The Pattern of Co-authorship in the Russian Research Community, SCI-E, 2008-2020

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ABSTRACT: *Our study aimed to explore authorship patterns in the Russian research community and trace changes in gender imbalance based on publications indexed by the Science Citation Index Expanded (SCI-E) from 2008 to 2020.*

We analyzed over 480,000 records of Russian publications indexed in the SCI-E from 2008 to 2020, collecting data on 418,774 unique Russian authors and 461,226 foreign authors during this period. The total number of unique authors (Russian and foreign) nearly doubled between 2008 and 2017, but this growth was followed by a significant 24% decline from 2018 to 2020. The overall trend in authorships remained positive, with a remarkable threefold increase since 2016, surpassing 1.1 million.

Our analysis revealed a significant gender disparity in the total RP, with males accounting for approximately 65% and females 35% throughout the studied period. Considerable gender inequality was observed across research areas.

Our findings indicated that there are national barriers to female equity in various research areas. These data could be useful for research policymakers to stimulate efforts to achieve greater parity.

Keywords: Science Citation Index-Expanded, publications, subject category (WoS), Russian author, foreign authors, collaboration, authorship, research productivity, gender imbalance,

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1. Introduction

Publications or researchers' productivity (RP) became an object of study at the beginning of the century. The tremendous growth of RP and the co-authorship network was observed since 1940th by Prof. D.Price (Little Science, Big Science, 1958). As Prof. D.Price (1963) noted, "the size of research teams and consequently the number of authors per paper increased after the Second World War in richer nations, driven by the cost of research, as part of the development of "big science."

However, the launch of SCI drastically increased its usage in various scientometric investigations to trace the growth of research productivity, networks among researchers, institutions, countries, domestic and international collaborations, etc.

The globalization of knowledge society stimulated the growth of research collaboration, changes in co-authorship patterns and human resources mobility. The co-authorship became an established bibliometric indicator to measure scientific collaboration (Bever D. et al., 1978; Glanzel W. et al., 2001; Gazni A. et al., 2012). It has been published a substantial amount of literature evaluating authorship networks in various fields of science (Glanzel W. *et al*, 2005; Puuska H. *et al*, 2014; Mindeli L., *et al* 2016; Thelwall *et al*,2022), solo and multiple co-authorship (J.Adams J. *et al* 2020), exposing gender disparity in various field of science, editorial board position, mentorship position, in clinical practice guidelines and etc. Ethical problems of co-authorship became an important issue of modern science (Savchenko et al., 2024). As Li W. et al. (Nature 2022) noted, early co-authorship with top scientists has a significant impact on young researchers' careers.

Prof. M.Thewall (et.all, 2022) conducted very comprehensive research investigating trends on co-authorship based on statistics of journals indexed by Scopus for the period from 1900-2020. The authors used Scopus classification of 27 broad areas and 332 mini-fields. Their finding emphasized the significant difference in authorship per an article in a broad research field and a more striking gap in mini-fields like "Immunology and Classic". The authors' conclusion was that there was a steady positive trend in growing co-authorship with "no sign of slowing" during the last 121 years.

The pattern of Russian researchers' co-authorship was investigated in our previous publications (Libkind et al. l, 2014; Mindeli et al., 2015), Markusova et al., 2023). The authors examined a special group: grant-holders on nanotechnology funded by the government agency the Russian Foundation for Basic Research (RFBR) COLLNET 2015.

Recently, we've investigated the 30-year trends in Social Sciences & Humanities (SS&H) and STEM development in Russia and global science based on statistics from Web of Science Core Collection and *InCite*s. One of the findings was that over the past decade in Russia, there has been a noticeable decline in the prevalence of single authorship across all studied scientific disciplines, with varying rates of change. In all studied fields, teams of 2 to 5 members were common. Notably, in 'Economics', 84.5% of teams fell within this range, indicating that 74% of international collaborative publications in SC 'Economics' involve teams of 2-5 individuals.

The history of gender study as a discipline goes back to the 1970s. Sociologists were among the first researchers to use SCI as an important tool for evaluating women's role in science and measuring research productivity.

A significant contribution to scientometrics research on gender studies is attributed to well-known American sociologists Prof. R. Merton and Prof. H. Zuckerman since the end of 1960th. E. Garfield (Current Contents, 1982) emphasized in his essay that "despite increasing Women's role in research, they "still face barriers to scientific achievement, and women in science remains a controversial topic" (Essays, 1982). The role of gender imbalance in cancer in Europe (2023) was examined by Lawler M. et al. (2023) and in biomedical research by Dr Lewison et al. (STM-2023).

