Gender Gap in Academic Research

Nora Taravari[1][*], Hava Rexhepi[1], and Zineta Asani[2]

[1] Mother Theresa University Skopje, North Macedonia

[2] Fon University Skopje, North Macedonia

ARTICLE INFO	ABSTRACT
	North Macedonia scored 62 points in 2019 and 64.5 points in 2022 on Gender Equality Index. More significant changes can be observed in the domains of Power (+6.0), Knowledge (+2.8) and Money (+2.2). No progress in the domain of Time due to lack of new data and only an insignificant change. In the domain of Health (+0.1). If this pace is continued, the country will need ~57 years to achieve full gender equality. This paper aims to analyze gender disparities in academic research, comparing North Macedonia's progress to global trends and benchmark countries. Using mixed-methods approach, primarily quantitative, to analyze the gender gap in academic research in North Macedonia, the findings derive from secondary data, statistical trends, representation analysis, and cross-referencing. Key research constraints include limited data availability and disciplinary differences, as some academic fields may experience greater gender disparities than others, necessitating further sector-specific studies. Findings show that North Macedonia has made significant progress in closing gender gaps in education, with women surpassing men in tertiary enrollment and postgraduate degrees. However, disparities persist in academic research, particularly in leadership roles and STEM fields. While North Macedonia has made great strides towards gender equality in education and research, sustainable efforts are needed to eliminate structural barriers. Entrenching gender-sensitive policies, fostering inclusive research cultures, and granting equal access to funding and leadership roles will be crucial in bridging the gender gap and furthering real equality in academic research.

1. Introduction

According to Cambridge Dictionary, Gender gap refers to the "difference between the way men and women are treated in society, or between what men and women do and achieve" (Cambridge University Press, n.d.). Those differences are represented across entire spectrum of professions, industries, reflective of bias, distorted perceptions, opportunities, and

acknowledgments – both tangible and intangible. While it is hardly likely to achieve a perfect gender balance in all professions, and some are still perceived as a "typical male" or "typical female" professions, it is challenging to learn of the imbalances in areas where both men and women are equally educated for a certain job.

North Macedonia published two Gender Equality Index editions that allow to monitor the progress over time. It scored 62 points in 2019 and 64.5 points in 2022. More significant changes can be observed in the domains of Power (+6.0), Knowledge (+2.8) and Money (+2.2). No progress in the domain of Time due to lack of new data and only an insignificant change In the domain of Health (+0.1). If this pace is continued, the country will need ~57 years to achieve full gender equality. North Macedonia drew closer to the EU scores and is now just 3.5 points behind the EU-27 (2021) average. In the domain of Power, the country has a 3.6 points higher score than the EU average. More work needs to be done in domains of Money and Time, which are respectively by 18.1 and 9.1 points behind the EU average (European Institute for Gender Equality, n.d.).

Kellie Hanna (2023), in her study "Gendered Jobs: Exploring Career Stereotypes," surveyed over 1,000 participants in the United States and consulted gender and labor statistics to explore perceptions and realities of gender imbalance. The study found that, in 2022, women made up slightly more than 58% of the labor force in the US, yet only around 6.5% were employed in male-dominated occupations. Globally, male-dominated industries include construction, vehicle technicians, and carpentry, where women's participation is only 1–2%. Societal beliefs often suggest that men are better suited for pilots, firefighters, and electricians, while women are seen as more suitable for preschool teachers, nursing, and secretarial roles. In these female-dominated professions, men represent at most 10% of the workforce (Hanna, 2023).

But what if the research focuses on high education levels and respective achievements, instead of the particular professions? According to findings published on AXIOS, following research in gender gap and research (Knight, 2024), latest Elsevier report acknowledges progress in women representation in research, compared to 20 years ago, but the gap still exists: "women now represent 41% of researchers globally, but serious challenges persist in gender equality in research and innovation" (Elsevier, n.d.-a). In addition, the Report reveals disparities per countries, and it is noteworthy that the research does not include all countries, but only those for which data was available and comparable, omitting countries with lack of continuity or extent of data, including many small countries, but also the country with second largest population in the world - China.

