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Women in Academia – A Glass Ceiling in The South Caucasus?

The topic of women and power roles in academia is an area of significant interest and concern in contemporary society. While strides have been made in promoting gender equality in higher education, academic institutions continue to encounter issues with representation and empowerment for women in various positions of authority and influence. The policy paper delves into the dynamics surrounding women's participation and progression in academia, shedding light on the challenges they face, the progress achieved, and the potential pathways to further enhance their presence in positions of power. We discuss the empirical evidence from the South Caucasus countries, showcasing both the progress and the substantial gaps in equality for women in academia, including a cross-country analysis of gender gaps in scientific output. In particular, our analysis indicates that gender gaps in scientific output are both general and subject-specific, and, as the case of Georgia reveals, include even subject areas where women make up majority of publishing authors.

WOMEN IN HIGHER EDUCATION AND WOMEN IN ACADEMIA: WHERE DOES THE PROGRESS STOP?

Since receiving higher education is a prerequisite for an academic career, the first issue to address is the progress that women made over the years and the gaps that still exist in higher education achievement. The second issue is the progress of women on the academic career ladder.

During recent decades there has been a rapid global increase in higher education achievements, coupled with a significant reversal of the gender gap in education. This growth can largely be attributed to the remarkable progress made by women in pursuing and attaining higher levels of education. Over time, women have caught up with and even surpassed men in educational attainment. In the past one observed higher enrollment and graduation rate for males in tertiary education, but the past few decades have witnessed a substantial surge in women's educational achievements, leading to a convergence of educational patterns between genders. Initially the trend was observed in most industrialized nations and subsequently is also seen in a growing number of developing countries (Heath & Jayachandran, 2016). The data, when analyzed based on gender, demonstrates not only a relative balance in educational attainment between men and women in industrialized countries, but also a continuous acceleration of female attainment compared to males. This acceleration enabled women to outperform men in tertiary educational attainment, resulting in an expanding gender gap favoring women in higher education achievements (UNESCO, 2021). This phenomenon was also called “female advantage” (Niemi, 2017)

However, gender inequalities in higher education attainment become obvious when we look at the representation of women across different fields of science. The most recent high-scale study U-Multirank Gender Monitor 2022 analyzes data from more than 1000 institutions from more than 80 countries. The study evaluates how women and men are represented in various fields of studies. The data covers 25 subjects across a three-year period and confirms that there still exist subjects with high male or female domination. Female share in subject as social work, education and nursing is more than 80%, while subjects of computer science electrical engineering and mechanical engineering the share of female students is around 20%. STEM-oriented institutions are still generally perceived as having a high share of male presence, whereas institutions focused on health and humanities subjects have a significant majority of female students. In institutions, where more than half of the graduates obtain STEM degree, women are represented by less than 40% on every educational level and less than 20% as Professors (U-Multirank, 2022).

The second glaring gap is the representativeness of women in higher rank and leadership positions in academia. The same study reveals that women remain underrepresented in

academic staff and professorial positions across all subjects. Although women make up slightly more than half of undergraduate and graduate students pursuing bachelor's and master's degrees, their representation gradually declines as they progress through their academic careers, with only 47% of PhD students, 44% of academic staff, and 29% of professors being female. This phenomenon is known as the "glass ceiling", where women may be equally or even over-represented in lower positions, while severely under-represented in higher positions of power. The evidence of the "glass ceiling" and disparity between genders tends to widen more noticeably in research-intensive universities, which are evaluated based on the portion of their research budget. Institutions characterized by high research expenditures have a 9% lower representation of women among their academic staff, and when it comes to professors, the gender gap widens to 12% points. (U-Multirank, 2022).

Despite significant progress made by women in educational attainments, they continue to face barriers when it comes to attaining positions of power in academia and in the choice of study fields while pursuing higher education. While efforts have been made to improve the legal and structural frameworks within Higher Education Institutions (HEIs) in terms of gender equality, social norms, cultural biases, stigmas, and discrimination still pose significant challenges for women. Despite their educational achievements, women often encounter obstacles that hinder their success and advancement in academic careers, which in return creates status and income inequality (UNESCO, 2019).

To start with, women may be in a disadvantaged position compared to their male colleagues because of the pressures of raising a family and meeting the requirements of an academic career at the same time. Therefore, they may not be as successful as their male counterparts while competing for a limited number of higher academic positions. The influence of gendered identities and the division of labor within household labor has a significant impact on career aspirations, the amount of time dedicated to paid work, productivity, and subsequent advancement in one's career. Alongside fulfilling more household chores, women in partnerships, particularly mothers, tend to assume a greater share of responsibility than their male partners in terms of allocating, managing, and supervising household tasks. This can partly be attributed to culturally established norms and perceptions of gender roles, or sometimes might be a conscious decision, as well as the practical need for someone to take charge of housekeeping and caregiving. However, assuming the burden of household chores and childcare undeniably limits the time and energy available for pursuing professional career advancement, thereby altering women's ambitions, productivity, and rank attainment over the course of their careers (Baker, 2010).

Besides, women may encounter difficulties on the academic career ladder because of existing cultural pressures, stigmas and discriminatory practices. Llorens et. al. discuss in more detail the presence of gender bias from various perspectives, including: career stages; scientific

productivity, authorship and peer-review; number of citations; scientific fundings and awards; teaching evaluations; academic hiring, tenure, promotions; negotiations; conferences; sexual harassment and family planning. The paper highlights a male advantage in all the listed directions. Particularly, multiple studies that experimentally manipulated the authors' identity have shown that conference abstracts, papers, and fellowship applications were consistently perceived to have greater merit when they were attributed to male authors. Moreover, studies indicate that current citation practices disproportionately favor men, resulting in the undervaluation of research led by women that is of equivalent quality and has comparable potential impact. As for the funding, although a progress is being made towards achieving gender parity in the funding landscape, women continue to encounter significant hurdles when competing for limited resources. It is noteworthy that women receive a higher proportion of NIH research career grants during the early stages of their careers compared to men (54%). However, there is a gradual decline in the percentage of grants awarded to women as they progress to later career stages (research project grants: 34%; research center grants: 26%; NIH, 2020) (Llorens, et al., 2021).

