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GENDER REPRESENTATION IN RUSSIAN ACADEMIC JOURNALS

Representation of women in academic outputs is an important indicator of a country's gender equality. Starting in the 1950s, extensive scientific growth in the Soviet Union came with the establishment of a large number of academic institutions and journals. However, this massive rise in academic production has not been accompanied by an increase in equality between women and men in terms of publications; the sciences and the humanities remain dominated by men. This study focuses on gender disparity in domestic academic productivity. The availability of online archives and a long history of publications were crucial factors in choosing specific journals for this study. Collected data include the output statistics of the following journals: for humanities, Questions of History (1955–2013) and Russian Literature (1958–2014); for sciences, Acoustical Physics (1955–2014), Mathematical Notes (1967–2014), and Biomedical Chemistry (1956–2014). In addition, a list of publications of the journal Questions of Psychology available in the period between 1980 and 1999 was also taken into account. The data show the percentage of female academic outputs and its changes through the decades, taking into account the socioeconomic, political, and historical background. A brief analysis of the scientific productivity reveals underrepresentation of women authored publications in mathematics (7%), physics (11%), and history (15%). On the other hand, psychology (40%), biochemistry (39%), and literature (28%) show better rates of gender equality. The article provides an explanation of this phenomena. During decades, a slight increase of women authored outputs gradually occurred in every scientific discipline, although this share was still low overall. The outcomes were compared with gender representation in sciences and humanities in other countries, which allows the conclusion that gender disparity in terms of the academic output in analysed Russian journals is not unique but follows global trends.

Keywords: women in academia, gender disparity, gender equality, research productivity, academic journals, Russia

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Women's representation in academic outputs such as publications in journals is an important indicator of a country's gender equality. Extensive development of science in the Soviet Union from the 1950s onwards (Graham 1992) came with the establishment of a large number of academic institutions and journals. This provoked a massive rise in scholar publications (Kaiser 2012) that reflected not only the development of the sciences but also may reflect gender equality if contributions of women and men are equal. Participation in academia is one of the most important ways in which people can contribute to the socio-political and economic development of a society. Thus, an examination of who has the opportunity to be involved in academic reproduction among other things reflects the gender policy of a country and its priorities. Certainly, such policies differ in different countries at different periods of time. Hence, it is important to consider historical circumstances of the Soviet Union in the studies of current Russia to understand women's representation in academic journals today.

Since its establishment, the Soviet authorities were enthusiastic about science and technology, claiming gender equality in the workplace, and bringing women into industry. Such integration was essential for the Soviet economy. The period of reconstruction after the Second World War reinforced demand for female workers in industrial production. Certain careers were valued more than others, however. For example, Cold War competition between the Soviet Union and the USA had important effects on industrial policies and science-related fields. Both countries put great effort into promoting physics and mathematics, the two fields vital to the space industry and weapon production (Kaiser 2012). Physics and mathematics were the most important spheres with governmental support; mathematics and theoretical physics were often spoken of with reference to the 'blackboard rule,' meaning that Soviet scholars could be expected to excel internationally with tools no more complicated than the blackboard and chalk (Graham 1993: 207).

In both countries, the number of specialists with higher stages of education grew rapidly. For instance, the absolute number of students who completed their undergraduate and PhD degrees in physics and mathematics in the period between 1950 and 1970 increased dramatically: from 25,000 to 120,000 in the USA and from 10,000 to 110,000 in the USSR (Kaiser 2012: 283). The number of Soviet physicists and mathematicians increased 9.3 times during the same interval (Allakhverdyan 2014: 62). Acceleration growth in academic institutions and publications was also marked in both countries.

The foundation of the most important academic journals took place in that period. Despite the isolation of Soviet science and its lack of international collaboration or exposure to Western science, the Nobel Prizes awards, frequency of citations for Soviet research, and honorary membership in foreign scientific societies was an impressive achievement (Graham 1992). Soviet academic journals

enjoyed a high reputation domestically, allowing them to maintain a comparable level with the US journals. An opportunity to be published in the journals linked to the Soviet Academy of Sciences was considered a privilege for local scholars. Besides, the number of journals was very limited. This study concerns several of these Soviet journals that have survived to the present day.

