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Synchronous scientific mobility and international collaboration: case of Russia

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Abstract
The phenomenon of multiple institutional affiliations of authors of research papers, or synchronous scientific mobility has emerged, partly in response to a scientometric quantitative approach to assessing the performance of scientific organizations in full accordance with Goodhart's law. Its wide distribution may distort the results of analysis of research collaborations based on bibliometric data. The article traces the influence of this phenomenon on the assessment of international collaborations of Russian researchers and organizations, evaluates the success of Russian programmes to attract leading foreign scientists. We show that in up to 20% of Russian international publications there are no authors with purely Russian affiliations. We identified at least 225 presumably invited researchers who have not published a single paper in collaboration with their Russian colleagues in 2014-2018.

Introduction

The importance of international collaborations in enhancing the performance and quality of research is widely recognized in the scientific world (J. Adams, 2013; J. D. Adams, Black, Clemmons, & Stephan, 2005; Aldieri, Kotsemir, & Vinci, 2018). The focus of integrating Russian science into the international community, strengthening international collaborations, including by attracting leading foreign scientists to Russian organizations, is secured by programme documents and decrees of the President of the Russian Federation. Reforms and restructuring of the Russian research and development sector have been taking place almost since the beginning of the 21st century, significant changes that have occurred over the past 5-6 years are described in (Block & Khvatova, 2017; Ivanov, Markusova, & Mindeli, 2016; Mindeli & Chernykh, 2016; Schiermeier, 2007). These changes, in aggregate, led to a significant increase in the productivity of Russian science (Kosyakov & Guskov, 2019a; Moed, Markusova, & Akoev, 2018; Shashnov & Kotsemir, 2018), and the transformation of its structure. An important driver of this growth has been the state scientific policy, focused on the use of quantitative performance indicators according to international databases, primarily the Web of Science. In this regard, Russian researchers have actively joined in the "publish or perish game", with this background, the interest in scientometric research in Russia has grown (A. Guskov, Kosyakov, & Selivanova, 2016).

In the contest of the rapid growth of the total publications number, the number of Russian publications in international collaborations grew much slower, and their share in the total flow has steadily decreased since 2007 despite all the efforts undertaken by the state to intensify international research cooperation (Shashnov & Kotsemir, 2018) (Fig. 1). The programmes to attract leading foreign scientists led to the emergence of foreign researchers in Russian universities and research institutes. Press releases and interviews with these scientists, such as Professor Roberto Morandotti, who took the position of a visiting professor at ITMO University[i], appeared in the news bulletins of the leading universities. One of the main objectives of such cooperation is the formation of permanent research team in Russian institution.Since foreign researchers are attracted to part-time and temporary positions they usually indicate several affiliations in their articles. However, some articles of these scientists

are published without the participation of Russian co-authors, while the Russian affiliation of this scientist is also indicated (Fig. 2).

There also occurs the opposite situation: when the Russian author indicates a foreign affiliation as additional, while all other authors indicate only Russian affiliations. Based on formal criteria, such publications are considered as written in international collaborations with Russian participation, although they are unlikely to be, since they can hardly be regarded as the result of the cooperation of researchers from Russia and other countries. We consider a research collaboration as a joint work of different researchers (Katz & Martin, 1997), and an international research collaboration as a joint work of researchers from different countries.

