

the faculty involved in research activities was still predominantly male. [6] Thus, to better interpret these findings, further research is needed on the publication rates of men and women in the cohorts entering university faculty positions in the 1990s and differences in the primary responsibilities of female and male faculty entering universities during this time (administration or teaching vs. research). My analysis also points to dramatic differences in the distribution of men and women across scientific fields in the USSR. Women were much more likely to have published in Chemistry and the Life Sciences, and less likely to be in Astronomy, Mathematics and Physics. This pattern is similar to the US, where women's underrepresentation in science is primarily in the more math-intensive fields. [7] An important part of the story of the productivity gap in both Soviet times and during the transition period is likely this segregation across scientific fields. Life Science and Chemistry, where women were most prevalent, were the fields that had the greatest declines in productivity and in which individuals were the most likely to exit science.

Social scientists have referred to the difference in publications of male and female researchers in the US as the "productivity puzzle". It was called a puzzle, since the lower publication rates of women scientists in the US at the time could not be explained by reasons related to family or field-differences. My analysis of publication rates suggests that this "puzzle" also existed in the USSR, as a gap in publication rates appears to be significant, and field differences do not account for the gap. While I cannot account for family-related factors in the analysis, assuming that Soviet state support for working mothers was effective, then these factors should have been even less constraining in the Soviet Union.

In sum, my analysis of publication data shows that a gender publication gap existed in the USSR on par and even larger than in the US, despite the importance placed on gender equality and scientific achievement in the Soviet Union.

References and notes

- [1] As quoted in an article on the Communist Party Conference in the Guardian on July 4, 1988.
- [2] See Ganguli, I. (2017), "Did the Soviets Solve the "Productivity Puzzle"? Gender Differences in Science in the Soviet Union", University of Massachusetts Working Paper, for more information.
- [3] Gender in the Global Research Landscape Report, available at <https://www.elsevier.com/research-intelligence/resource-library/gender-report>.
- [4] I assign a gender based on whether the last name ends in a "-va", "-na" or "-ya", which typically indicate that the individual is a woman.
- [5] Estimates from the US around the same time period are 0.785 in 1988 and 0.759 in 1993. See Xie, Y., & Shauman, K. A. (1998). "Sex differences in research productivity: New evidence about an old puzzle." *American Sociological Review*, 847-870.

[6] Reports of the Federal State Statistics Service of the Russian Federation, such as Женщины и мужчины России, available at http://www.gks.ru/bgd/regl/B02_50/Main.htm.

[7] See discussion in Ceci, S., D. Ginther, S. Kahn, and W. Williams (2014). "Women in Academic Science: A Changing Landscape." *Psychological Science in the Public Interest* 15(3):75-141.

Russian Women in Academia: Bibliometrics

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In early 2015 researchers from Canada, USA and Russia published a paper on the bibliometric indicators of Soviet/Russian men and women [Paul-Hus et al., 2015]. That article described the evolution of the place of women in Russian science over 40 years, from 1973 till 2012. The text you are reading now is a summary of the paper's results and mainly presents its abridged version.

Data for the research [Paul-Hus A., Bouvier R.L., Ni C., Sugimoto C.R., Pislyakov V., & Larivière V. (2015). Forty years of gender disparities in Russian science: A historical bibliometric analysis. *Scientometrics*, 102(2), 1541-1553. DOI: 10.1007/s11192-014-1386-4. (<http://dx.doi.org/10.1007/s11192-014-1386-4>)] were taken from the Web of Science database (Thomson Scientific, now Clarivate Analytics). As Russian social sciences and humanities are poorly represented in the database, only STM (science-technology-medicine) disciplines were considered. In total, more than 1 million documents with at least one Russian institutional address were analyzed.

There are no gender tags in bibliometric databases, so gender was assigned to authors by gender-specific suffixes (for example, -ov, -in, -ev, -ky, -kii, -kiy, -yi, -ny for men or -ova, -ina, -eva, -aia and -aya for women). The analysis of male and female researchers' relative contribution to published papers was based on the proportion of papers published by authors of each gender for whom gender could be assigned. The number of papers was calculated by fractional counting where each author is given 1/x count of the authorship, x representing the number of authors for which gender was identified on the given paper.

Output

Figure 1 shows that women's proportion of fractionalized authorships is lower than that of men in all disciplines except Psychology. Areas in which Russia has been historically very prominent – such as Mathematics, Physics, and Engineering & Technology – are male-dominated. In these

disciplines, women represent less than 20% of fractionalized authorships. The global proportion of female scientific output ranges between 20% and 30% of fractionalized authorships for the 1973–2012 period. This proportion slightly decreased after the fall of the USSR in 1991. From 2008 onwards, there is a stabilization of women's share of authorship in all disciplines except Psychology.