In the past decade, much research on Russian gender representation in academic publications has focused on wide usage of international databases and international citation indexes (Wilson, Markusova 2004; Markusova et al. 2009; Pislyakov, Dyachenko 2010; Lewison, Markusova 2011; Paul-Hus et al. 2015). The specificity of international databases is that they mostly include publications from natural sciences and engineering, rather than social science and humanities articles. Also, international databases have few non-English outputs. For authors of social sciences and humanities it is difficult to be included in international databases published outside of the United States or the United Kingdom, 'whether the language used is English or not' (Larivière et al. 2006: 998). The impact of non-English publications in these scientific fields cannot be evaluated properly. Moreover, the sources of data for the studies of Russian academic output represent authorship only on the international arena, while decades of domestically published articles seem invisible in these studies.

Therefore, the purpose of this research is to study gender disparity in domestic academic productivity by looking at local journals, something neglected by researchers focused on international sources of data. The collected data includes publication information for journals established in the aftermath of the Second World War, during the period of intensive scientific development. These include journals for the humanities, *Questions of History* and *Russian Literature*; and for the natural sciences, *Acoustical Physics*, *Mathematical Notes* and *Biomedical Chemistry*. The choice of the sources, among other factors, depended on the availability and the most accomplished bibliographical lists of published articles. An important fact is that all the chosen journals might be considered scientifically reliable and domestically influential whilst they have a long history of publication and currently have been included in international databases such as the *Web of Science* and *Scopus*.

Scientific output can be easily estimated through comparison: fewer female-authored articles indicates women's limited involvement in producing academic publications while, according to statistics (Rosstat 2016: 72–75), enrolments of women at all educational and academic levels are stably high. I consider journal publications as a sign of participation of women in the academia, and a signal that allows us to recognize the patterns of a career development for a woman.

Gender Representation in Russian Academia

A brief review of publications on gender representation in Russian academia shows that a gender gap indeed exists. These results are not surprising

and correlate with traditional perceptions about the role of women in sciences. Thus, a study by Natalia Agamova and Alexander Allakhverdyan (2000) examined gender disparity in Soviet academic positions, both among students and faculty. They showed that the relative success of Soviet science after the 1960s was not correlated with women's participation in academia. Even though access to higher education and academic degrees for women increased from 37.3% in 1961 to 48.8% in 1994, female scholars were poorly represented and/or were excluded from decision-making positions, and their output was low and remained unchanged until the early 1990s.

As for publications of Russian scholars abroad, which was very well studied by Valentina Markusova et al. (2009) from 1997 to 2007, with some exceptions, Russian scholars were underrepresented in a number of international databases, especially in the fields of social sciences and humanities. By 2007, the *Science Citation Index* (SCI) database included only six Russian humanities journals. Concepción Wilson and Markusova (2004) discovered a remarkable increase in Russian scientific output from the mid-1990s in comparison with the previous decades, which was caused by international collaboration, as well as a massive emigration of scientists from Russia to other countries.

Another study addresses gender disparities in Russian publications and is based on data drawn from the *Web of Science* (Paul-Hus et al. 2014). The research indicates the underrepresentation of Russian women in the sciences before 1991 and its increase in the 1990s. Yet, international databases of research contain more natural-science related publications rather than those in social sciences and humanities. This may influence gender representation in publications. For example, Grant Lewison and Markusova (2011) compared the proportion of men and women in the list of the authors of the *Web of Science* in 1985, 1995, and 2005. The data showed that women trailed men in all scientific fields in terms of output, from about 10% in mathematics to about 40% in clinical medicine and biology. Social sciences and humanities are not represented due to small number of publications. Besides, as the authors contend, women mostly publish in Russian rather than in English, collaborate less with foreign colleagues, write fewer reviews, and have their papers cited less frequently.