SITUATION IN THE SOUTH CAUCASUS – ANALYSIS OF PROGRESS AND GAPS

Structure of higher education in the South Caucasus counties

The educational systems in the South Caucasus countries (Georgia, Armenia and Azerbaijan) remain heterogeneous, especially where higher education is concerned, with some countries (Armenia and Azerbaijan) preserving some of the remnants of the Soviet higher education structure, while Georgia adopting mostly Wester-style structures.

In Georgia higher education consists of three stages – bachelor programme (first degree), master's programme (second degree) and doctorate programme (third degree). Having a doctorate degree (PhD) is a prerequisite for receiving academic appointments as a professor (a full professor equivalent), an Associate professor or an Assistant professor in the Georgian education system. The law only specifies the difference in the number of years of teaching/research experience to obtain these appointments. Other requirements are deferred to the educational institutions themselves.

In Armenia, the third degree of higher education system envisions two levels – Candidate of Science (Ph.D), which takes 3 years to complete, and, at the next level, Doctor of Science (D.Sc), is undertaken in one of the research institute of the National Academy of Sciences. There is no specific requirement in the law that a D.Sc. degree is necessary to obtain the position equivalent to a full professor. These decisions are deferred to educational institutions on the basis of their

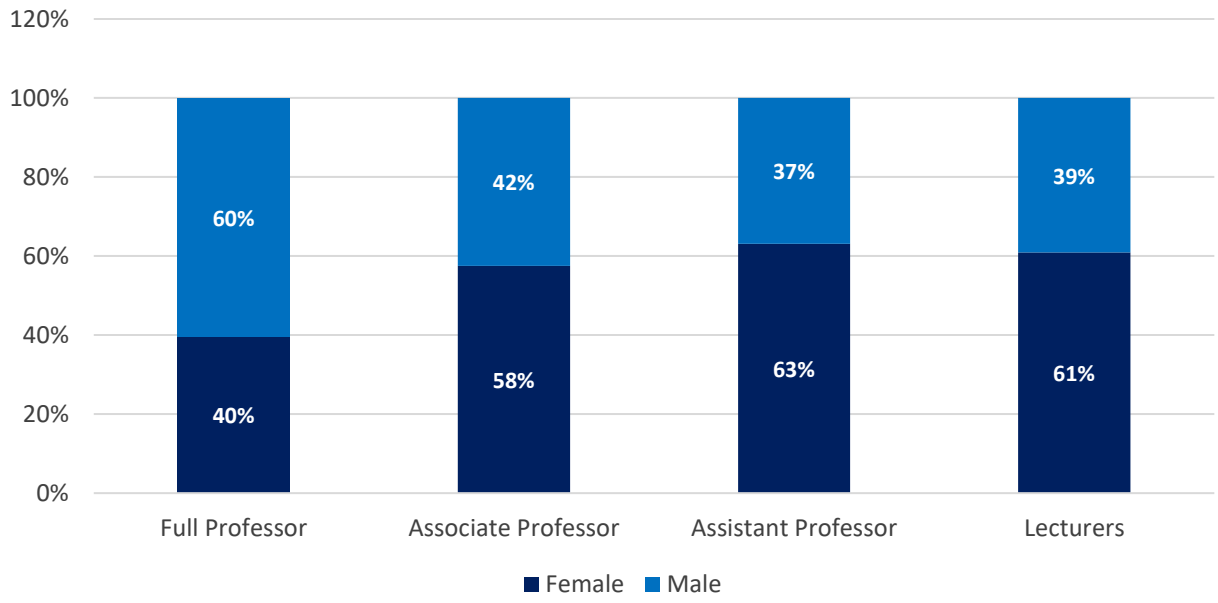
statutes. However, it can be assumed that academic career progression within the state university system depends on the person obtaining a D.Sc. degree.

In Azerbaijan, like in Armenia, the educational system also retains some of the vestiges of the Soviet system - the country has both PhD and Doctors of Science programmes, and a Doctor of Science degree is usually a pre-requisite for obtaining the title of a Professor (equivalent to a full professor) within the education system.

Balance of power in academia – data and evidence for the South Caucasus.

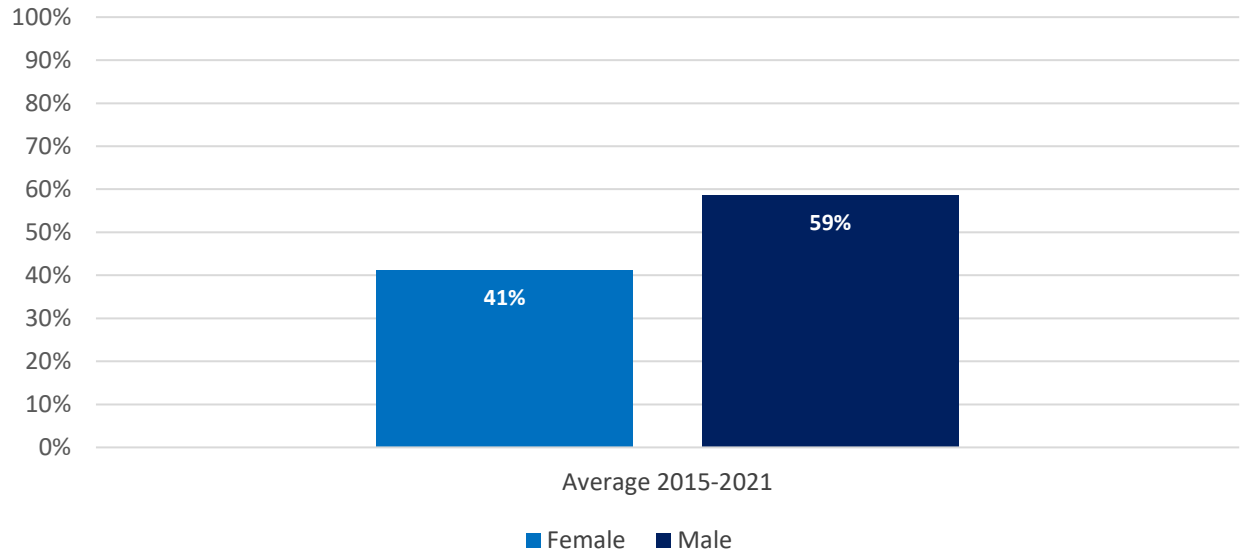
To estimate the gender power balance in academia in the South Caucasus one must look at country-specific indicators. For example, for Georgia one of the relevant indicators of power in academia which also shows up in national statistics would be the shares of women among Professors vs. Associate and Assistant professors.