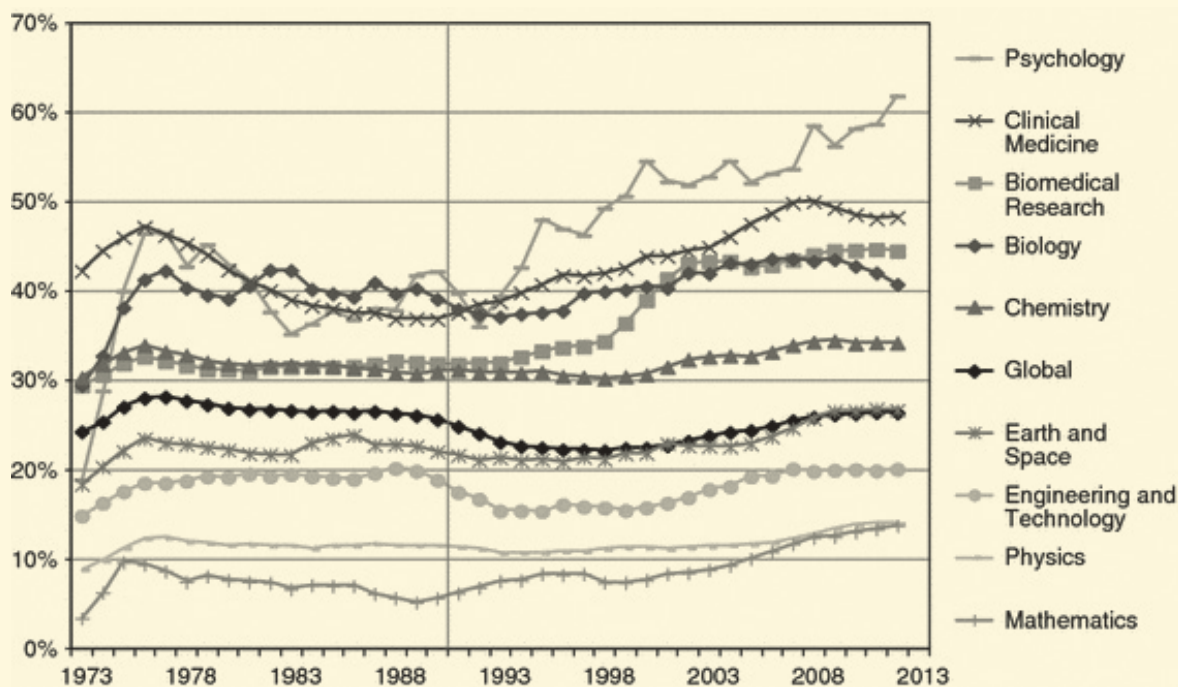


Figure 1. Women's fractionalized authorships, by discipline, 1973–2012 (3-year moving average).

As for Psychology, which appears to be the most gender-equal discipline in Russia, one of the explanations for this result may be that a majority of Russian psychology papers in WoS are published in two Russian journals.

Additional investigation demonstrated that women publish in Russian journals and in Russian language proportionally more often than men (Fig. 2).