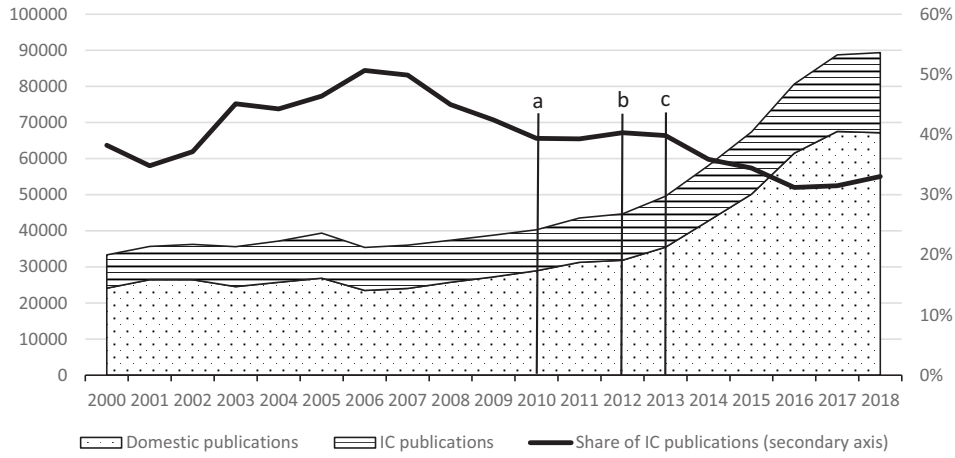

Fig. 1. Total number of Russian publications in Scopus, number of publications in international collaborations (IC) and share of IC publications in 2000-2018.

Milestones: a) Government Statement 220 on attracting foreign scientists, b) Decree 599 stated that the Russian share of research output (RO) has to reach 2.44% c) Reform of Russian State Academies of sciences, Government Statement 979 ordering to include bibliometric indicators in any research organization's evaluation


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Continuously tunable orthogonally polarized RF optical single sideband generator based on micro-ring resonators (Article)

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Fig. 2. Screenshot from sample publication webpage in Scopus.

Research questions

The phenomenon of multiple affiliations itself has attracted the attention of researchers quite recently, primarily due to the proliferation of bibliometric methods for analysing scientific mobility and migration (Moed & Halevi, 2014; Robinson-Garcia et al., 2019). In the paper (Markova, Shmatko, & Katchanov, 2016) the phenomenon of multiple affiliations is analysed from the point of view of scientific mobility. The authors introduce the term "synchronous scientific mobility" (SSM), including international (SISM). Hotternrott and Lawson (Hottenrott & Lawson, 2017) assert, that the number of authors with multiple affiliations has at least doubled over the past few years in Germany, Japan and the UK in biology, chemistry, and engineering. Our calculations show that the share of Russian researchers indicating more than one affiliation in publications has also increased in recent years, and in 2017, the proportion of publications in which at least one of the authors indicated multiple affiliation reached 30% (Kosyakov & Guskov, 2019a).

Even the multiple co-authorship make it difficult to assess the contribution of individual institution in the national research output. Multiple affiliations of the authors make it much more complex task. Fractional count is one of the possible solution (Gauffriau, Larsen, Maye, Roulin-Perriard, & von Ins, 2007; Sivertsen, Rousseau, & Zhang, 2019). But at the moment the whole counting is widely adopted in adopted in Russia's practices of research performance assessment (Kosyakov & Guskov, 2019b), and strongly relies on affiliation data in the article's byline. We suppose that it has a significant impact on the high incidence of multiple affiliations in the last years.

Bhattacharjee (Bhattacharjee, 2011) draws attention to the fact that publications in which Saudi universities are indicated as an additional affiliation are based on studies conducted mainly in other places. Thus, part-time employment of the authors of these publications in those universities is a form of purchasing "academic prestige". Biagioli, Kenney, Martin, and Walsh (Biagioli, Kenney, Martin, & Walsh, 2018) mentioned the similar case in connection with the "Organizational gaming of the ranking". It can be noted that the "publish or perish" passion in the form of "gaming of the ranking" has shifted from the individual to the institutional and even the country level.

In the study of strategies aimed at increasing the publication activity of Russian universities-participants in the 5/100 project (A. E. Guskov, Kosyakov, & Selivanova, 2018), the authors have already paid attention to the type of publications in the collaboration between universities and, above all, research institutes of the Russian Academy of Sciences, in which, there is not a single author who has designated only university affiliation. We have selected these publications in a separate category and linked them to one of the dubious strategies for increasing publication activity.