Graph 1. Gender Distribution of University Professors, Associate Professor, Assistant Professors and Lecturers, Average 2015-2023, Georgia



Similarly, one can look at the share of women who are scientific advisor of doctoral students (although scientific advisors to doctoral students do not necessarily need to hold the title of a professor). Scientific advising is typically associated with reputational as well as monetary benefits to the advisors. Doctoral students have discretion in approaching faculty members to be their scientific advisors, but typically scientific advisors are chosen among the most experienced and respected scholars in their fields. Not only they help guide students in their scientific work but command enough influence and power in the field to lead a student to a successful defence.

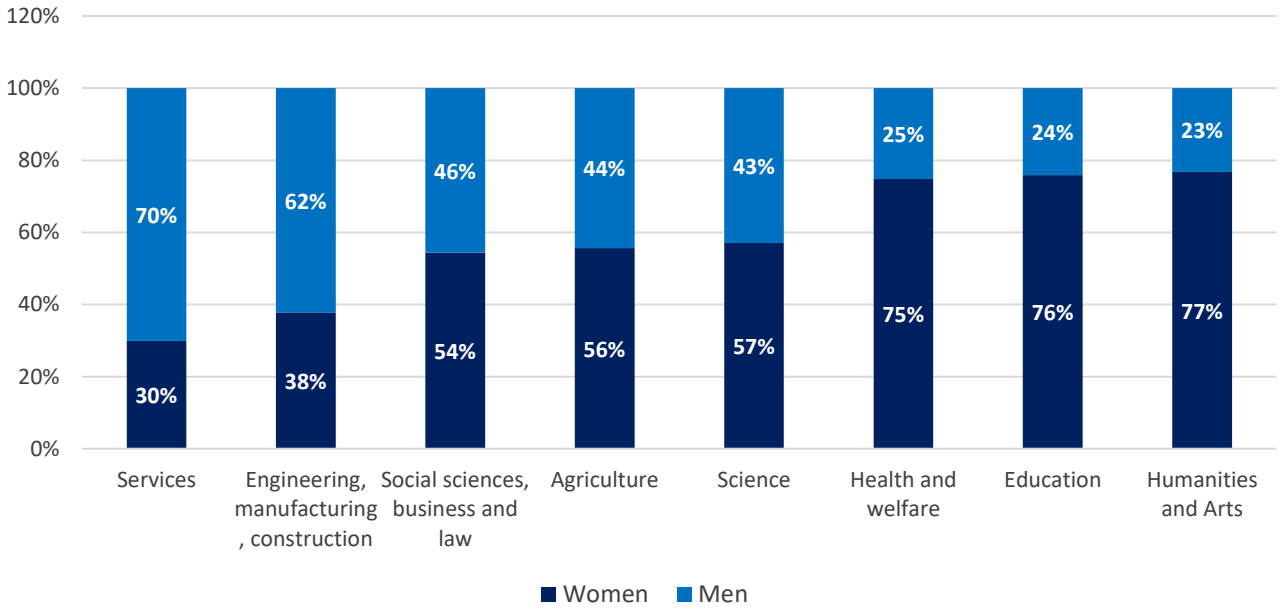
Graph 2. The gender distribution of scientific advisors of doctoral students, Georgia



Here, once again the gender imbalance is palpable. The backdrop of this statistics is the fact that the share of female PhD graduates in Georgia averaged 58% in the last and has not exhibited much variation between 2015-2023. These results suggest that the problem in Georgia's academia is not so much with the accessibility doctoral education. The gender disbalance mainly affects the areas of influence and power in the academic world.

As far as the fields of study for doctoral graduates are concerned, here we have ample evidence that a number of fields suffer from moderate to severe gender disbalance.