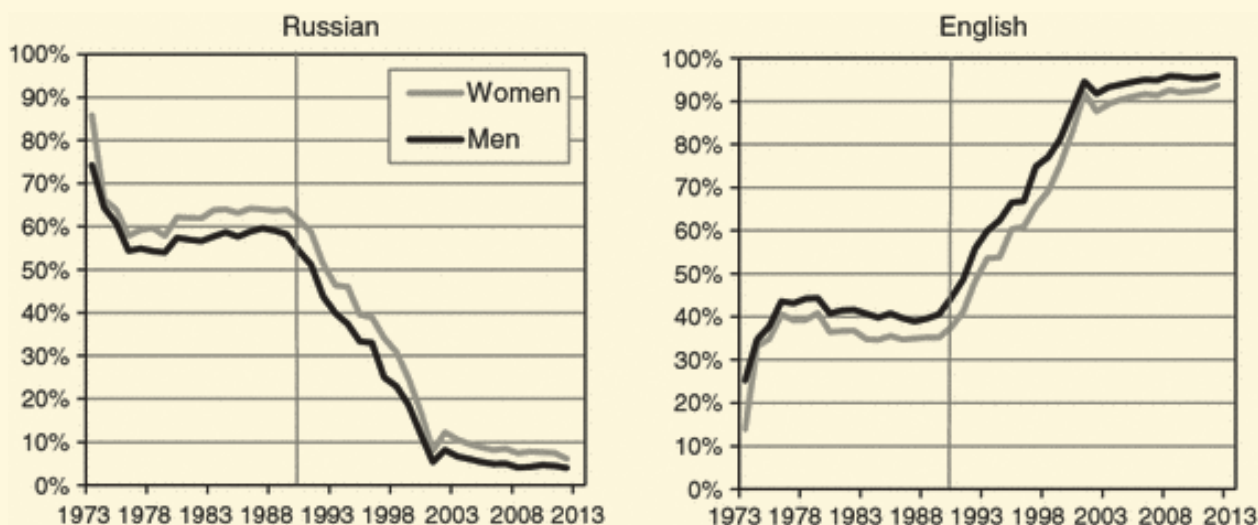


Figure 2. Proportion of papers written in Russian and in English, by gender of the first author, 1973–2012.

Productivity, i.e., the number of papers per researcher, was also assessed for men and women for the 2008–2012 period. The result was that women were less productive than men in all disciplines. On average, a woman publishes 30% fewer papers than a man. However, in Physics, in Engineering & Technology, and in Clinical Medicine, the productivity gap is less important. Productivity gap between women and men is largest in Chemistry, Biomedical Research and Mathematics.

How often do women become first author of the papers they contribute to? To answer this question additional analysis was done. It showed that in modern Russia, there is a perfect equality in this aspect: the proportion of papers first-authored by women is the same as the total share of papers with women among authors. Women more often become first authors in Chemistry and Biomedical sciences, less often in Engineering & Technology.

Collaboration

For collaboration, the proportion of papers resulting from national collaborations compared with those that were the result of international collaborations was analysed for each gender.

International collaboration was virtually nonexistent before 1991. Only the fall of the USSR provided an opening of the Soviet scientific community to the rest of world. Still, even now domestic collaboration remains the principal type for both genders.

However, there is a striking difference. While women lead in national type of collaboration, men are more involved

into international partnerships. This difference is evident and can be traced during all the 1973–2012 time period, especially after 1991. For some years the gap reaches 15% for domestic collaboration and about 8% for international. It may be said that men are more present on the international arena while women, in their turn, are more relatively active on the national scene.

Scientific Impact

Finally, the scientific impact of male and female researchers was compared using the average of relative citations (ARC). ARC provides field-normalized citation rates, thus allowing the comparison of data between different specializations that have otherwise different citation practices. More specifically, the number of citations received by a given paper is divided by the average number of citations received by articles in the same discipline published that year. ARC greater than 1 indicates that an article is cited above the world average for the same field, and an ARC below 1 means that it is cited below the world average.

Figure 3 shows the 1973 to 2012 evolution of the relative scientific impact of Russian papers according to the gender of the first author. It shows that despite important variations in the overall impact of Russian papers, the difference between the scientific impact of men and women remains relatively stable throughout the period, except after the fall of the Soviet Union in 1991, where it seems to widen (this increasing difference can be attributed to the lesser propensity of women to publish in English).