One of the reasons of poor gender representation of women in academic output is state policy. Natalia Pushkareva (2014) concluded that despite broad representation of women in the Academy (40%), there is a gender asymmetry in publications and the signs of marginalisation of female scholars. Employing on qualitative research methods, she interviewed female scholars affiliated to the Russian Academy of Sciences to explain this. The main reason, as Pushkareva argues, is the state's backward-oriented policy in promotion of traditional values over the support for women in the sciences (Pushkareva 2014: 43).

However, underrepresentation of women in academy is not a unique situation for Russia. An examination of recent publications contained in international databases confirms the imbalance between male- and female-authored

outputs. According to the global bibliometric analysis for 2008–2012, gender disparity persists in research output worldwide: women account for nearly 30% of fractionalized authorship, while men represent more than 70% (Larivière et al. 2013). In terms of specification of scientific fields, women publish fewer articles in mathematics and physics than in other disciplines. Women are also less represented when it comes to funding and financing and have fewer publications because of this (Larivière et al. 2011).

To exemplify regionally, Marek Kosmulski (2015) examined gender disparity in Polish academia. Poland had remained in similar socio-economic and cultural conditions to those of Russia and was also part of the Soviet bloc. Based on data drawn from the *Web of Science*, Kosmulski shows that women were underrepresented in Polish scholarly outputs. Male domination in Polish academia in 1975–2014 was very strong in physics and mathematics, but in biochemistry, the contributions of male and female scholars were equal. The male dominance became less significant only after 1995 (Kosmulski 2015: 663).

The above literature review shows that a lot can be learned from previous publications about gender representation in Russian academic articles drawn from the international databases. However, the estimation of domestic scientific output drawn from archives of a few Russian academic journals was not previously studied. This article fills the gap calculating academic output in Russian journals in terms of gender representation in chosen fields of sciences.

Methodology

The data used for this study are drawn from the online archives of a few Russian academic journals. The study attempted to represent academic journals from various scientific fields. Of course, not all the spheres of science were covered, but vacant areas can be filled in and continued in further research. The online availability of archives is still a problem for some Russian academic journals, which are not digitised completely. For example, the archive of *Questions of Philosophy*, an epoch-making journal for Russian philosophers that was established in 1947, is not available online except for issues published in or after 2009. Availability and a long history of publications were main factors in choosing journals for analysis. So several journals were explored: humanities related journals, *Questions of History* (1955–2013) and *Russian Literature* (1958–2014), and natural sciences related journals, *Acoustical Physics* (1955–2014), *Mathematical Notes* (1967–2014), and *Biomedical Chemistry* (1956–2014). In addition, the list of publications of the journal *Questions of Psychology* which is available in the period between 1980 and 1999 was taken into account, even though it does not show a better historical perspective in comparison to other journals taken in this study.

The authors' information was considered in all of the articles, notes, conference proceedings, and reviews. The following analysis reflects publications

written in Russian language and does not take into account international and/or any national citation index, scientific productivity indicators, impact factor of scientific journals. In addition, publications have not been distinguished whether done individually or collaboratively. The authors in historical, literary, mathematical, and psychological journals publish most articles individually, while in physics and biochemistry, the number of articles done collaboratively is higher. Specific conditions related to the work in a laboratory often necessitates a group of researchers.

The present bibliometric analysis aimed to distinguish authors' surnames, as Russian surnames have gender-specific endings. All names mentioned in these journals' bibliographies were estimated. Some surnames, usually those that are not of Russian origin, could not be identified in terms of gender. In this case, further research was done in the form of gender spotting given names. If these attempts were not successful, those surnames were excluded from the analysis. Foreign authors who had published their research were excluded from the data as well. The number of excluded cases is insignificant. Female surnames were deducted from the total number of authors, counted, and expressed in percentages.

Results and discussion

The findings of this study clearly show that women are less represented in mathematics and physics publications. There was an increase in female authorships in *Mathematical Notes* from 4% to 12%, and the average women's output was almost 7%. The average of publications authored by women in *Acoustical Physics* has remained relatively stable at about 11%. Women were more represented in *Biomedical Chemistry*, where the scientific output was relatively stable during the entire period of observation. The percentage of publications by women was 39%. Even in the period of the late 1970s-80s when the absolute number of publications doubled, the percentage of female-authored publications was nearly the same.