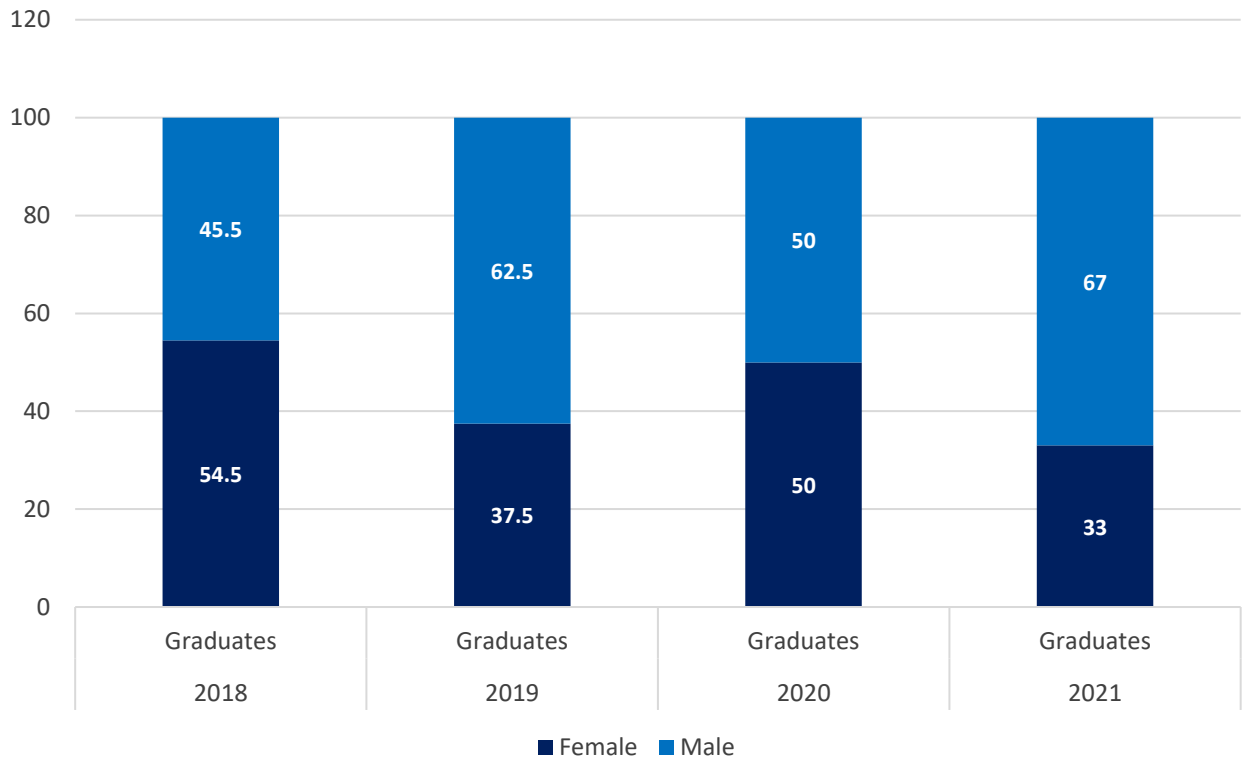
Graph 3. The gender distribution of scientific advisors of doctoral students, Georgia



In Georgian PhD programmes the disbalance affects the fields of Education, Health and welfare, Humanities and Arts. These programmes have a disproportionately high share of females seeking doctoral degrees. Science, Agriculture and Social sciences are in the middle category, but tilted towards female graduates. Engineering and Services are the fields dominated mostly by male graduates.

In Armenia there is much less available data to judge the extent of gender disbalance in academia. We only have access to the most general statistics, like the number of women among graduates of the Doctor of Science (i.e., the highest degree that can be obtained at the second stage of doctoral studies).

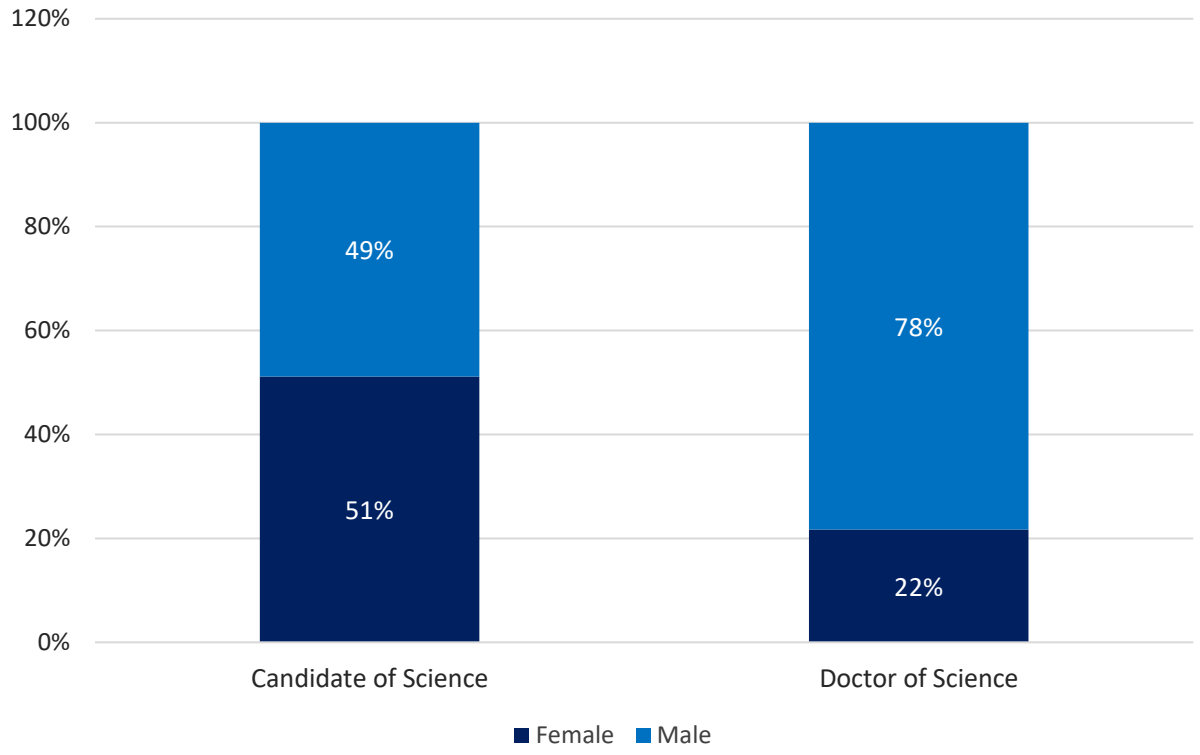
Graph 4. Gender distribution of doctors of science, %, Armenia



The data shows that the while the share of women fluctuates over the years, there is some evidence of a downward trend. At the same time there is a tendency towards higher share of women among the post-graduates (PhDs, or Candidates of Sciences), and women consistently command a much higher share (69% average) among the MA degree graduates.

Among the researchers who work in scientific fields, women who hold a Candidate of Sciences degree (PhD) comprise 51% (broadly in line with 50% of female graduates in this degree category), while the share of female Doctors of Sciences who work in research drops dramatically to 22% (as compared to 43% of graduates from D.Sc. programs).