This discriminatory policy to female role in society ended in Russia after the revolution in 1917, and women enjoyed equality of access to high schools and universities. Despite formally being equal, nevertheless, women suffered many of the same barriers to success that afflicted their sisters in the West (Lewison et al., 2010). Pilkina M. (et al., 2022) conducted an analysis of gender inequality in academia based on Russian research productivity (RP) in WoS for 2017-2019. They underlined recent progress in parity between women and men in some research areas but noted that the gap still exists.

The aim of our study was to explore authorship patterns in the Russian research community and to trace changes in gender imbalance based on publications indexed by the Science Citation Index Expanded (SCI-E) from 2008 to 2020. To provide additional insight into gender imbalance across various research areas, we selected and examined publication models in five leading subject categories (SC) by the number of publications in Russian research productivity: SC "Cell Biology," SC "Chemistry, Organic," SC "Energy & Fuels," SC "Neurosciences," and SC "Physics, Mathematical" during 2008-2020. The choice of SCI-E is due to its broad coverage of STEM research, indexing 166 Russian journals, compared to the Social Science Citation Index and Arts & Humanities Citation Index (SSCI), which index only 16 Russian journals.

2. Methodology

Using the search strategy "CU=(Russia) and PY=(2008-2020)," we downloaded a dataset of over 480,000 Russian publications (research productivity - RP) indexed in SCI-E for the years 2008 to 2020. All publications included at least one author affiliated with a Russian organization, and all types of documents were analyzed. Each paper's authors' names, institutional affiliations, publication year, addresses, and email addresses were extracted and processed using MS SQL Server 2019. The analysis employed the full counting method, one of the most common approaches for calculating bibliometric indicators (Waltman & Van Eck, 2015; Perianes-Rodriguez, Waltman & Van Eck, 2016). This method assigns a full count to each co-author of a publication. Various approaches were used to resolve author name disambiguation, determine gender, and confirm affiliations.

It is worth noting that Web of Science began including full author names in 2007, with searchable data available in the database from 2011. For Russian publications, full author names have only been included since 2016. As Teles et al. (2020) pointed out, “Adequately disambiguating author names in bibliometric databases is a precondition for conducting reliable analyses at the author level.”

It is important to clarify the distinction between the concept of a ‘unique author’ and ‘authorship.’ A ‘unique author’ refers to a specific individual who has authored one or more publications, and identifying a unique author involves a series of complex identification procedures, which are detailed in our previous works [Libkind NTI,1-3?]. In contrast, ‘authorship’ merely indicates that a person with a particular name is listed as the author or co-author of a publication.

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Several approaches were used to address the disambiguation of authors’ names, gender assignment, and affiliation. To identify an author’s name in cases of synonyms or homonyms, we employed the following procedure: if publications ‘A’ and ‘B’ list authors with the same full name—Ivanov Ivan Ivanovich—where in the publication ‘A’ the author is affiliated with one organization, and in the publication ‘B’ the author is affiliated with another, we applied specific methods to distinguish between these individuals.

Without additional analysis, it would be unjustified to assume that these are the same researchers. Unfortunately, in such cases, it is not always possible to use unique author identifiers like “ResearcherID” or ‘Scopus Author ID,’ as not every author has these identifiers, and email addresses often change. Moreover, knowledge of the subject matter of the publications does not always provide sufficient guidance. In these cases, we used an approach based on the assumption that the core group of co-authors for a consistently published scientist tends to be relatively stable. This method involved developing and implementing an algorithm as a computer program that uses recursion to establish the core group of co-authors for each problematic case. If an author with the same full name appeared in several publications and their group of co-authors remained generally consistent across these publications, the author was recognized as a unique individual. Each author within this stable core group also underwent similar identification procedures. Thus, the process of identifying unique authors was recursive in nature. As a result, we collected data on 418,774 unique Russian authors and 461,226 foreign authors during the period from 2008 to 2020.

3. Results and Discussion

We analyzed over 480,000 records of Russian publications (Research Productivity - RP) indexed in SCI-E during the period 2008-2020. The data indicate a steady growth in RP, increasing 1.6-fold from 29,748 records in 2008 to 49,129 records in 2020 (see Table 1, column 2). As a result, we collected statistics on 418,774 unique Russian and 461,226 foreign authors for the period 2008-2020. Statistics on Russian research productivity and authorship patterns are presented in Table 1.