Moreover, there has been a continuous increase in articles written by women in the journals *Questions of History* and *Russian Literature*. Women historians gradually improved their positions in publishing from 13% in the 1960s-70s to 18% in the 1980s-2000s. A scientific boom occurred in literature journals. The amount of female-authored publications dramatically increased from 18% to 38%. This result is comparable with that of *Questions of Psychology*. Psychology is a discipline with a major representation of women (40%), which is nearly gender-equal. Figure 1 shows the percentage of female authorships by journal.

Female authorship in the journals

Understanding gender representation in academic journals should be viewed within the statistics of gender representation in overall academia. The latest data shows that by 2015 the ratio of men and women in undergraduate

education was 46% and 54% accordingly, while in graduate institutions – 52% and 48% accordingly (Rosstat 2016: 70). In general, there are more women in academia, 57%, while the ratio of full-time female professors is 33%, and of female rectors is only 16% (Ibid: 75). Women are represented in academia, yet they face many obstacles to be promoted and published on the same terms as men (Moss-Racusin et al. 2012).

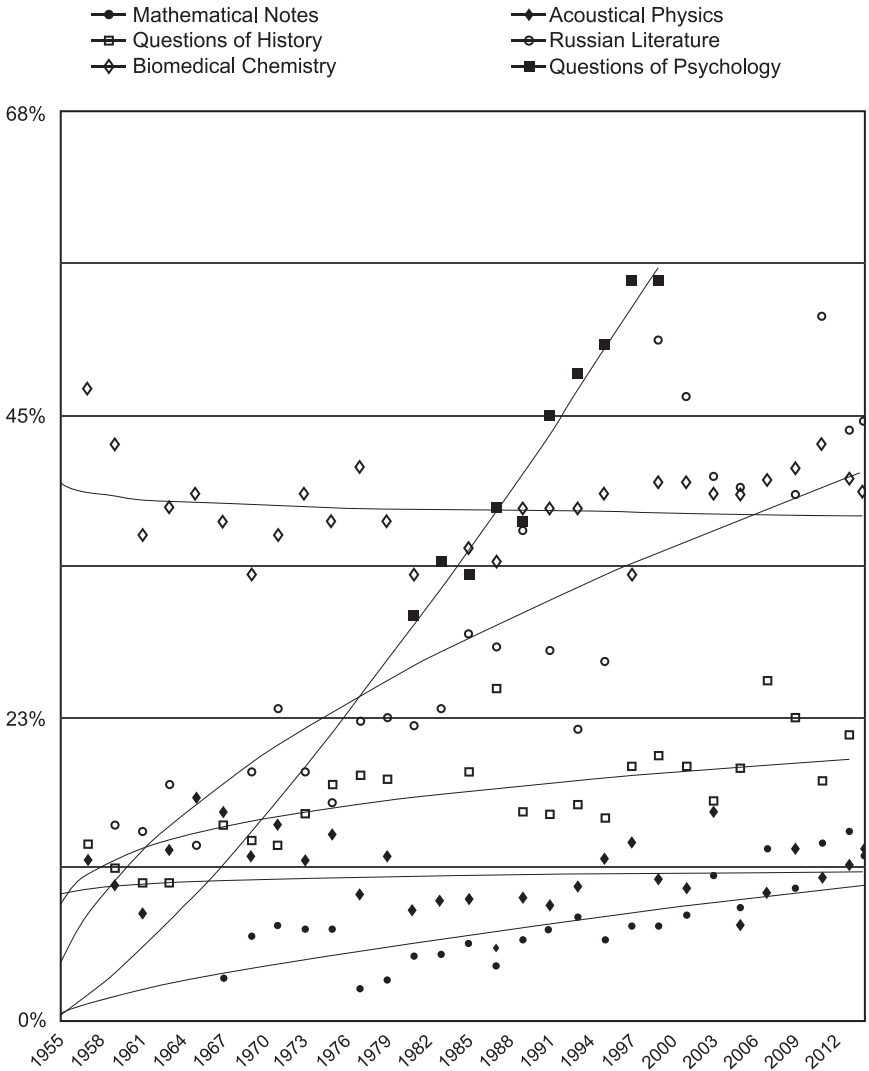


Fig. 1 Women’s authorship in Soviet and Russian academic journals

The low number of female-authored publications is seen predominantly in physics and mathematics and driven by the prevalence of stereotypical perceptions that women are not capable for these scientific fields. Gender stereotypes suggest that men are more suited to maths and science, lowering women's engagement with these domains and academic engagement in general (Kessels et al. 2014). However, Soviet policies always emphasized gender equality, while the real situation showed a gender gap in these fields. The number of publications and male dominance in *Mathematical Notes* and *Acoustical Physics* are predictable in spite of the fact that in the departments of physics and mathematics female undergraduate students comprise currently about 40% (Rosstat 2016: 72). The results of the study do not look unique yet are confirmed with the proportions of women-authored publications in physical sciences of one of the most prestigious academic journals *Nature*, which is embarrassingly low, at 8% (Conley, Stadmark 2012).

Even though physics and mathematics were the subjects to ensure the scientific growth of the USSR, social sciences and humanities played an important role in promoting and spreading Soviet values. This justifies the meaning and relevance of the historical and philosophical publications for the official state's policy. Perhaps, this resulted in gender inequality in humanities, as well. The common view on gender differences in choosing scientific fields, namely that women tend to choose social sciences and humanities and men prefer natural science fields, was not confirmed in the studied database. The very low percentage of female-authored publications in *Questions of History*, serves as counter-evidence against the notion of female high preference for the humanities.