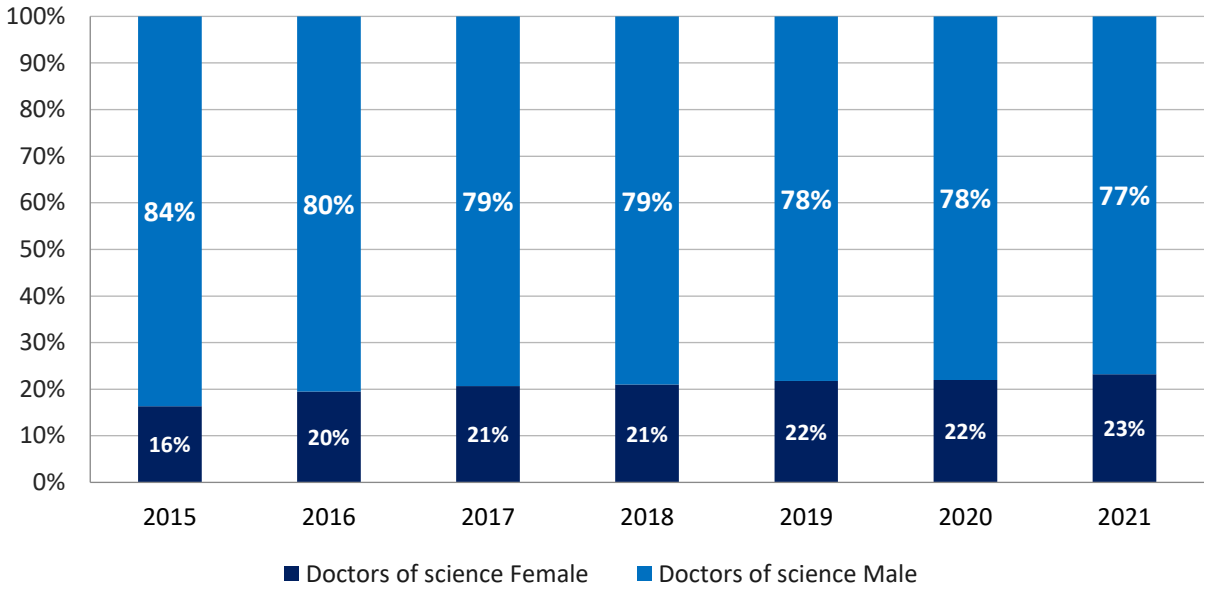
Graph 5. Gender distribution of specialized-researchers having scientific degree and implementing scientific-technical work, average 2018-2021



Unfortunately, there is no data on the gender distribution of DSc. or PhD holders according to the fields of sciences.

In Azerbaijan, like in Georgia and Armenia, there is a higher share of women either studying for or graduating from PhD programmes. When compared to Armenia, Azerbaijan has a higher share of females studying for the DSc. programmes (47.9% vs. 41.5%). However, when it comes to people engaged in research work, the shares of females who are Doctors of Sciences drops dramatically and looks remarkably similar (20,6% in Azerbaijan vs. 22% in Armenia). As for Candidates of Sciences/PhDs doing research work, the numbers are also similar in both countries (49.3% in Azerbaijan vs. 51% in Armenia).

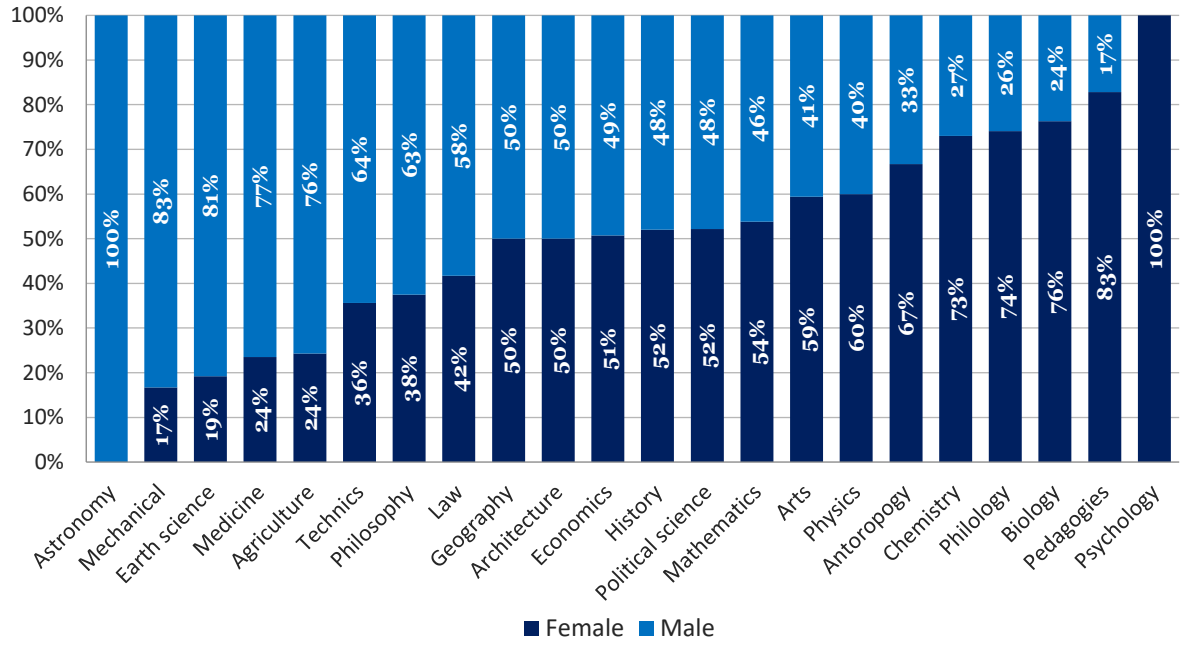
Graph 6. Gender distribution of doctors of science: number of employees engaged in research and development works



This points to the possibility of significant barriers women face when trying to apply their scientific knowledge and engage in scientific research or an academic career. Georgia does not have similar statistics, but we know that a share of PhD graduates (58%) is higher than in Armenia and, most probably, in Azerbaijan.