Another relevant strand of literature connects gender disparities with brain drain. Research shows that many highly educated women from the Western Balkans migrate for better academic and professional opportunities, a trend described as a "female brain drain" (Petreski & Jovanovic, 2021). According to the World Bank (2019), such migration reduces the domestic pool of female researchers and deepens inequalities in academic leadership. This perspective helps situate the North Macedonian case within broader regional and global dynamics.

A broader engagement with regional and international literature, particularly comparative studies from neighboring Western Balkan countries, would further strengthen the theoretical foundation of this research.

The purpose of this paper is to explore gender disparities with respect to academic research, using comparative approach of the available statistics for the selected world countries, and the data on North Macedonia. In particular, the research objectives are to: (1) analyze the extent of gender disparities in academic research in North Macedonia, (2) compare national trends with selected global benchmarks, and (3) identify structural and cultural factors that contribute to

persistent inequalities. This clearer framing of purpose and objectives sets the foundation for the research.

2. Methodology

Researching gender balance in North Macedonia is essential for identifying challenges, and crafting policies that promote opportunities and approaches to close the gender gap. By addressing these challenges, North Macedonia can create a more prosperous and harmonious society that supports its growth and integration into the European community.

This study employs a mixed-methods approach to explore the gender gap in academic research in North Macedonia, combining predominantly quantitative methods to provide a comprehensive analysis. The research is based on the analysis of the available secondary data, published by the World Bank, Center for Research and Policy Making, OECD, EUROSTAT, Ministry of Labor and Social Policy, State Statistical Office, as well as distinguished institutions and publishers. The data was collected by approaching the above-mentioned institutions or researching their publications databases and official reports. The collected information includes statistics published within last 5 years, to allow also for pre-pandemic and post-COVID insights, following assumptions that many aspects of academic life were challenged and affected by the pandemic, including the research overall.

Data processing included statistical trend and representation analysis, as well as cross-referencing of the information to arrive at a conclusion that would allow for a better understanding of the explored issues and the establishment of a baseline to be used in further creation of policies to address the issues and offer solutions to the socio-economic challenges.

Note on Qualitative Data Collection: While semi structured and structured interviews and focus groups with a sample of 30-40 researchers from universities in the country would be beneficial, there were limitations to this approach that include potential sample selection and respective bias in data collection and interpretation. Although qualitative data collection was limited, future studies should include in-depth interviews and focus groups to capture lived experiences and structural barriers faced by women in academia, thereby strengthening the overall credibility of the findings.

Qualitative approaches would allow the research to go beyond numerical trends and capture the lived experiences, perceptions, and barriers encountered by women in academia. For instance, semi-structured interviews with female researchers in STEM could reveal how institutional culture, workload distribution, or informal networks affect their career progression—factors that remain invisible in quantitative data. Incorporating such methods in future research would not only increase credibility but also provide more nuanced and actionable insights for policymakers.

In addition, it is noteworthy to acknowledge the limitations to this research that derive from: a) Data Availability: Limited information and access to statistics; and b) Disciplinary Differences: Some academic fields may have greater gender disparities than others, requiring further sector-specific studies.

3. Results

Gender disparities persist in various sectors globally, and academic research in North Macedonia is no exception. While the country has made strides in promoting gender equality, significant gaps remain in the realm of academic research.

With respect to educational attainment, North Macedonia has achieved commendable progress in educational attainment among women. According to the 2018 World Economic Forum's Global Gender Gap Report (World Economic Forum, 2018), the country ranks well above average on educational attainment and health indicators. Notably, North Macedonia, along with Serbia, boasts a higher share of female students in natural sciences, mathematics, and statistics compared to other Western Balkan economies.