Taking into account the number of publications where professor Morandotti is the only Russian-affiliated author and the ITMO affiliation is the second or third one we can assume that it is also a form of purchasing academic prestige. In this regard, it is interesting to what extent this practice is common in Russian scientific organizations, how many formally Russian publications are made without the participation of only Russian affiliated authors. In a more general sense, we are interested in assessing the influence of the multiple institutional affiliation phenomenon on the quantitative indicators of the international scientific collaboration of Russian researchers. It is also important to evaluate the performance of programmes to attract leading foreign scientists, identifying and attempting to categorize "Russian" authors indicating multiple international affiliations.

Data and methods

We use the Scopus database as a data source. This choice is due to several factors:

- Availability of an application programming interface (API) for downloading sufficiently detailed bibliographic records available in a standard subscription.
- Use of unique identifiers of authors and institutions to facilitate the implementation of the necessary calculations.
- A bibliographic record format which includes, in addition to the identifier, the country and city of affiliation.

Scopus warns that inaccurate identification of authors and affiliations is possible, and in this case, there may be duplicate profiles that may affect the calculations. We are trying to limit the influence of this factor, in some cases not taking into account the "long tail" in which duplicate profiles are concentrated. For the purposes of this study, we assume that the involvement of leading foreign scientists by Russian organizations is performed on a temporary basis, therefore, at least in their publications, they indicate both Russian and foreign affiliation, that is, they demonstrate synchronous international scientific mobility (SISM). The same applies to the facts of the temporary work of Russian researchers abroad. In this regard, for the purposes of analysis, SISM authors were selected. There is a possibility that some of the foreign scientists could immigrate to Russia on a permanent basis, breaking ties with the previous place of work and ceasing to indicate foreign affiliations in their publications. We cannot trace these authors with proposed approach.

Data acquisition and processing was carried out in the following sequence:

- The list of Russian publications for the years 2000-2018, obtained from the Scopus web interface by the request "AFFILCOUNTRY (Russian Federation) AND PUBYEAR AFT 1999", was downloaded in comma-separated value format using the Scopus web interface.
- According to this list, the bibliographic records of individual publications were downloaded, converted, and saved in the MongoDB database using the Powershell script using the Scopus Search API.
- Since the number of authors of single article is limited to 100 in the Scopus Search API answer, detailed bibliographic records of such publications were downloaded using the Scopus Abstract Retrieval API.
- From the two data collections obtained, the MongoDB script compiled a general list, the entries in which contain data about all publication authors and their affiliations in a form suitable for further processing.
- From this list, the MongoDB aggregated query obtained a list of publications in international collaborations (those in which affiliations from different countries were indicated) in the following classification:
    - If all publication authors have both Russian and foreign affiliations, this publication is of "Synchronous Publication (SP)" type.
    - If the publication does not belong to "SP" type and all publication authors have at least one Russian affiliation, this publication belongs to "Russian Publication (RP)" type.
    - If the publication does not belong to "SP" type and all authors have at least one foreign affiliation, this publication belongs to "Foreign Publication (FP)" type.
    - Other publications have both authors only with Russian affiliations and authors only with foreign affiliations. Such publications are of "International Publication (IP)" type.
- From the general list of publications, the MongoDB aggregated query also obtained a list of authors who indicated multiple affiliations, at least in part of their publications. For each of these authors, the number of publications was calculated, in which they indicated only foreign, only Russian affiliation and both Russian and foreign affiliations.