Publication Year	Total number publications	Total number of unique authors (Russian and Foreign), who participated in Russian publications in each year	Total number of unique Russian Authors by year	Total number of unique foreign authors who participated in Russian publications by each year	Total number of authorships participated in Russian publications
1	2	3	4	5	6
2008	29,748	96,649	55,128	43,255	243,316
2009	30,229	97,309	56,709	42,242	256,535
2010	29,089	99,643	55,953	45,3	250,315
2011	31,022	109,64	60,264	50,957	253,747
2012	32,685	110,543	63,46	48,629	307,351
2013	32,598	121,51	66,106	57,14	329,444
2014	33,388	128,251	69,059	61,135	323,458

2015	37,938	148,258	79,188	71,295	375,207
2016	39,739	179,867	83,916	98,114	1,067,548
2017	41,689	190,05	90,519	101,949	1,046,585
2018	45,19	189,445	96,952	94,822	1,130,455
2019	48,335	167,874	98,547	70,982	1,110,411
2020	49,129	144,716	81,654	64,37	802,57
Total number of unique authors for the period 2008-2020			418,774	461,226	

Table 1. Statistics on Russian Research Productivity and Authorship Patterns, as indexed in SCI-E, from 2008 to 2020

The total number of unique authors (both Russian and foreign) nearly doubled between 2008 and 2017, but this growth was followed by a significant 24% decline from 2018 to 2020 (Column 3). For Russian unique authors, there was a 1.8-fold increase until 2019, followed by an 18.2% decline in 2020, likely due to the onset of COVID-19 (column 4).

In contrast, unique foreign authors showed a different pattern, with notable 2.4-fold growth from 2008 to a peak in 2017, followed by a sharp 37% decline over the next three years (Column 5).

However, the pattern for the total number of co-authorships showed a different trend. The overall trend in authorships remained positive, with a remarkable threefold increase since 2016, surpassing 1.1 million (Column 6). The growth in total authorships was steady from 2008 to 2014, followed by a significant 2.8-fold jump in 2016. Subsequently, there was a modest annual growth of 4% between 2016 and 2019. However, this upward trend was interrupted by a 28% decrease in authorships in 2020 (Column 6). These trends are visualized in Figure 1.

Figure 1. Statistics on authorship in Russian research productivity from 2008 to 2020, as indexed in SCI-E

The fluctuations in the number of foreign authors can be linked to the rise and fall of mega-collaborations, where publications involve from 1,000 to more than 5,000 co-authors. To support this observation, we analyzed publications from our dataset with more than 1,000 co-authors between 2015 and 2020. In 2015, there were 54 such publications. This number increased significantly in subsequent years, reaching 339 in 2016, 359 in 2017, 333 in 2018, and 421 in 2019.

We calculated the share of publications by the number of countries participating in the total Russian RP in 2016. The visualized data are presented in Figure 2. It is clear that about 36% of RP was published in collaboration with foreign countries in 2016. Mega-collaborations involving thirty to ninety countries accounted for 0.9%. (see figure 3)

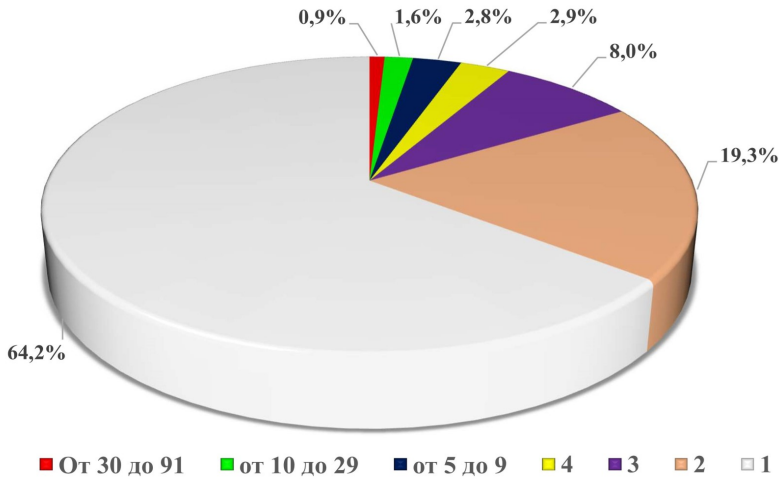

Figure 2. Share of countries participating in Russian research publications in 2016, as indexed in SCI-E.

We calculated the share of publications authored solely by Russian researchers, excluding international collaborations, for each year studied. This share ranged from 60% to 70%. A similar result was observed by Mindeli L. et al. (2015), who analyzed co-authorship in publications indexed by the RFBR grant-holders database. The share of Russian authors fluctuated annually between 66% and 70% from 2009 to 2013.