In line with the above, is the Census of 2021 which reflects that of 29,654 citizen with master degree 16,796 were female, however, only 2,923 female of 6,037 citizen with PhD (State Statistical Office of North Macedonia, 2022).
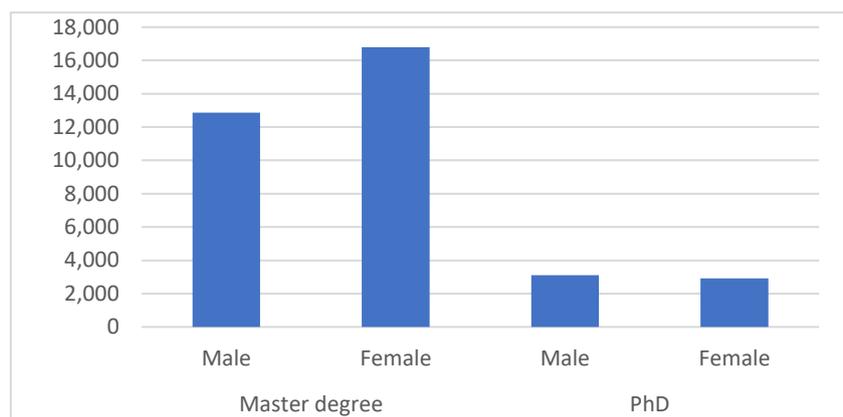
Figure 1. Census 2021 - gender and tertiary education data
Source: State Statistics Office

The 2023 Statistics Office report indicates that in higher education, year after year, more women are enrolling at universities (State Statistical Office of North Macedonia, 2023). This tendency is also visible at the postgraduate and doctoral levels, where female participation continues to rise. Furthermore, the same gender ratio is reflected among graduates across the first, second, and third cycle of studies, confirming the consistent predominance of women throughout all stages of higher education. (State Statistical Office of North Macedonia, 2023).

A gap exists for both men and women at all levels of educational achievement. Women outnumber men in both low and high educational attainment level which is termed as negative gap. On the contrary, men dominate the mid-level education ensemble. In 2020, the gap was 9.3 percentage for the males in the lower quarter, 13.1 deficit midterm for the females, and 3.9 over for the high achievers. There is also some evidence that the proportion of women and men with low levels of education is falling over time and this is being accompanied by an increase in the other two categories (Risteska, 2022).
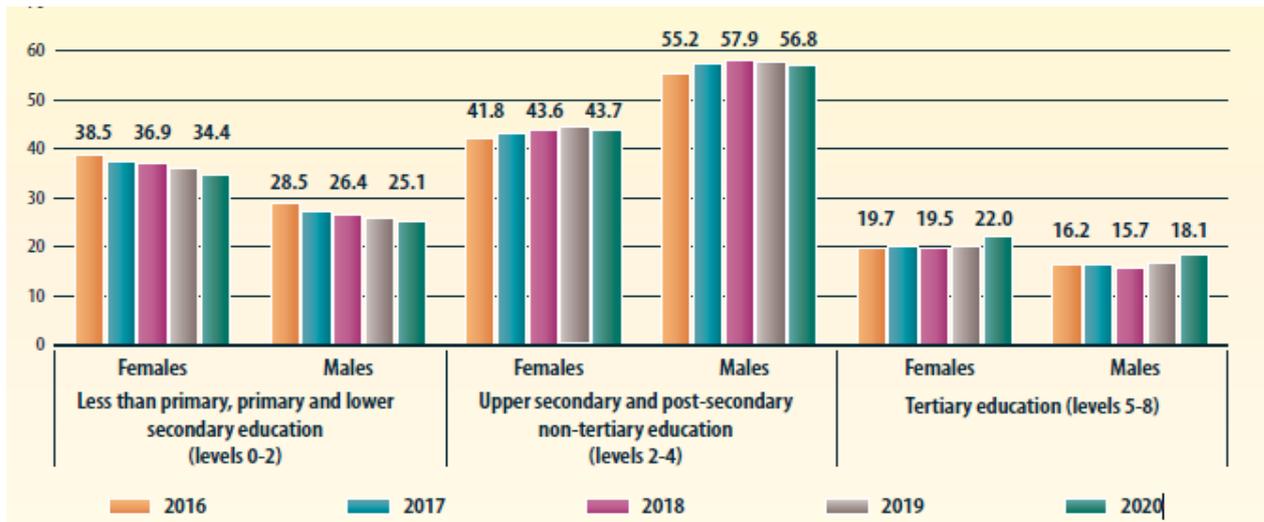
Figure 2. Education gap by gender
Source:. (Risteska, 2022)

In 2021, 41.1 per cent of women aged 25-34 had completed tertiary education, compared to 30.3 per cent of men, and compared to 28.5 per cent of women and 21.8 per cent of men in 2011.323 The situation is similar in postgraduate education, with women representing 60 per cent of all graduates with master's degrees, and 61 per cent of all PhD graduates in 2021 (State Statistical Office of North Macedonia, 2023).

