future: A paradox for uncertain times', *International Journal of Educational Management* 34, no. 7: 1143–1153. https://doi.org/10.1108/IJEM-01-2020-0018.

Alpár, D., G. G. Barnaföldi, É. Dékány, E. Kubinyi, Á. Máté, B. Munkácsy, E. Neumann, K. Solymosi and G. Toldi (2019), 'Fiatal kutatók Magyarországon – felmérés a 45 év alatti kutatók helyzetéről' [Young researchers in Hungary – Survey on the situation of researchers under 45], *Magyar Tudomány* 180, no. 7: 1064–1077. https://doi.org/10.1556/2065.180.2019.7.13.

Barry, J., E. Berg and J. Chandler (2012), 'Movement and coalition in contention: Gender, management and academe in England and Sweden', *Gender, Work & Organization* 19, no. 1: 52–70. https://doi.org/10.1111/j.1468-0432.2011.00578.x.

Bozzon, R., A. Murgia and P. Villa (2017), 'Precariousness and gender asymmetries among early career researchers: A focus on STEM fields in Italy', *Polis* XXXI, no. 1: 127–156. https://doi.org/10.1424/86082.

Butler, J. (2009), *Frames of War: When is Life Grievable?* (London: Verso).

Davies, B., M. Gottsche and P. Bansel (2006), 'The rise and fall of the neoliberal university', *European Journal of Education* 41, no. 2: 305–319. https://doi.org/10.1111/j.1465-3435.2006.00261.x.

European Commission (2019), *She Figures 2018*.(Brussels: Directorate-General for Research and Innovation). https://data.europa.eu/doi/10.2777/936.

European Commission (2021), *She Figures 2021: Gender in Research and Innovation: Statistics and Indicators* (Brussels: Directorate-General for Research and Innovation). https://doi.org/10.2777/06090.

Eurostat (2022), 'Part-time employment and temporary contracts - annual data'. https://doi.org/10.2908/LFSI_PT_A. (accessed 29 October 2022).

Fényes, H., V. Paksi, K. Tardos, V. Markos and F. Szigeti (2020), 'Magyar kutatók külföldön: A női és férfi karrierutak főbb jellemzői' [Hungarian researchers abroad: The main characteristics of female and male career paths], *Metszetek* 9, no. 4: 23–48. https://doi.org/10.18392/metsz/2020/4/2.

Harley, S., M. Muller-Camen and A. Collin (2004), 'From academic communities to managed organisations: The implications for academic careers in UK and German universities', *Journal of Vocational Behavior* 64, no. 2: 329–345. https://doi.org/10.1016/j.jvb.2002.09.003.

Hill, D. (2005), 'Globalisation and its educational discontents: Neoliberalisation and its impacts on education workers' rights, pay and conditions', *International Studies in Sociology of Education* 15, no. 3: 257–288. https://doi.org/10.1080/09620210500200143.

Ivancheva, M., K. Lynch and K. Keating (2019), 'Precarity, gender and care in the neoliberal academy', *Gender, Work & Organization* 26, no. 4: 448–462. https://doi.org/10.1111/gwao.12350.

Kalleberg, A. L. (2009), 'Precarious work, insecure workers: Employment relations in transition', *American Sociological Review* 74, no. 1: 1–22. https://doi.org/10.1177/000312240907400101.

Kalleberg, A. L. and S. P. Vallas (2018), 'Probing precarious work: Theory, research, and politics', *Research in the Sociology of Work* 31, no. 1: 1–30. https://doi.org/doi:10.1108/S0277-283320170000031017.

Klentzin, J. C. and D. T. Bucci (2012), 'Part-time faculty and the academic library: A case study', *Journal of Academic Librarianship* 38, no. 2: 101–107. https://doi.org/10.1016/j.acalib.2012.02.002.

Lannert, J. and B. Nagy (2020), 'Changing institutional policies and gender equality challenges: The Hungarian case', in S. Sümer (ed.), *Gendered Academic Citizenship: Issues and Experiences* (Cham: Springer International), 165–197.

Le Feuvre, N. (2015), *Contextualizing Women's Academic Careers in Cross-National Perspective: Garcia Working Papers 3* (Trento: Trento University Press).

Loher, D., S. Strasser, D. Monterescu, E. Dabağcı, E. Gallo, C. Shore, A. Gupta, C. Mathur, L. Anton, R. Zane et al. (2019), 'On politics and precarity in academia', *Social Anthropology* 27, no. S2: 97–117. https://doi.org/10.1111/1469-8676.12695.

Lynch, K. (2014), 'New managerialism: The impact on education', *Concept: The Journal of Contemporary Community Education Practice Theory* 5, no. 3: 1–11. http://concept.lib.ed.ac.uk/article/view/2421 (accessed 29 October 2024).

Manchester, C. F., L. M. Leslie and A. Kramer (2013), 'Is the clock still ticking? An evaluation of the consequences of stopping the tenure clock', *ILR Review* 66, no. 1: 3–31. https://doi.org/10.1177/001979391306600101.

Maranto, C. L. and A. E. Griffin (2011), 'The antecedents of a "chilly climate" for women faculty in higher education', *Human Relations* 64, no. 2: 139–159. https://doi.org/10.1177/0018726710377932.

Maxmen, A. (2018), 'Why it's hard to prove gender discrimination in science: Lack of transparency and unconscious biases make it hard to spot inequality', *Nature*, 15 May. https://doi.org/10.1038/d41586-018-05109-w.