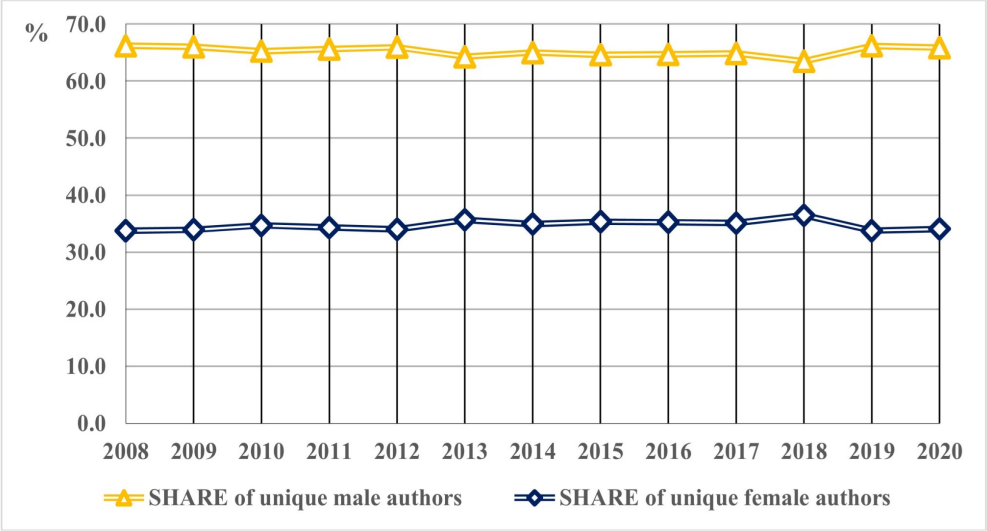

Figure 3. Distribution of unique Russian authors by gender, SCI-E, 2008-2020.

There is a body of literature focusing on gender disparity. In our previous publication (Markusova V.A. et al., 1999), funded by INTAS programs (**INTAS-96-0036**), we examined grant distribution by the C. & J. McArthur Foundation and the International Science Foundation. Our data showed that female researchers received approximately 30% of the grants awarded between 1993 and 1996.

The analysis of the total dataset of Russian research publications (RP) revealed a significant disparity in participation: males accounted for about 65%, while females accounted for 35% throughout the studied period (see Figure 3).

As mentioned in the 'Methodology' section, we analyzed authorship patterns and gender distribution across the five leading subject categories (SC) by publication number according to WoS classification for the period 2008–2020. These categories are SC 'Cell Biology,' SC 'Chemistry, Organic,' SC 'Energy & Fuels,' SC 'Neurosciences,' and SC 'Physics, Mathematical.'

It is worth noting that various government programs have encouraged the Russian research community to collaborate with international partners (Moed, 2018). Table 2 presents data on the percentage of Russian and foreign authors in these five selected research areas. Please note that the combined share of Russian and foreign authors can exceed 100% if an author is affiliated with both a Russian institution and a foreign country.

Table 2. Percentage of Russian and foreign authors participating in Russian publications across five disciplines (SC) in each year, 2008–2020, SCI-E

	NeuroScien		Cell Biology		Energy & Fuels		Chemistry, Org.		Phys. Math	
Years	Share of unique Russian authors	Share of unique foreign authors	Share of unique Russian authors	Share of unique foreign authors	Share of unique Russian authors	Share of unique foreign authors	Share of unique Russian authors	Share of unique foreign authors	Share of unique Russian authors	Share of unique foreign authors
2008	79.4	23.3	59.7	43.9	88.2	12.0	87.5	13.4	71.0	35.7
2009	78.3	26.0	69.0	34.1	84.1	16.2	84.1	16.5	68.1	37.5
2010	67.6	34.6	74.3	27.3	86.2	14.4	86.2	14.3	71,1	34.9
2011	73.8	29.1	72.4	29.8	85.2	15.5	88.3	12.3	72.3	33.7
2012	76.5	25.7	60.5	41.6	86.0	14.5	88.1	12.3	68.5	35.8
2013	66.1	38.8	66.2	36.2	86.2	15.0	89.0	11.6	68.4	37.1
2014	63.6	38.3	63.5	39.5	76.6	25.0	89.2	11.3	69.5	37.6
2015	61.7	41.2	60.2	41.5	81.5	20.0	89.0	11.7	72.7	33.6
2016	63.2	38.7	36.7	64.5	80.6	20.9	90.0	10.8	74.4	30.9
2017	65.2	37.2	60.1	41.8	80.2	21.2	89.3	11.5	54.1	49.9
2018	63.7	38.5	67.9	34.1	84.2	17.0	91.6	9.0	56.1	48.2
2019	73.0	28.7	78.5	22.5	87.2	13.6	94.6	5.9	44.6	57.5
2020	67.0	34.7	64.6	36.4	86.4	14.7	96.0	4.4	71.7	32.2