- For authors who indicated only Russian and foreign affiliations simultaneously with the use of the Scopus Search API, lists of their publications without Russian affiliations were obtained.
- Analysis of the publication history of the SISM authors allowed them to be classified according to the following principles:
    - The authors who in the part of publications indicated only Russian affiliations and never only foreign ones, were classified as "Russian Authors (RA)".
    - The authors who in the part of publications indicated only foreign affiliations and never only Russian ones, were classified as "Foreign Authors (FA)".
    - The authors who in part of their publications indicated only foreign and in another part only Russian affiliations were classified as "Migrated Authors (MA)".
    - The authors in all publications of which for the period under review both Russian and foreign affiliations were indicated were classified as "Synchronous Authors (SA)". Most of these authors have only one publication in the sample, which suggests that in this case we are dealing with a duplicate of the author's profile.
- A subset of Russian-affiliated publications of authors classified as "FA", and these authors' rankings by the number of publications for different periods of time allowed us to make assumptions about these authors' origin (in terms of Russian or not Russian) based on their names.
- Based on the affiliation data from publications of authors classified as "FA" for 2013-2018, a ranking of Russian organizations was also obtained by the number of invited foreign authors.

Results and discussion

The analysis performed yielded the following results.

Distribution of internationally collaborative papers of different assigned types

Table 1 presents data on the number of Russian publications in the international collaboration (IC publications) in accordance with the classification principles described above. It can be noted that the share of full-fledged collaborations (IP) decreased from 80% in 2009 to 70% by 2018 due to the increase in the number of publications with Russian co-authors, some of which indicated additional foreign affiliation (RP) and publications with foreign co-authors, some of which indicated additional Russian affiliation (FP). The share of the latter has grown to almost 20% of all Russian publications with international affiliation, which is also clearly seen in Fig. 3. As mentioned above, the number of IC publications more than doubled over the period under review, but with the background of a nearly threefold increase in the total number of publications, this led to a decrease in the share of IC publications in the total number.

Types of authors with multiple institutional affiliations from different countries

The classification of the authors according to the proposed principles gave the results presented in Table 2 and Fig. 4. Only those authors who, at least in the part of publications, have indicated both Russian and foreign affiliation are considered. The number of active authors, that is, having at least one publication in a given year, is indicated. It can be noted that the average annual number of invited foreign authors (FA) ranged within 600-300, reaching 322 in 2010, and since 2012, it has shown steady growth. We assume that this growth is associated with the effect of programmes to attract leading foreign scientists and stimulate publication activity that is reflected in the international databases.

Table 1. Number of Russian publications in Scopus database according to proposed classification of internationally collaborative papers

Years	*SP*	*RP*	*FP*	*IP*	*Total*
2000	409	277	1604	6935	9225
2001	398	271	1535	7012	9216
2002	411	291	1420	7700	9822
2003	348	303	1922	8505	11078
2004	370	287	1928	8817	11402
2005	388	403	1838	9857	12486
2006	398	408	1687	9404	11897
2007	329	358	1659	9648	11994
2008	349	388	1719	9135	11591
2009	387	399	1465	9308	11559
2010	392	404	1529	9060	11385
2011	414	435	1687	9739	12275
2012	415	601	1816	9998	12830
2013	412	730	1991	10989	14122
2014	468	829	2447	11595	15339
2015	511	1089	2871	12780	17251
2016	593	1365	3296	13934	19188
2017	569	1575	3694	15414	21252
2018	611	1842	4331	15411	22195