In Azerbaijan, we also observe the data on the gender segregation in different fields of sciences. When we look at the students who are studying in Doctor of Sciences programmes, it is interesting that females have a disproportionately lower share in such fields as Astronomy, Mechanical Engineering, Earth Sciences, Medicine, Agriculture, Technology, Philosophy and Law. The fields that have 59 to 100 percent female DSc students include Arts, Anthropology, Philology, Biology, Pedagogy, Psychology, but also, interestingly, Physics and Chemistry.

Graph 7. Gender distribution of students studying on DSc program by fields of science the beginning of 2022



The most "equal" fields are Geography, Architecture, Economics, History, Political sciences, and, interestingly, Mathematics.

Scientific output of women and men in academia in the South Caucasus – a cross-country comparison

A "glass ceiling" in academia can also be evident when comparing scientific outputs of men and women across fields (or within the same field). Gaps in scientific output between men and women can point to a situation where women face barriers to become part scientific collaboration groups or grant applications; another possibility is that women, more often than men, face competing demands on their time, thus leaving less time for research. Studying patterns of scientific output gaps, especially in cross-country settings, can give policy makers and university administrators a better picture of where the interventions may be needed to achieve higher gender equity in academia.

To compare scientific output by men and women in the three countries of the South Caucasus we use a Scopus database of authors, which can be sorted by the number of peer-reviewed publications associated with each author, as well as author's institutional and country affiliations. The gender of each author is determined by the full name provided in Scopus database (in case only last name and initials are available, an attempt is made to determine the gender by the last name. If the gender of the author cannot be determined, the observation is

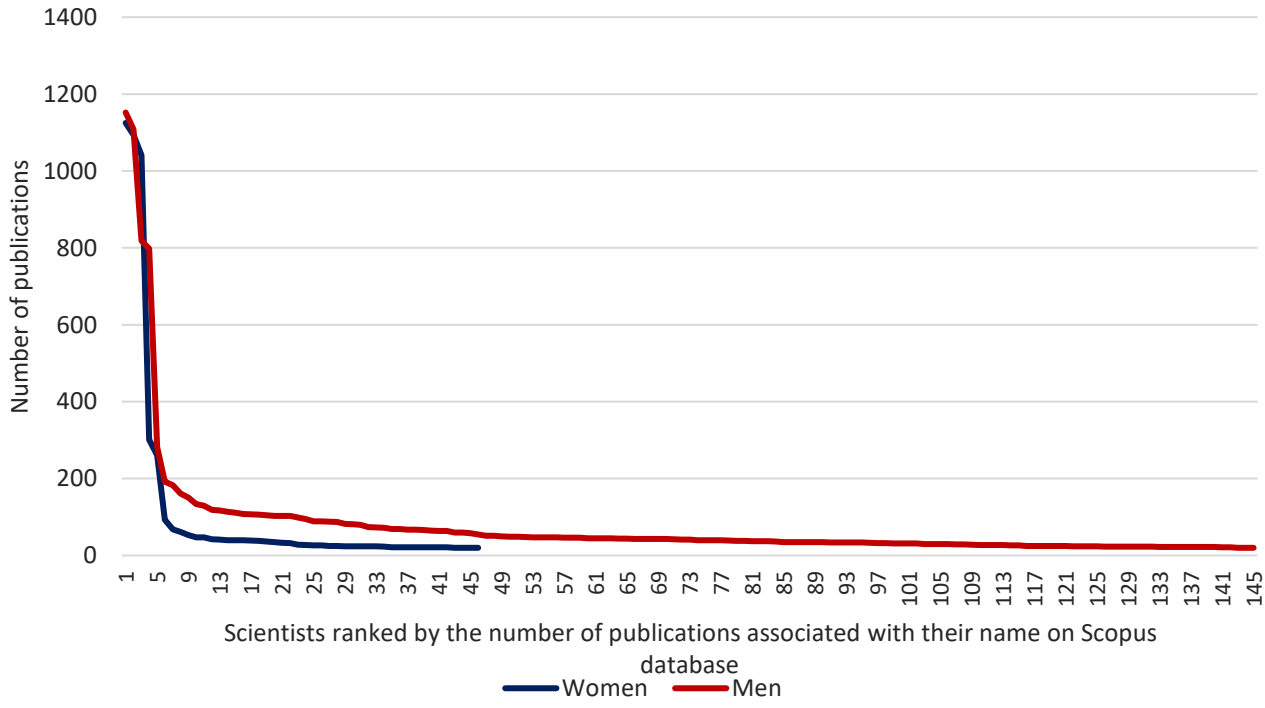
dropped). To illustrate the gender gap problem of scientific productivity in academia, we select the top publishing authors in each country[1] (those with no less than 20 publications associated with their name on Scopus database).

The results for Georgia, Armenia and Azerbaijan are quite different and, in some way, illustrate different aspects of scientific productivity gaps in these countries.

In Georgia, among the authors with at least 20 publications in Scopus, only 24% are women (notably, this result is very similar to Ukraine, where 26% of authors in this category are women). However**, in this category women are associated with 31% of published articles.** But if we select the authors who have less than 20 but at least 5 publications, women comprise 47%. Moreover, the output gap closes completely for this category, with women associated with 47% of published articles.

Distributional analysis of the top publishing authors reveals (see graph below) that this is due to the fact that there are some (very few) women scientists who publish on par with their male colleagues, but the productivity gap opens wide after the first few top publishing authors.