According to Ministry of Labor and Social Policy, there is no even distribution of women with tertiary education when it comes to different professions, with only few aiming at STEM fields. Women are predominantly represented in education, humanities, and social sciences, whereas men are more likely to choose disciplines such as information and communication technologies and engineering, which are associated with higher income and career growth opportunities. However, the gender gap in STEM enrollment has been gradually narrowing in recent years as more women choose STEM fields for their future careers. Positive measures, such as awareness campaigns and scholarships for women in STEM, may have contributed to these changes, as well (State Statistical Office of North Macedonia, 2022).

The Eurostat data on Proportion of women scientists and engineers compares the EU average with the individual EU and non-EU countries, including North Macedonia, marking significant growth from 2012 to 2020, although having 2020 data below 2019 (probably due to the pandemic), yet even higher than the average of 41%, as can be observed by the Figure 3.
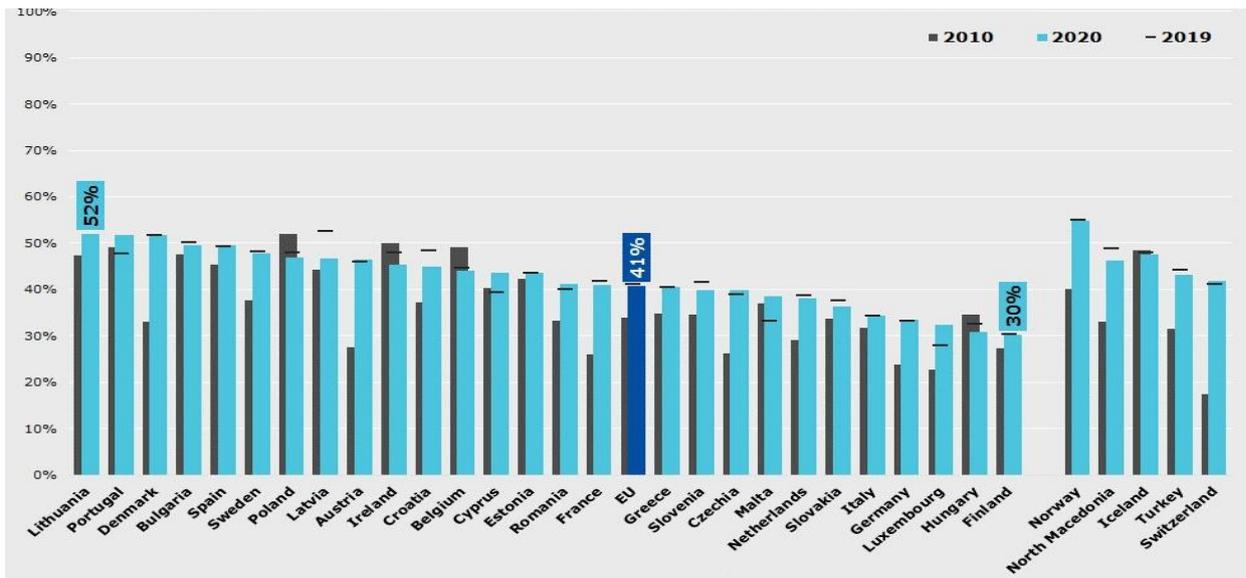
Figure 3. Proportion of women scientists
Source: Eurostat