It is evident that there is a significant difference in the ratio of unique Russian to foreign authors across the selected disciplines. Despite yearly fluctuations, the average ratio observed was approximately 65% Russian and 35% foreign authors in SC 'Cell Biology' and 'Neurosciences.' Our data revealed a notable deviation in SC 'Physics, Mathematical,' where a balance between Russian and foreign authors was achieved in 2017. Only SC 'Chemistry, Organic' consistently exhibited a negative trend, with the proportion of Russian authors declining from 13.4% in 2008 to 4.4% in 2020 compared to foreign authors.

The ratio between Russian and foreign authors in SC "Energy & Fuels" varied over the years, but the average ratio was about 85% to 15%, respectively. The bibliometric performance of Russia and industrialized countries in the research area of "Energy & Fuels" (Markusova et al., 2020) revealed that the share of international collaboration (IC) was significantly 15% lower than the average in Russian research publications during 2008-2018. A negative trend in foreign authors' participation was observed exclusively in SC "Chemistry, Organic," where it decreased from 16% in 2008 to 4.5% in 2020. In our future research, we plan to investigate the reasons behind this phenomenon.

Despite the significant contributions and achievements of women in education, our findings reveal considerable gender inequality across research areas, as illustrated in Figure 4. The greatest disparity was observed in SC 'Physics, Mathematical,' where 90% of authors were male and only 10% were female. A similar disparity was noted in our study of Russian grant holders from RFBR (Mindeli et al., 2015, COLLNET). Significant inequality is also present in SC 'Energy & Fuels,' with a distribution of 70% male and 30% female authors. Our data indicate that the life sciences areas SC 'Cell Biology' and SC 'Neurosciences' exhibit a relatively balanced gender ratio (see Figure 4).