Morris, C., T. Hinton-Smith, R. Marvell and K. Brayson (2022), 'Gender back on the agenda in higher education: Perspectives of academic staff in a contemporary UK case study', *Journal of Gender Studies* 31, no. 1: 101–113. https://doi.org/10.1080/09589236.2021.1952064.

Morris, C., F. Parada, M-P Moreau, V. Paksi, B. Read, M. Sautier and K. Tardos. (2024), *Gender Inequity and Precarity in European Neoliberal Academia*, Working Papers on University Reform (Copenhagen: Centre for Higher Education Futures, Aarhus University), https://dpu.au.dk/fileadmin/edu/Forskning/CHEF/Publications/Working_Paper_41.pdf.

Nagy, B. (2009), 'The paradox of employment and fertility: An introduction', *Review of Sociology* 15, no. 2: 47–56.

Neményi, M., B. Ságvári and K. Tardos (2019), *Personal and Social Perception of Discrimination and Legal Awareness of the Right to Equal Treatment: Survey Findings 2019* (Budapest: Egyenlő Bánásmód Hatóság).

OECD (2021), 'Reducing the Precarity of Academic Research Careers', OECD Science, Technology and Industry Policy Papers, no. 113. https://doi.org/10.1787/0f8bd468-en.

O'Keefe, T. and A. Courtois (2019), '"Not one of the family": Gender and precarious work in the neoliberal university', *Gender, Work & Organization* 26, no. 4: 463–479. https://doi.org/10.1111/gwao.12346.

Paksi, V., B. Nagy and K. Tardos (2022), 'Perceptions of barriers to motherhood: Female STEM PhD students' changing family plans', *Social Inclusion* 10, no. 3: 149–159. https://doi.org/10.17645/si.v10i3.5250.

Read, B. and C. Leathwood (2018), 'Tomorrow's a mystery: Constructions of the future and "un/becoming" amongst "early" and "late" career academics', *International Studies in Sociology of Education* 27, no. 4: 333–351. https://doi.org/10.1080/09620214.2018.1453307.

Récsényi Legal Firm (2021), 'A határozott idejű munkaszerződések buktatói' [The pitfalls of fixed-term employment contracts], 29 June, https://recsenyi.hu/a-hatarozott-ideju-munkaszerzodesek-buktatoi/.

Ryan, S., J. Burgess, J. Connell and E. Groen (2013), 'Casual academic staff in an Australian university: Marginalised and excluded', *Tertiary Education and Management* 19, no. 2: 161–175. https://doi.org/10.1080/13583883.2013.783617.

Ryan, S., J. Connell and J. Burgess (2017), 'Casual academics: A new public management paradox', *Labour and Industry* 27, no. 1: 56–72. https://doi.org/10.1080/10301763.2017.1317707.

Schad, J., M. W. Lewis, S. Raisch and W. K. Smith (2016), 'Paradox research in Management Science: Looking back to move forward', *Academy of Management Annals* 10, no. 1: 5–64. https://doi.org/10.5465/19416520.2016.1162422.

Schraedley, M. K., J. J. Jenkins, M. Irelan and M. Umana (2021), 'The neoliberalization of higher education: Paradoxing students' basic needs at a Hispanic-serving institution', *Frontiers in Sustainable Food Systems* 5. https://doi.org/10.3389/fsufs.2021.689499.

Shore, C. and S. Wright (2016), 'Neoliberalisation and the "death of the public university"', *Anuac* 5, no. 1: 46–50. https://doi.org/10.7340/anuac2239-625X-2451.

Standing, G. (2011), *The Precariat: The New Dangerous Class* (London: Bloomsbury Academic).

Standing, G. (2012), 'The precariat: From denizens to citizens?', *Polity* 44, no. 4: 588–608. https://www.jstor.org/stable/41684505.

Steinþórsdóttir, F. S., T. Brorsen Smidt, G. M. Pétursdóttir, Þ. Einarsdóttir and N. Le Feuvre (2019), 'New managerialism in the academy: Gender bias and precarity', *Gender, Work & Organization* 26, no. 2: 124–139. https://doi.org/10.1111/gwao.12286.

Sümer, S., P. O'Connor and N. Le Feuvre (2020), 'The contours of gendered academic citizenship', in S. Sümer (ed.), *Gendered Academic Citizenship: Issues and Experiences* (Cham: Springer International), 1–36.

Szikra, D. and B. Tomka (2009), 'Social policy in East Central Europe: Major trends in the twentieth century', in A. Cerami and P. Vanhuysse (eds), *Post-Communist Welfare Pathways: Theorizing Social Policy Transformations in Central and Eastern Europe* (London: Palgrave Macmillan), 17–34. https://doi.org/10.1057/9780230245808_2.

Tardos, K. and V. Paksi (2021), 'Can equality plans contribute to the sustainable development goal linked to gender equality in higher education and research performing organisations?', *Education of Economists and Managers* 62, no. 4: 35–53. https://doi.org/10.33119/EEIM.2021.62.2.

Tardos, K., V. Paksi and G. Fábri (eds) (2021), *Tudományos karrierek a 21. század elején* [Academic careers at the beginning of the twenty-first century] (Szeged: Belvedere Meridionale).

Wilson, J. Z., G. Marks, L. Noone and J. Hamilton-Mackenzie (2010), 'Retaining a foothold on the slippery paths of academia: University women, indirect discrimination, and the academic marketplace', *Gender and Education* 22, no. 5: 535–545. https://doi.org/10.1080/09540250903354404.

Xie, Y., M. Fang and K. Shauman (2015), 'STEM education', *Annual Review of Sociology* 41, no. 331. https://doi.org/10.1146/annurev-soc-071312-145659.