World Bank, in its Country Gender Assessment for North Macedonia acknowledges increasing rates of female enrollment in tertiary education and a "positive" gender gap: "The most significant gender gap is observed in tertiary education, where women dominate with a gross enrollment rate of 50.6 percent in 2020, compared to men at 35.9 percent. Despite this, North Macedonia ranks fifth in the Western Balkans in terms of tertiary enrollment rates for women" (The World Bank, 2023).
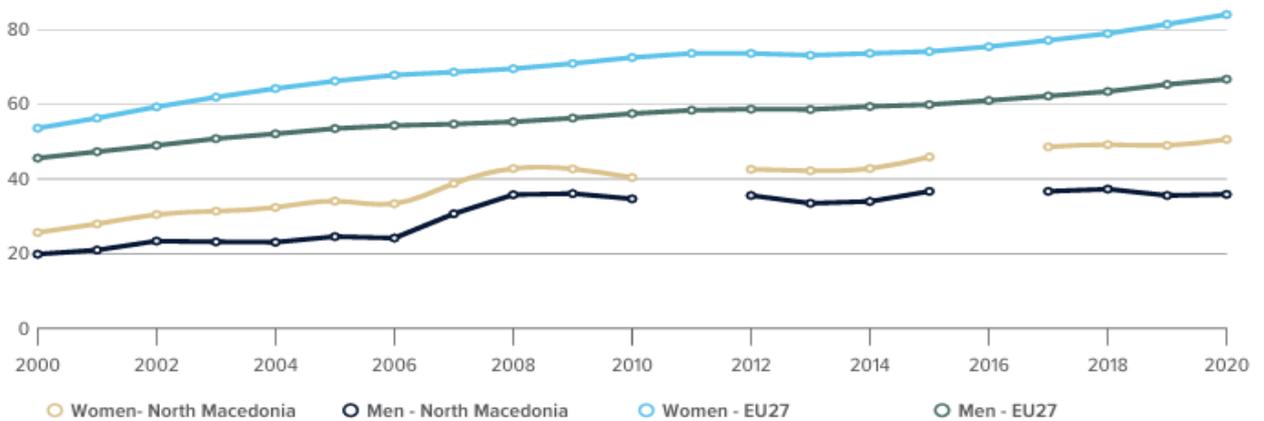

Figure 4. Enrollment rates in tertiary education
Source: World Bank Gender Data portal (2024)

The "Progress towards Gender Equality in Research & Innovation – 2024 Review" on the other hand reveals trends in the world that are to high extent reflective or comparable with those in North Macedonia, both in terms of increased numbers of women in tertiary education, and research, as well as their underrepresentation in particular professions. In addition, the Report identifies obstacles to "keeping up" with male, deriving from the "traditional" role of women in raising children and devoting to family (Elsevier. (n.d.-b).

Exploring available data, the same report includes information that women are represented on Scopus (data from 2022), with their research publication only by 35%, either as authors or co-authors. This has further adverse effect since the publications by men are more cited compared to the publications by women, according to the same Report. On a positive note, that tendency disappears as careers advance. Ultimately, women dominate the researcher pool among several UN SDGs: education, gender inequality, reduced inequalities, and peace and justice.

Unfortunately, the report does not encompass any of the Western Balkan countries, as that would provide for further comparison with countries with which North Macedonia shares history, but also demonstrates similarities in cultural, educational, political, and socio-economic background.

Since 2012, the European Commission's strategy on gender equality in R & I in the ERA framework (European Commission, 2020a) has been underpinned by three objectives:

    1. fostering gender equality in scientific careers;
    2. ensuring gender balance in decision-making processes and bodies;
    3. integrating the gender dimension into R & I content, that is taking the biological characteristics and the social features of women and men into account (European Institute for Gender Equality, 2022).

Table 1 provides an overview of selected EU and non-EU countries and North Macedonia, on women researchers in all sectors (Eurostat, n.d.-a).