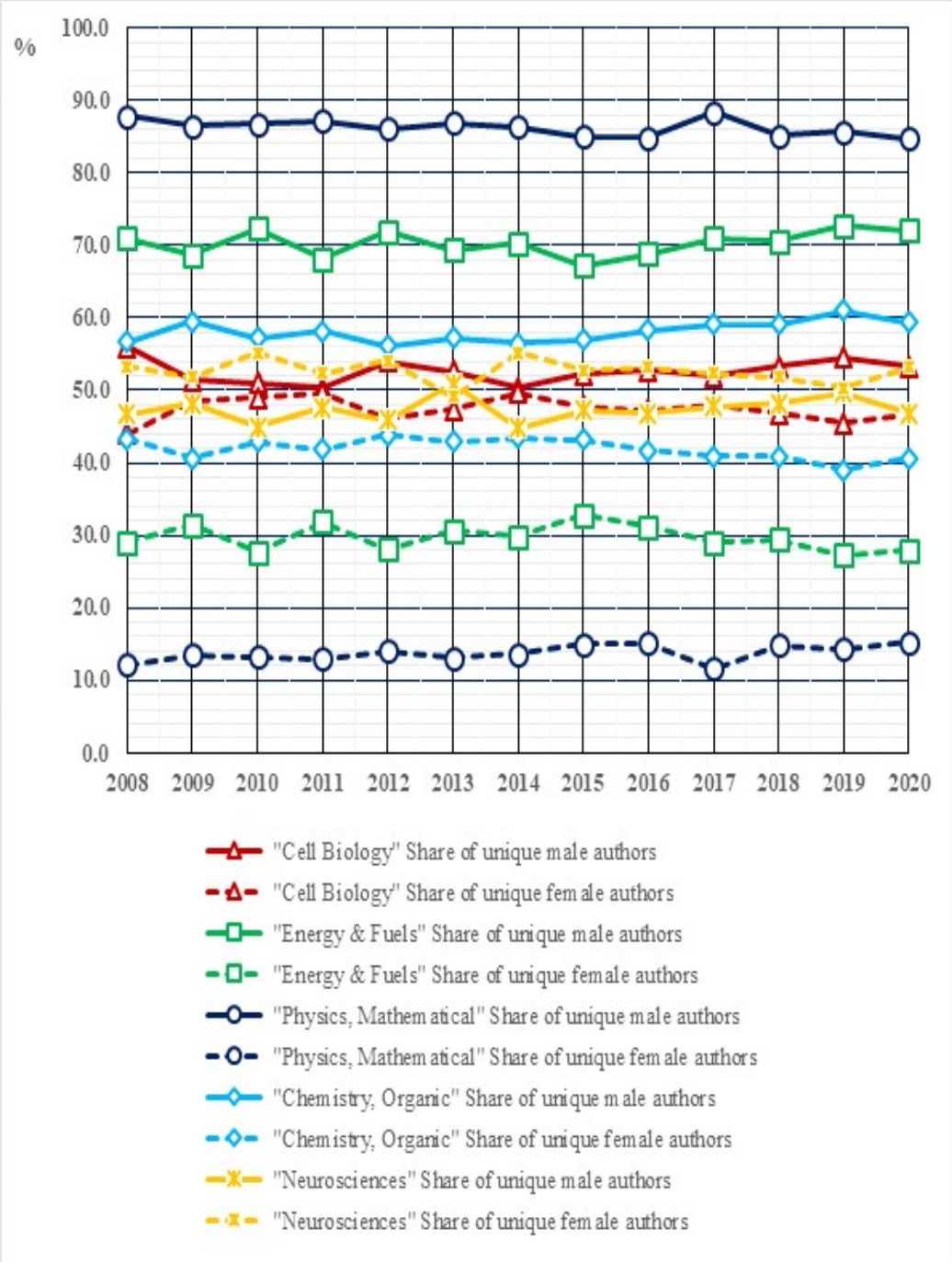

Figure 4. Impact of research area on gender disparity, as indexed in SCI-E, from 2008 to 2020

Our data support the findings of Pilkina M. et al. (2022), who examined approximately 121,000 publications by Russian authors, classified by ESI and published in WoS during 2017–2019.

Human resource mobility is a crucial factor in knowledge exchange. However, it raises the question: is it a case of brain drain or brain gain? We selected a group of researchers (Group A) whose publications were affiliated with both a Russian institution and a foreign country between 2008 and 2020 (see Table 2, Appendix). Their mobility is illustrated in Figure 5.

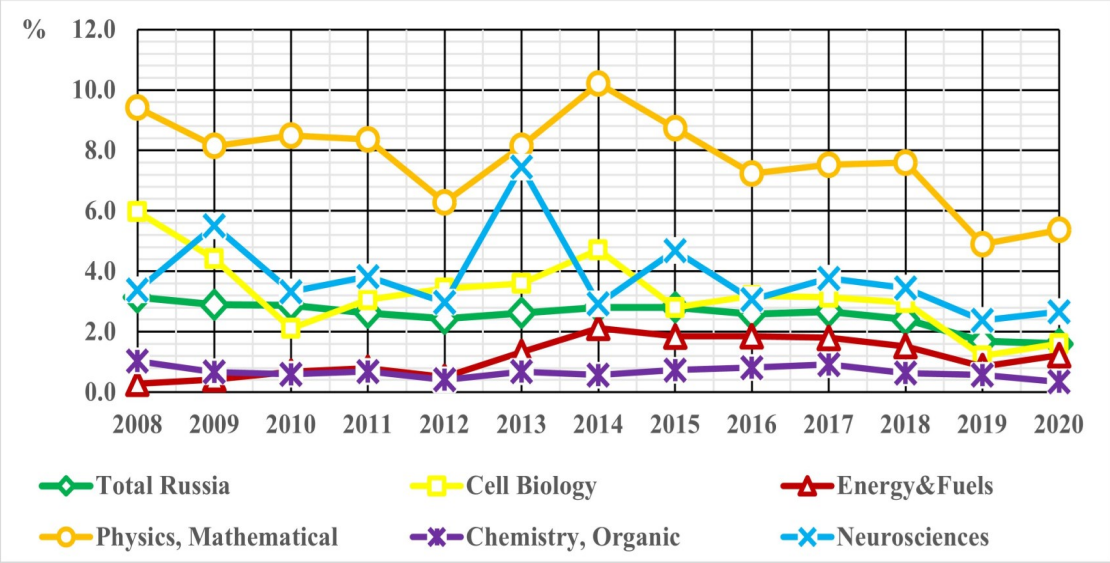

Figure 5. Trends in research productivity of scholars (Group A) affiliated with both a Russian institution and an international organization, as indexed in SCI-E, from 2008 to 2020.