In contrast, female productivity in biochemistry, psychology, and literature remains stably high. *Biomedical Chemistry*, *Questions of Psychology*, and *Russian Literature* have a high proportion of female-authored publication. Paul-Hus et al. (2015) confirms the results of this study: the proportion of output is the largest in psychology, clinical medicine, and biomedical research. While biochemistry was not mentioned separately, *Biomedical Chemistry* may correspond to clinical medicine and biomedical research specialties. In *Russian Literature* and *Questions of Psychology* the number of female-authored articles is significantly higher than in other journals. These scientific fields do not attract men, as 80% of undergraduate students in these fields are women (Rosstat 2016: 72).

A pathway to international recognition?

Since the Soviet Union collapsed, the situation has slightly changed, and the number of women who started to publish has increased. The socio-economic situation in the early 1990s pushed some men out of science. The conditions changed, and scholars had to adapt to a new situation to survive. Many males had to leave their academic positions for business and other more financially-independent occupations while females stayed in the field. At the same time, some scholars emigrated (Graham 1993: 195).

Openness to the international global community did not mean immediate recognition and an equivalent citation rate. Russian scholars as well as those of other non-English speaking countries put themselves in a situation that is different from the domestic situation with publications: competition and recognition on the international stage require much greater effort and high-quality research. Vladimir Pisyakov and Ekaterina Dyachenko (2010) examined Russian papers in physics and chemistry that were published abroad and concluded that papers of Russian origin had a lower likelihood of citation. Robert Drago (2011) affirms that the underrepresentation of women in the sciences is related to their nationalities, backgrounds, and identities; the low representation of foreign women in math-intensive fields in the US is related to their languages skills, not their gender. For instance, he has found the advantage of American women in publications in mathematics, even though the highest skills in mathematics is currently established in Asian countries.

Presumably, the former achievements of Soviet science cannot be considered and cited through formal requests in international databases due to the isolation and the language barrier of the time. The problem is that domestic publications in non-English speaking countries have no significance in a scholar's rates because they are rarely included in international databases, have lesser chances to be cited and recognised internationally. Although this problem has been partly solved in current publications as Russian scholars start to publish abroad and Russian journals joined international databases, all the same papers published in previous decades seem to be lost from international access and usage.