Table 1 . Share of women researchers, all sectors

Time	2019	2020	2021	2022
Greece	39.57	39.29	38.16	39.86
Spain	39.85	39.9	39.75	39.56
France	:	:	:	:
Croatia	47.54	48.04	48.27	47.33
Italy	34.5	35.12	36.15	36.37
Romania	46.28	46.79	45.36	45.22
Slovenia	32.3	32.71	33.83	34.69
Slovakia	39.21	39.76	38.6	37.78
Iceland			42.29	42.86
Bosnia and Herzegovina	51.29	48.8	50	
Montenegro	51.37	:	:	:
North Macedonia	56.36	56.59		57.3
Albania	:	:	:	:
Serbia	52.14	53.04	52.47	52.81
Türkiye	33.91	34.29	34.3	34.39

Source: Eurostat

Furthermore, the Table 2 provides and overview of specific areas of interest and occupation for female researchers (UN Women, 2025).

Table 2. Female researchers full time (2020)

Field of Science	Total	Females	Share (%)
Total	1,639	924	56.38%
Natural sciences	357	257	71.99%
Engineering and technology	281	104	37.01%
Medical and health sciences	181	126	69.61%
Agricultural sciences	106	50	47.17%
Social sciences	458	227	49.56%
Humanities	256	161	62.89%

Source: Eurostat

Following the same source, as observed in gender participation in the economic sector and education, women's involvement as researchers in Engineering and Technology fields was also low. Within country investment proportions for research projects, in 2022 the bigger portion of grants were given to Medical and Health Sciences while Environment and Climate Change received the greatest average value of the research grants. There is no available data on the grants disbursed to determine whether there was equal funding for female researchers, and most interviewees had the impression that a gender funding disparity exists.

When it comes to representation in Academic Research, "despite high levels of educational attainment, women are underrepresented in senior academic positions and research leadership roles". The European Research Area (ERA) Platform's Country Report for North Macedonia (European Commission, 2023) acknowledges that gender equality as a principle in all private and public sectors and decision-making bodies has been enshrined in the Constitution, the Law on Equal Opportunities of Women and Men (LEO) with its changes adopted in 2014 and the Strategy on Gender Equality 2022-2027 along with the Action Plan for the period 2022-2024. However, the same report indicates that no specific actions or measures have been proposed by national authorities regarding gender equality in research and development. This lack of targeted policies may contribute to the continued underrepresentation of women in academic research. The absence of R&D-specific actions addressing gender equality suggests a need for comprehensive policies to promote women's participation in academic research. The ERA Platform's report highlights that, as of 2023, North Macedonia had not committed to specific ERA Actions related to gender equality in research. Implementing targeted measures, such as mentorship programs, equitable funding distribution, and gender-sensitive hiring policies, could help bridge the gender gap in academic research.

However, according to UNESCO data for 2019, Macedonia is the leader in Europe according to the share of women-researchers out of the total number of researchers in the country. More than a half i.e. 52,3% of all researchers in the country are women. Nevertheless, out of 35 regular and associate members of the Macedonian Academy of Sciences and Arts (MANU), only 5 are women, which is around 14% of MANU's total membership (Meta.mk, 2023).

4. Discussion

North Macedonia has been successful in closing gender gaps in education, with women outperforming men in tertiary education enrollment and postgraduate degrees. This positive trend is reflective of broader worldwide efforts of gender equality in academia. Although progress has been made, disparities in academic research persist, particularly in leadership roles and STEM research. While more and more women enroll in higher education, they remain underrepresented in certain occupations, reproducing traditional gender segregation in the labor market. A more granular analysis of the interplay between national policies, institutional practices, and societal expectations is required to fully grasp the persistence of gender disparities, especially in leadership and STEM fields.

The underrepresentation of women in STEM disciplines and research leadership is fueled by a number of factors, including societal expectations, career progression barriers, and unequal access to research funding.

The results suggest that the transition from education to research careers is a critical bottleneck. Although women dominate among graduates, their representation decreases significantly at the doctoral and post-doctoral levels, indicating structural barriers in career progression. Furthermore, analysis of funding distribution and publication impact points to systemic disadvantages for women, which perpetuate inequality even when entry into research is relatively balanced. These findings emphasize that policies limited to increasing female enrollment are insufficient; instead, comprehensive measures addressing retention, promotion, and visibility of female researchers are necessary.