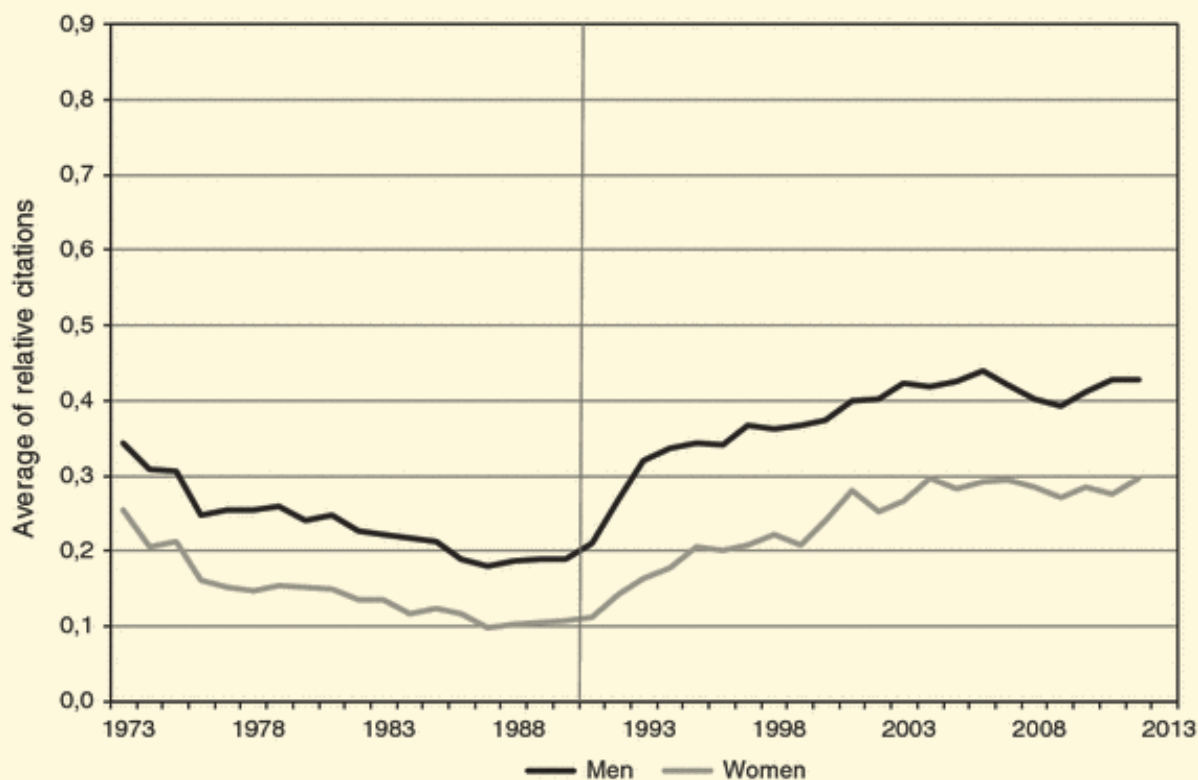


Figure 3. Average of relative citations (ARC) of Russian papers, by gender of the first author, 1973–2012.

The extent of the gender gap in terms of impact varies greatly by discipline. The largest difference is in Physics (where women never surpass men in ARC), in Mathematics and, after 2000, in Biomedical Research. Psychology is again the most gender-balanced discipline with similar impact for male and female papers. Furthermore, after 1991, women's impact increased to reach that of men.

To conclude, the authors of [Paul-Hus et al., 2015] have shown that women remain underrepresented in Russian science (STM disciplines) in terms of the number of papers, international collaboration and citation score. The question of whether it is their deliberate choice or some kind of abuse, the so-called 'glass ceiling,' remains open and cannot be answered by means of pure bibliometric research. Finally, it must be stressed that the patterns presented in the paper are in not Russia-specific. As demonstrated in another recent study [Larivière et al., 2013], gender disparities in science are still widespread across the world. Over the 2008–2012 period, men accounted for more than 70% of fractionalized authorship worldwide, which approximately coincides with the results for Russia.

References

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Gender Wage Gap in the Russian Academia

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Introduction

Gender wage gap exists in many countries, which is proven both by researchers and international organizations (OECD, International Labor Organization, World Bank, etc.) in their reports. Gender wage gap can be observed not only in the private sector but in the public sector too, in-

cluding higher education. Is there discrimination against women on the labor market? Why do men get higher salaries? Is this a result of discrimination or are there other factors that can explain gender wage gap to a great degree?

Discrimination, Segregation or Self-Selection?

The discrimination theory proponents use special terms: sticky floor and glass ceiling. Sticky floor is used point to such an employment pattern at early career stages when men progress up the career ladder and earn more than women, who experience difficulties with rising above entry-level. Glass ceiling describes unacknowledged barriers to advancement in a profession that prevent women from obtaining upper-level positions which become available for men only, while women keep bumping into a 'glass ceiling' or 'glass walls.'

Those who use other arguments to explain inequality point out that gender wage gap is to a large extent tied to cross-sectoral differences: horizontal segregation does exist (some professions are traditionally considered to be more 'manly,' while others – more 'womanly'), and the 'manly' occupations tend to be better paid. Segregation can also be caused by self-selection on behalf of women who may choose certain professions according to their personal preferences. Moreover, gender inequality can be related to non-pecuniary job characteristics (risk level, health hazards, etc.).

Gender specialization effect influence gender wage gap too: men increase their labor supply while women often focus on family obligations and domestic labor. As a result, there are disparities in job experience, and women's employment record is interrupted during maternity leave, which affects the difference between a man's and a woman's remuneration. Many employers actually expect women to focus on family and to take maternity leave, so they are less likely to employ women and if they do, they offer relatively lower salaries compared to what men get. Some researchers analyze gender inequality through the prism of human capital theory. They argue that women underinvest in their own human capital because they are aware of potential discrimination and of the need to boost their professional profile.

Gender Wage Gap at Higher Education Institutions

International research indicates that there is gender wage gap in the academia: men's salaries are, on average, 15-30% higher than women's. In other words, there are gender disparities within the same sector though gender inequality exists to a large extent due to cross-sectoral differences in remuneration. One of the peculiarities of wage setting at universities is that these organizations aren't aimed at maximizing profit

In Russia, as well as in some other countries, public HEIs prevail over private ones, and universities are highly hierarchical structures with extensive bureaucracy, where re-