It is evident that there were several waves of mobility for Group A, with peaks and declines throughout the studied period. However, there is a notable disciplinary difference in the share of publications by authors in Group A: from 9.5% in SC “Physics, Mathematical” to 0.3% in SC “Energy & Fuels” in 2008. This gap narrowed to 6.4% in SC “Physics, Mathematical” and 1.2% in SC “Energy & Fuels” by 2020.

Overall, the share of publications peaked across all studied disciplines between 2012 and 2014. This peak can be attributed to the Russian government’s mega-grant program, which aimed to send postdoctoral students to work under the guidance of leading foreign scholars abroad from 2010 to 2014. We can infer that scholars in this group are more associated with ‘brain circulation’ rather than brain drain Subbotin A. et al (2022). It is worth noting that the Ministry of Higher Education of the Russian Federation announced in July 2024 that this mega-grant program will be extended.

4. Conclusions

To explore authorship patterns in the Russian research community, we analyzed over 480,000 records of Russian publications (Research Productivity-RP) indexed in SCI-E during the period 2008-2020. The data indicate a steady growth in RP. As a result, we collected statistics on 418,774 unique Russian and 461,226 foreign authors for the studied period. For Russian unique authors, there was a 1.8-fold increase until 2019, followed by an 18.2% decline in 2020, likely due to the onset of COVID-19.

The overall trend in authorships remained positive, with a remarkable threefold increase since 2016, surpassing 1.1 million. However, this upward trend was interrupted by a 28% decrease in authorships in 2020.

Our analysis revealed a significant gender disparity in the total RP, with males accounting for approximately 65% and females 35% throughout the studied period. Our findings indicate considerable gender inequality across research areas. The greatest disparity was observed in SC ‘Physics, Mathematical,’ where 90% of authors were male and only 10% were female. It is notable that the life sciences areas exhibit a relatively balanced gender ratio.

To trace Russian researchers' mobility, we selected a group of researchers whose publications were affiliated with both a Russian institution and a foreign country between 2008 and 2020. It is evident that there were several waves of mobility for Group A, with peaks and declines and the impact of research areas throughout the studied period.

Our findings shed additional light on national barriers to female equity in various research areas. These data could be useful for research policymakers to stimulate efforts to achieve greater gender parity in academic research.

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References

[1] Abramo, G., D'Angelo, C. A., Di Costa, F. (2023). USA vs. Russia in the scientific arena. *PLoS ONE, 18*(7), e0288152. https://doi.org/10.1371/journal.pone.0288152

[2] Adams, J., Quashi, J. E., Pendlebury, D., Szomszor, M. (2020). *Global research report: Multi-authorship and research analytics 2020.* Retrieved from https://clarivate.com/lp/global-research-report-multi-authorship-and-research-analytics

[3] De Beaver, D., Rosen, A. (1978). Studies in scientific collaboration - Part 1. The professional origins of scientific co-authorship. *Scientometrics, 1*(1), 65-84.

[4] Gazni, A., Sugimoto, C. R., Didegah, F. (2012). Mapping world scientific collaboration: Authors, institutions, and countries. *Journal of the American Society for Information Science and Technology.* https://doi.org/10.1002/asi.21688

[5] Garfield, E. (1982). Why aren't there more women in science? *Essays of an Information Scientist, 5,* 498-500. Retrieved from https://garfield.library.upenn.edu/essays/v5p498y1981-82.pdf

[6] Gilyarevskii, R. S., Libkind, A. N., Markusova, V. A. (2019). Dynamics of Russian publication activity, 1993-2017, based on Web of Science data. *Automatic Documentation and Mathematical Linguistics, 53*(2), 51–63.

[7] Gilyarevskii, R. S., Libkind, A. N., Libkind, I. A. (2022). Investigation of references in citing publications by Web of Science Core Collection. *Nauchno-Tekhnicheskaya Informatsiya, Series 2*(7), 25-35. https://doi.org/10.36535/0548-0027-2022-07-3

[8] Glänzel, W., Schubert, A. (2005). Domesticity and internationality in co-authorship, references, and citations. *Scientometrics, 65*(3), 323-342. https://doi.org/10.1007/s11192-005-0277-0

[9] Glänzel, W. (2001). National characteristics in international scientific co-authorship relations. *Scientometrics, 51*(1), 69–115. https://doi.org/10.1023/A:1010512628145

[10] González-Salmón, E., Robinson-Garcia, N. (2024). A call for transparency in gender assignment approaches. *Scientometrics, 129*(1), 2451–2454. https://doi.org/10.1007/s11192-024-04995-4

[11] Lawler, M., Oliver, K., Philip, R., Lewison, G. (2023). Gender inequity in cancer research leadership in Europe: Time to act. *European Journal of Cancer, 194*(1), 113345. https://doi.org/10.1016/j.ejca.2023.113345

[12] Lewison, G., Markusova, V. (2011). Female researchers in Russia: Have they become more visible? *Scientometrics, 89*(1), 139-152.