Graph 8. Georgia – distribution of publications among scientists with at least 20 publications

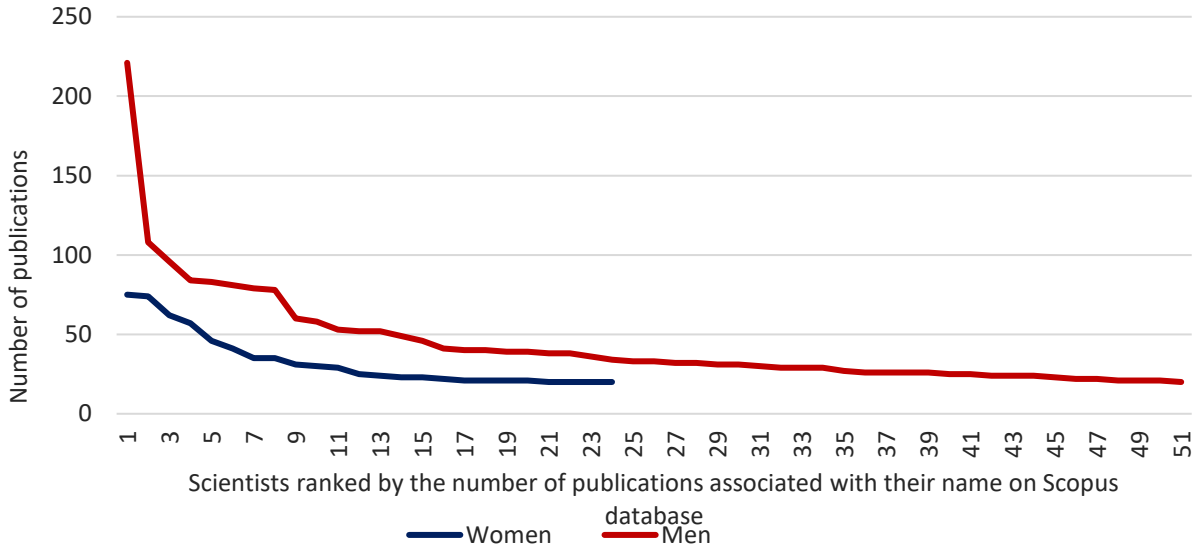


In Armenia the situation is somewhat different. Here **women account for 32% of authors with at least 20 publications** in Scopus database. They are also associated with somewhat lower

[1] Note: "top publishing" according to Scopus database.

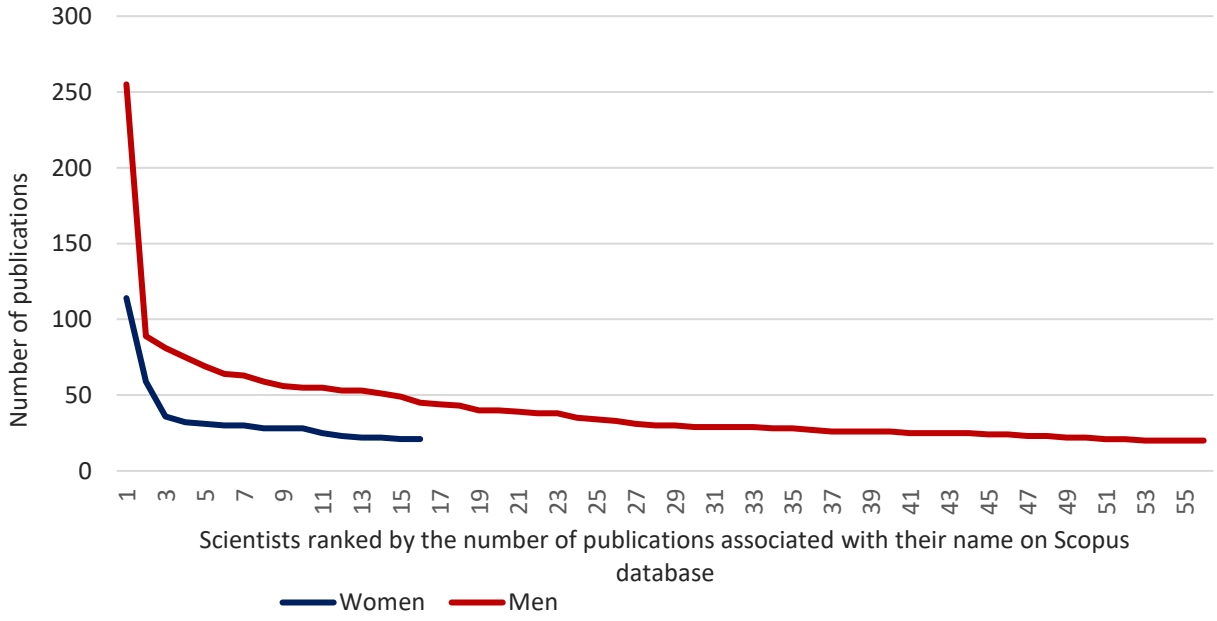
share of publications for people in this category (26% of the total). This means that the scientific output gap, unlike in Georgia, starts early (see graph below).

Graph 9. Armenia – distribution of publications among scientists with at least 20 publications



In Azerbaijan the distribution of productivity among men and women is somewhat similar, except that the share of women in the top publishing category is lower than in Armenia and similar to that of Georgia - **women comprise 22% of scientists with at least 20 publications while the share of publications associated with women is even lower, 19%.**

Graph 10. Azerbaijan – distribution of publications among scientists with at least 20 publications



Thus, the observed scientific output gap among the top publishing authors appears to be larger in Azerbaijan than in other South Caucasus countries.

One may argue that the scientific output gap may be mostly driven by the fields of study. For example, in the Physics and Astronomy fields scientists typically work in large groups in can be associated with hundreds of articles, whereas in Economics and Social sciences such high output is not expected. If there are less women in Physics, it may be natural for the "gap" to emerge among the top publishing authors in any given country. This can be checked if we compare scientific output of men and women across different fields of study[2].

For illustrative purposes we look at the case of Georgia and find surprising results. First, we notice that in the field of **Physics, women comprise only 23% of publishing scientists, but are associated with 39% of scientific output**. This field is an exceptional case in Georgia and may be driven by a few top women in the field.

There are fields where women's presence and their share in scientific output is lopsided: for example, in **Chemistry women comprise majority, or 52% of publishing authors, but are associated with only 33% of scientific output**. The same is the situation in Biochemistry, Genetics and Molecular Biology (women 53% of authors, but associated with 29% of output).[3]

There are also fields where women's scientific output is about 10 percentage points below their share in the total number of authors. Among these fields are Engineering, Materials and Chemical Engineering (42% percent of authors and 33% of output), Mathematics (20% percent of authors and 10% of output); Medicine (65% percent of authors and 52% of output).