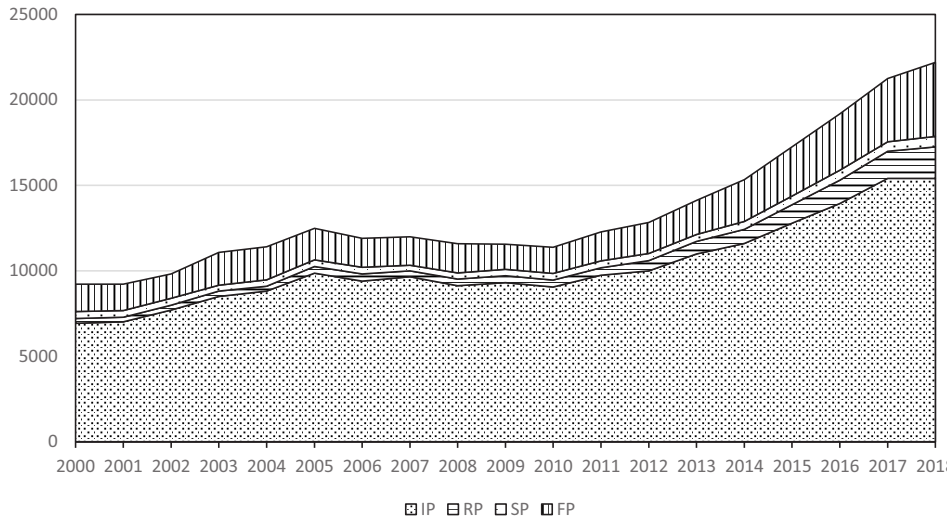

Fig. 3. Internationally collaborative Russian publications according to proposed classification

Table 2. Number of SISM authors by category and by year according to proposed classification

Years	*FA*	*MA*	*RA*	*SA*	*Total*
2000	599	2420	3192	20	6231
2001	553	2521	3316	19	6409
2002	655	2571	3530	13	6769
2003	390	2438	3505	14	6347
2004	344	2465	3678	24	6511
2005	452	2511	3912	22	6897
2006	427	2551	3900	10	6888
2007	544	2573	3991	18	7126
2008	296	2633	4124	18	7071
2009	364	2644	4196	10	7214
2010	322	2697	4367	6	7392
2011	448	2834	4470	15	7767
2012	391	2866	4510	24	7791
2013	436	2938	4744	19	8137
2014	606	3041	4945	38	8630
2015	777	3146	5155	45	9123
2016	1072	3236	5202	82	9592
2017	1146	3208	5266	94	9714
2018	1186	3077	5043	131	9437

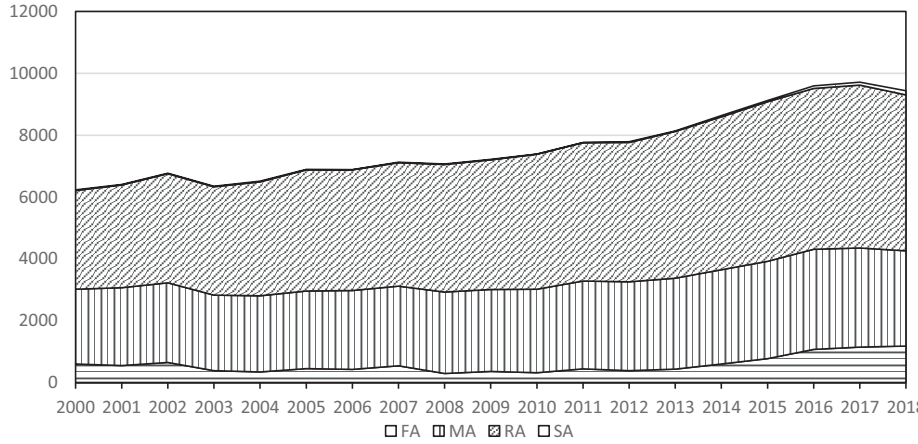

Fig. 4. Number of SISM authors by category and by year according to proposed classification

Number of invited researchers and host institutions

Publications for 2014–2018 were chosen as the basis for the analysis, since during this period all factors related to the state scientific policy to attract leading foreign authors were fully operational. In order to reduce errors due to inaccuracy of data in Scopus, authors were selected with more than one publication over the entire period 2000-2018. We counted 2,253 such authors that had publications with Russian affiliations in 2014-2018, while the total number of these authors for the entire period 2000-2018 was 7,284.

The most active organizations in attracting foreign authors are shown in Table 3.