[13] Lewison, G., Roe, P., Sharp, H., Sullivan, R. (2023). The sex (or gender) of biomedical researchers in Middle East and North Africa (MENA) countries in 2009 and 2019. *Proceedings of the Fourth International Conference on Science & Technology Metrics (STMet 2023),* November 16-17, 2023, BITS Pilani, Dubai, UAE. Retrieved from https://dline.info/newl/STMProceedings

[14] Li, W., Aste, T., Caccioli, F. (2019). Early co-authorship with top scientists predicts success in academic careers. *Nature Communications, 10*(1), 5170. https://doi.org/10.1038/s41467-019-13130-4

[15] Libkind, I. A., Markusova, V. A., Terekhov, I., Rubval'ter, R. A., Libkind, A. N. (2014). Bibliometric analysis of competitive research project results. *Scientific and Technical Information Processing, 41*(4), 254–264.

[16] Markusova, V., Minin, V., Mirabyan, L., Arapov, M. (1999). Policy for distribution of grants in new Russia in 1993-1994 by two funding agencies: The International Science Foundation and the Russian Foundation of Basic Research. *Research Evaluation, 8*(1), 53–59.

[17] Mindeli, L. E., Libkind, A. N., Markusova, V. A. (2014). The effect of grant-assisted financing on the efficiency of scientific studies in higher education. *Herald of the Russian Academy of Sciences, 84*(6), 432–440.

[18] Mindeli, L. E., Ivanov, V. A., Libkind, A. N., Markusova, V. A. (2016). Bibliometric approach to analyzing the co-authorship network of Russian researchers, 2006-2013. *Scientific and Technical Information Processing, 8,* 14–23.

[19] Moed, H. F., Markusova, V., Akoev, M. (2018). Trends in Russian research output indexed in Scopus and Web of Science. *Scientometrics, 116,* 1153–1180.

[20] Mutebi, M., et al. (2024). Sex and authorship in global cancer research. *BMJ Oncology, 3,* e000200. https://doi.org/10.1136/bmjonc-2023-000200

[21] Pilkina, M., Lovakov, A. (2022). Gender disparities in Russian academia: A bibliometric analysis. *Scientometrics, 127*(6), 3577-3591. https://doi.org/10.1007/s11192-022-04383-w

[22] Rossi, R. E., A La Salvia, R., Modica, R., Spada, F. (2024). Authorship of Italian medical literature on neuroendocrine neoplasms: Any gender gap? *Journal of Endocrinological Investigation.* https://doi.org/10.1007/s40618-024-02347-w

[23] Savchenko, E., Rosenfeld, A. (2024). Authorship conflicts in academia: An international cross-discipline survey. *Scientometrics, 129,* 2101–2121. https://doi.org/10.1007/s11192-024-04972-

[24] Shokida, N. S., Kozlowski, D., Larivière, V. (2024). Construction of a bibliometric dataset on gender studies. *SCT Proceedings in Interdisciplinary Insights and Innovations, 2*(1), 316. https://doi.org/10.56294/piii2024316

[25] Subbotin, A., Aref, S., et al. (2021). Brain drain and brain gain in Russia: Analyzing international migration of researchers by discipline using Scopus bibliometric data 1996–2020. *Scientometrics, 126,* 7875–7900. https://doi.org/10.1007/s11192-021-04091-x

[26] Tekles, A., Borrmann, L. (2020). Author name disambiguation of bibliometric data: A comparison of several unsupervised approaches. *Quantitative Science Studies, 1*(4), 1510–1528. https://doi.org/10.1162/qss_a_00081

[27] Thelwall, M., Maflahi, N. N. (2022). Research co-authorship 1900–2020: Continuous, universal, and ongoing expansion. *Quantitative Science Studies, 3*(2), 331–344. https://doi.org/10.1162/qss_a_00188

[28] Wislar, J. S., Flanagin, A., Fontanarosa, P. B., DeAngelis, C. D. (2011). Honorary and ghost authorship in high-impact biomedical journals: A cross-sectional survey. *BMJ, 343,* d6128. https://doi.org/10.1136/bmj.d6128