Among the most "equitable" fields in terms of both shares of authors and their share in scientific output are Economics and Social Sciences (38% percent of authors and 34% of output); Earth and Planetary Sciences (26% percent of authors and 20% of output); Environmental Sciences[4] (63% percent of authors and 64% of output).

Naturally, the first questions to ask is what are the drivers behind the gap in scientific productivity as well as power gaps between men and women in academia? Below we explore this issue.

[2] We compared scientists who have at least 5 publications in Scopus in Georgia.

[3] It is interesting that in Arts and Humanities we encounter a similar albeit less severe lopsided results, which can be driven by small sample (women are 56% of authors, associated with 49% of output). A similar situation is detected in Computer sciences field (women are 56% of authors, associated with 44% of output). Here one must once again note that there are only 8 men and 10 women listed as publishing in this field on Scopus, and as the number of authors is small, this can bias the results.

[4] Note that the results for this fields may again be somewhat biased due to low numbers of authors.

Reasons behind disbalance of power and fields of study in academia/higher education in the South Caucasus.

Overall, in the South Caucasus we observe gender disbalance across the fields of education and gender disbalance in the positions of power and influence in academic institutions. Unfortunately, the studies on the root causes of gender inequalities in this area for the South Caucasus have been few. However, there are a number of papers that shed light on the attitudes and perceptions of people in academia through interviews and small-scale surveys. For Armenia, studies note that the prevalence of women in higher education on lower level (first and second degree of studies, such as BA and MA) can be explained by the perception of higher education for women as a sort of a "dowry item" – a signal of higher status and quality of the girl and her family. A small survey[5] of teaching and research staff in Armenian universities revealed that 86.2% of respondents responded "no" to the direct questions whether there exists gender discrimination in Armenian universities. About 19% of female respondents thought that gender discrimination existed in this context, while 0% of male respondents thought that way. At the same time, 72% of respondents did not think that equality in gender composition in academia is important or very important (all those who thought it was important were female respondents).

Such perceptions make clear that lack of awareness of gender inequality can in itself be a product of the existence of such inequality. The idea that gender inequality does not exist implies that the prevalence of men in leading positions simply reflects their higher motivation, higher ability and perseverance rather than inherent social privileges. This idea is fundamentally flawed.

Sociological studies (Babayan, 2001) point out that while obviously laws and regulation declare formal equality of women and men in education and further in academic career, the cards are still stacked against women due to the implicit social "gender contract" where "professional interests of women should not compete with family interests" (ibid), and care for family/children should hold the first place in their personal hierarchy of values. Meanwhile it is clear that men are not bound by such expectations, and for them professional advancement can be prioritized over engagement with family and/or domestic care work. Thus, men and women who enter higher education are already on different levels on a professional playing field. Women pursuing higher levels of education and competitive academic careers have to work hard for their professional success while at the same time standing up against the power of social judgement. The fact that very few women reach the top in the hierarchy of power in academia is a testimony of the enormous difficulties of such a struggle, leading women to lose motivation and be discourages from pursuing this life path, opting for not investing further in their human capital despite natural abilities and inclinations.

[5] The Survey covered 29 people.

Another study discussing the case of Azerbaijan argues that the barriers towards higher participation of women in academia, especially in the positions of power, has to do as much with cultural barriers and perceptions as well as demands of the academic field. Specifically, "if male and female applicants are under evaluation for a PhD degree, male applicants are preferred" and "women encounter specific difficulties in trying to earn a PhD degree or forging careers in academia. The process of earning PhD demands very important sacrifices; forcing someone to push forward, spend unlimited energy, make enduring efforts, and exclude private life" (Aghayeva, 2012).

RECOMMENDATIONS FOR POLICY INTERVENTIONS

For enhancing female presence and power in various academic fields, recommended policy interventions can be once again categorized along the two dimensions: 1) addressing the gender imbalance in higher education across fields of study and 2) addressing the under-representation of women in higher academic position.

In the existing literature, the possible policy interventions focused on the first issue aim to increase the interest of girls and women in STEM fields put a large emphasis on exposing children to science and mathematics subjects in early childhood, encouraging schools to implement targeted interventions aimed at enhancing skills that are correlated with success in STEM, such as language and spatial abilities. Furthermore, to actively promote STEM subjects among female students and recognize and celebrate their achievements. According to UNSECO, to create an inclusive learning environment, countries should strive to develop curricula that are free from gender stereotypes and purposefully represent women in STEM fields. Additionally, to re-train teachers to have the same attitude and expectations towards boys and girls in STEM related subjects (UNESCO, 2019) (UNESCO, 2021).

To promote women representation in high rank academic positions the literature suggests that it is important to first have the legislative base supporting women in work-life balance[6], addressing gender-based violence in academic settings, and equal pay issues that will lay the necessary foundations for women's success (Anthia & Lewis, 2018; Bondestam, F. & Lundqvist, M. 2020a, b).

A more specific policy suggestion focuses on hiring and promoting practices that are advised to be evaluated based on both qualitative and quantitative measures. As during the early stages of their careers, women often shoulder most childcare responsibilities, it can impede their advancement in academia when solely quantitative metrics like publication counts or citations are takin into account. It is suggested to strike a balance by incorporating qualitative performance

[6] For the work-life balance, EU has adopted a Directive (Directive (EU) 2019/1158) that supports achieving a work-life balance by encouraging more equal sharing of parental responsibilities between men and women.

measures such as peer evaluations, teaching assessments, and community engagement. This holistic approach would provide a more comprehensive perspective on academics' contributions to their respective fields and foster an inclusive and diverse academic community (UNESCO, 2023).

In the realm of policy measures aimed at the academic sector, the most important factor is to establish monitoring systems that gather data on the representation of women and men at different stages of academic careers. This is crucial because the factors contributing to gender inequality in academia exhibit considerable variations among countries, Higher Education Institutions (HEIs), and over time. By implementing monitoring systems, it becomes possible to identify the specific areas where gender gaps exist and to devise tailored policies that effectively address these disparities (UNESCO, 2023).

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