For example, while women accounted for more than 60% of master's degree holders in North Macedonia in 2021, they represented only around 14% of the members of the Macedonian Academy of Sciences and Arts. This striking contrast illustrates how educational achievements do not automatically translate into senior academic representation. Compared to regional peers

such as Serbia and Croatia, where women also outperform men in higher education but remain underrepresented in research leadership, the North Macedonian case reflects a wider structural challenge across the Western Balkans. If these gaps persist, the country risks losing a significant portion of its highly educated female talent, undermining both academic productivity and the broader goals of social and economic development.

While initiatives such as awareness campaigns and scholarships have contributed to the gradual increase in women's participation in STEM, there remain challenges to giving women equal opportunity in research. Moreover, gender disparities in research output and citation indicate that female researchers must also overcome more barriers to get their research noticed. Although North Macedonia is a leader in Europe in the proportion of women researchers, women are underrepresented at higher academic ranks. National policies promote gender equality, but a lack of specific targeted policies in research and development may be an inhibitory factor. Reducing this gap must be tackled with multi-dimensional strategies that include mentorship programs, equitable research funding, and institutional reforms to support women's career advancement in academia.

From a policy perspective, three directions appear crucial:

1. **Institutional reforms** – Universities and research institutes should adopt transparent promotion criteria and gender-sensitive evaluation procedures that prevent bias in hiring and advancement.

2. **Targeted funding** – Establishing research grants and fellowships specifically for women in underrepresented fields such as engineering and ICT would mitigate the funding gap and encourage long-term participation.

3. **Mentorship and networking programs** – Creating formal mentorship schemes and regional research networks for female scholars would strengthen career development opportunities and improve international visibility.

By implementing such measures, North Macedonia can move from formal commitments to tangible outcomes, ensuring that women's growing educational attainment translates into equal opportunities and representation in the academic research sector.

Last but not least, while North Macedonia has made great strides towards gender equality in education and research, sustainable efforts are needed to eliminate structural barriers. Entrenching gender-sensitive policies, fostering inclusive research cultures, and granting equal access to funding and leadership roles will be crucial in bridging the gender gap and furthering real equality in academic research.

5. Conclusion

North Macedonia's experience illustrates both significant progress and ongoing challenges in promoting gender equality in academia. Women now surpass men in higher education achievement, yet their presence in research careers and leadership roles remains disproportionately low. Persistent underrepresentation in STEM disciplines, research funding, and senior academic positions reveals a "leaky pipeline" that diminishes the potential of the country's highly educated women. Unless addressed, these structural barriers risk weakening academic output and slowing broader social and economic development.

To tackle these inequalities, policy efforts must extend beyond increasing access to education and directly target retention, career advancement, and recognition. Transparent promotion systems, specialized funding programs for women in underrepresented fields, and well-

designed mentorship and networking initiatives are essential for meaningful progress. Narrowing these gaps is not only an equity issue but also a national priority for fostering innovation, competitiveness, and sustainable growth.

In the end, converting women's strong educational success into equal opportunities within research and leadership will be decisive in moving North Macedonia from policy commitments to real progress in academic gender equality and in fully utilizing its human capital.

References

Axios. (2023, December 5). STEM gender gap: A survey of students. *Axios.* https://www.axios.com/2023/12/05/stem-gender-gap-students-survey

Banerjee, B. (2014). Occupational segregation and gender differentials in earnings in Macedonia. *IZA Journal of Labor Studies, 3*(4). https://doi.org/10.1186/2193-9012-3-4

Banyan Global. (2019). *USAID North Macedonia gender analysis report.* https://banyanglobal.com/wp-content/uploads/2019/09/USAID-North-Macedonia-Gender-Analysis-Report.pdf

Cambridge University Press. (n.d.). Gender gap. In *Cambridge Dictionary.* Retrieved June 25, 2025, from https://dictionary.cambridge.org/dictionary/english/gender-gap

Elsevier. (n.d.-a). *Gender and diversity in research.* https://www.elsevier.com/insights/gender-and-diversity-in-research