Responding to global changes

Nowadays there are more opportunities for international collaboration and broader involvement of women in the academia. Stereotypical perceptions about a traditional role for a woman are challenged and influenced through education (Ceci, Williams 2011). Modern societies and educational institutions at each stage from the primary to higher schools are working to provide women more chances to be involved in research and development than ever before. One of the key elements of the European Union's Horizon 2020 program is empowering women in tertiary education and enhancing their employment opportunities, as well as ensuring gender equality (Eurostat 2017). Even in the male-oriented societies of Asia, where the percentage of women in science and technology remains low at 18.9% (The Association of Academies and Societies of Sciences in Asia 2015), Korea and Japan, two of the most technologically advanced countries, are making positive changes to promote women in the sciences. Such initiatives come from many institutions and a variety of science-related organisations.

Within these global changes, the gender question is gaining increasing attention and demands to be addressed and properly understood. Mentoring, employment, fair salaries, promotions, and other opportunities as special journals dedicated to achieving gender equity are the issues actively discussed

(e.g., Barres 2006; Mitchell 2013). Yet, the commonly known phenomenon of the 'leaky pipeline' and 'glass ceiling' still occur. The 'leaky pipeline' refers to the idea that, despite a high number of women studying in universities, these women seem to 'disappear' from or never make it to the workforce. The 'glass ceiling' refers to the relatively small number of women in management positions with the implication to how women can climb in a corporate or institutional ladder. There is only 2.9% of positions in the higher academic hierarchy in Russia occupied by women (Pushkareva 2010).

The situation on the international level is similar. Legacy effects of historical gender discrimination have led to a situation when women have to compete with each other as, for example, in the Netherlands, where female promotion rates do not lead to substantial improvement of the gender balance at higher levels in academia (Bakker, Jacobs 2016). In the US, by 2011, 71% of all PhDs in psychology and 57% of PhDs in life sciences were earned by women, while only about 12% of tenure-track positions in math-intensive fields were held by women (Ceci, Williams 2011). The study on authorship in academic medical literature in the United States (Jagsi et al. 2006) shows increase of female-authored publications from ~6% in 1970 to ~30% in 2004. Nevertheless, women still compose a minority of the authors of original research and guest editorials in those journals.

Irrespective of country, these problems arise after women get academic degrees and then eventually leave science due to family issues and likely experience difficulties in getting back after several years out of the field. In addition, Russia currently censors critical feminist potential and shows little or no acceptance of feminist ideas that resist or criticise Russia's gender policy (Pushkareva, Zolotukhina 2017). Nonetheless, the rise of the scientific participation for women is occurring everywhere and science is opening up for women to participate actively, and the number of women in sciences is continually increasing. In particular, women are more motivated than ever to participate in those scientific fields that stereotypically were not considered suitable for them. Progressive societies are incorporating more women in research and establishing a shared understanding of gender equality in the sciences as a necessity.

Conclusion

This brief analysis of the scientific productivity using the online archives of the Russian academic journals has revealed significant levels of underrepresentation of women's academic publications in mathematics, physics, and history. On the other hand, psychology, biochemistry, and literature are closer to achieving gender equality. A slight increase of female-authored outputs gradually occurred. The collapse of the Soviet Union marked the beginning of new phase of international cooperation that gave Russian scientists an opportunity to be recognised more frequently by publishing in English, collaborating with

foreign colleagues, including their work in international databases, and acquiring other forms of public recognition.

The result of this study, based on the estimation of the scientific outputs, was verified and affirmed via the journals' archives and has shed light on gender representation in sciences in terms of academic output since the Soviet times. It appears there are similar patterns of scientific development and women's involvement in research between the Soviet Union/Russia and those of the rest of the world. These include the slow increase of female authorship and different levels of participation of women among the scientific fields. However, these changes occur globally despite differences in socioeconomic and political backgrounds.

Bearing in mind some possible prejudices against the approaches of Soviet science, its general lack of recognition worldwide, and the low proportions of female-authored publications, it can be assumed that the long journey toward earning international recognition for Russian scientists has begun. Domestic academic achievements cannot be taken separately from international scientific development, as was done in Soviet times. The proportion of women in academia and their publications on the global scale closely corresponds with the results of this study. This means that processes that occur in academia have more similarities worldwide than differences based on cultural and national origins. Now that prejudice in research is being openly discussed, female representation in academic journals is able to progress in the manner that reflects their excellence alone.

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