Table 3. Top-20 of Russian institutions by number of invited foreign researchers in 2014-2018

Institution	*City*	*Number of researchers*
Joint Institute for Nuclear Research	Dubna	185
Lomonosov Moscow State University	Moscow	168
National Research University Higher School of Economics	Moscow	161
Novosibirsk State University	Novosibirsk	152
ITMO University	Saint Petersburg	152
National Research Nuclear University MEPhI	Moscow	129
Saint Petersburg State University	Saint Petersburg	122
Tomsk State University	Tomsk	115
Kazan Federal University	Kazan	109
Moscow Institute of Physics and Technology	Moscow	100
Tomsk Polytechnic University	Tomsk	88
Peter the Great St. Petersburg Polytechnic University	Saint Petersburg	78
RUDN University	Moscow	74
National University of Science & Technology (MISIS)	Moscow	74
Sechenov First Moscow State Medical University	Moscow	74
P.N. Lebedev Physical Institute of RAS	Moscow	59
Skolkovo Institute of Science and Technology	Moscow	55
Petersburg Nuclear Physics Institute (PNPI)	Gatchina	53
Ural Federal University	Ekaterinburg	44
Lobachevsky State University of Nizhni Novgorod	Nizhni Novgorod	43

Examination of the names of FA authors entering the top by publication activity for different periods of time allowed us to suggest that at the beginning of the period (before 2010), the majority of these authors were representatives of the Russian diaspora, scientists who emigrated from Russia in the 1990-s, but retained scientific ties with their alma mater organizations. In the latter period (2014-2018) there is a significant number of foreign authors, probably attracted under the relevant programmes in the top of the authors' ranking by publication activity. Many of these authors are also characterized by a significant number of FP publications, which are Russian only due to their additional Russian affiliation. The average proportion of such publications for FA authors is 45%, but for Professor Morandotti mentioned above, it is equal to 94%. For this period, only 4 out of 71 articles were published by Professor Morandotti in collaboration with his colleagues from ITMO University. More than two hundred authors (225) have not published any work at all in collaboration with their Russian colleagues, confining themselves to attributing additional Russian affiliation, which represents a significant 10% of the total number of FA authors for this period. A typical example is Rafael Luque, a chemist from Universidad de Córdoba, who mentioned Peoples Friendship University of Russia (RUDN University) as an additional affiliation in 45 publications for 2018. None of these publications contains co-authors not only from RUDN University but also from Russia in general.

Conclusion

The analysis shows that the practice of multiple affiliations can significantly affect both the general indicators of the publication activity of organizations and countries, and the assessment of international collaborations. Up to 20% of Russian publications related to international collaborations are attributed to Russia only because some authors of these works for some reason indicated the Russian organization as an additional one. Presumably, at least in part this

practice can be interpreted as the purchase of academic prestige. Where there are buyers, there are sellers. In fact, a community has emerged constituting researchers who are ready to peddle academic prestige – to assign additional affiliations for remuneration in one or another form. At least 225 presumably invited foreign researchers from Russian institutions have not published a single paper in collaboration with their Russian colleagues in 2014-2018. Of course, one cannot state the existence of scientific misconduct based only on bibliometric metadata, but we suppose that these cases require close study.

A significant number of papers are devoted to the discussion of ethical issues of multiple authors of scientific publications (see, for example, (Teixeira da Silva & Dobránszki, 2016). In their recent paper in Nature Ioannidis, Klavans, and Boyack (Ioannidis, Klavans, & Boyack, 2018) stated that "Loose definitions of authorship, and an unfortunate tendency to reduce assessments to counting papers, muddy how credit is assigned". Affiliations indicated by the article authors are currently used in a wide range of scientometric tasks, including in the calculation of different rankings, in the research assessment of institutions, even in informal research performance races between countries. As in the case of authorship, it is implied that the affiliations indicated in the scientific article are related to the contribution of relevant institutions to the research, expressed in the provision of funding, workplace, instrumentation base, samples, reagents, source data, etc. Thus, there is a lack of ethical principles widely accepted by the scientific community that determine the legitimacy of specifying a particular affiliation.

Acknowledgments

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[i] Interview with prof. Morandotti - http://news.ifmo.ru/ru/science/photonics/news/6741/ (accessed 20-01-2018, employee profile at the site of ITMO University - http://edu.ifmo.ru/teacher/231253/ (accessed 20-01-2018).