Elsevier. (n.d.-b). *Latest Elsevier gender equality study reveals 20 years of progress, but challenges remain for women in research and innovation.* https://www.elsevier.com/about/press-releases/latest-elsevier-gender-equality-study-reveals-20-years-of-progress-but-challenges-remain-for-women-in-research-and-innovation

Erasmus+ Montenegro. (n.d.). *Gender equality in academia and research (GEAR).* https://www.erasmusplus.ac.me/gender-equality-in-academia-and-research-gear/?lang=en

European Commission. (2021). *She figures 2021: Gender in research and innovation.* Publications Office of the European Union. https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/she-figures-2021_en

European Commission. (2024). *ERA country report 2023: North Macedonia.* https://european-research-area.ec.europa.eu/sites/default/files/documents/2024-05/ERA%20Country%20Report%202023%20North%20Macedonia.pdf

European Institute for Gender Equality. (2022). *Gender equality index 2021: Measuring gender equality in the European Union.* https://eige.europa.eu/sites/default/files/documents/20220795_pdf_mh0922276enn_002.pdf

European Institute for Gender Equality. (n.d.). *North Macedonia.* Retrieved June 25, 2025, from https://eige.europa.eu/about/eu-candidate-countries-and-potential-candidates/north-macedonia?language_content_entity=en

Eurostat. (2021). *Gender pay gap statistics* [Data set]. https://ec.europa.eu/eurostat/databrowser/view/tsc00006/default/table?lang=en

Hanna, K. (2023). Gendered jobs: Exploring career stereotypes. *My Perfect Resume.* https://www.myperfectresume.com/career-center/careers/basics/gendered-jobs

Knight, V. (2024, June 17). Share of women scientists varies widely by country. *Axios.* https://www.axios.com/2024/06/17/share-women-scientists-countries

Meta.mk. (2024). Although the gender gap in science and research is decreasing, it is still present. https://meta.mk/en/although-the-gender-gap-in-science-and-research-is-decreasing-it-is-still-present

OECD. (2021). *Reducing the gender gap in science and innovation: Policy insights.* OECD Publishing. https://doi.org/10.1787/92b93d1a-en

Petreski, M., & Jovanovic, B. (2021). *Female brain drain from the Western Balkans: Determinants and policy responses* (SEESOX Diaspora Working Paper). University of Oxford.

Reactor. (2020). *GAP II: Gender action plan in North Macedonia.* https://reactor.org.mk/en/wp-content/uploads/sites/4/2020/05/GAP_II_WebEn.pdf

Risteska, M. (2022). *Women employment study for North Macedonia.* Regional Cooperation Council. https://www.esap.online/docs/183/rcc-esap-2-women-employment-study-for-north-macedonia

State Statistical Office of North Macedonia. (2022). *Census of population, households and dwellings in the Republic of North Macedonia, 2021 – Final data.* https://www.stat.gov.mk/publikacii/2022/POPIS_DZS_web_MK.pdf

State Statistical Office of North Macedonia. (2022). *Women and men in North Macedonia: A statistical portrayal of trends in gender equality.* Author.

State Statistical Office of North Macedonia. (2023). *Women and men in North Macedonia.* https://www.stat.gov.mk/publikacii/2023/ZeniteMazite_2023.pdf

The World Bank. (2019). *Migration and brain drain in Europe and Central Asia.* https://doi.org/10.1596/978-1-4648-1502-1

The World Bank. (2023). *Gender and economic inclusion.* https://openknowledge. worldbank.org/server/api/core/bitstreams/1ffb6bb5-7ee2-4d93-931e-63599353405d/content

United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). (2025). *Gap analysis of innovation in gender equality and women's empowerment.* https://eca.unwomen.org/sites/default/files/2025-03/en_gap_analysis_innovation_web.pdf

United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). (2025). *Gender gap review: Analysis in the innovation and competitiveness area in North Macedonia.* https://eca.unwomen.org/en/digital-library/publications/2025/03/gender-gap-review-analysis-in-the-innovation-and-competitiveness-area-in-north-macedonia

World Economic Forum. (2018). *The global gender gap report 2018.* https://www.weforum.org/publications/the-global-gender-gap-report-2018