The Influence of Established Requirements for the Award of Academic Degrees on the Country's Scientific Indicators

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ABSTRACT: *This study analyzed the impact of degree requirements on academic performance, specifically looking at the requirements for obtaining a scientific degree in the Republic of Azerbaijan and how these requirements affected scientific indicators. The study used data from the "Web of Science," "Scopus," and "Scimago Journal & Country Rank" databases to analyze statistical data by year and field of science. The findings showed that the requirement of publishing articles is crucial in improving the country's scientific performance.*

Keywords: Science Metric Data, Scientific Degree, Web Of Science, Scopus

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1. Introduction

Scientometric systems and journal indexing have revolutionized the analysis of scientific research. The number of times an article is cited indicates the level of discourse around the research. With the information obtained from databases, it is now possible to analyze scientific areas and the relevance of research topics. This analysis can be conducted in two main directions: comparing the works of the same author or the works of two researchers in the same field. The results of these analyses are vital for researchers when selecting research objects, methods and areas of study.

It's important to analyze indicators by country to identify research directions and organize research accordingly. One way to direct research is by creating a map of research directions [1,2]. Collaborative studies have been conducted in recent years, beginning in the 1960s and 1970s in the former Soviet Union and Europe [3,4]. However, the scope of research has expanded due to the need to solve global problems. Thousands of researchers are currently involved in research conducted at CERN, and the analysis of the results obtained is,, therefore,, more interesting [5,6].

The development of information technology, especially the rapid dissemination of information through social networks, has led to research in this direction in several areas. It has been determined that the influence of social networks on the development of various sectors of the economy and tourism is quite strong. Therefore, extensive research is being carried out in this direction [7-9]. As modern technology develops, new problems arise in all fields of science. It is known that the expansion of the use of mobile phones leads to greater socialization of students and their distraction from the educational process due to the use of social networks. The study determined that the learning process can be made more interesting for students by using the capabilities of mobile phones. Currently, opportunities arise for using digital technologies in education, and cases of evasion from education are prevented [10]. As you can see, it is possible to improve scientific indicators using modern technologies and the capabilities of social networks.

Scientometrics is a field that studies scientific indicators of different countries [11,12]. However, there is a lack of research on

scientometric indicators in Azerbaijan. Additionally, the impact of rules for awarding academic degrees on changes in scientific indicators has not been studied. Therefore, this paper examines the effect of academic degree requirements on scientific performance in Azerbaijan. The analysis will focus on changes in scientific indicators after introducing new rules and the end of the special quarantine regime in 2019. The study will compare the results of 2021 and 2022 with those of previous years to determine any significant differences.

2. Research Method

The study examined the indicators of Azerbaijani researchers from 2017 to 2022 using the “Web of Science”, “Scopus”, and “Scimago Journal & Country Rank” databases. The statistics obtained under new requirements were compared with those obtained under old requirements, and the mechanism for changing results was studied. The researchers’ indicators were taken from the “Web of Science” and “Scopus” databases, and annual country scores were obtained from the “Scimago Journal & Country Rank” database. The analyses were carried out in the subjects of “Exact and Natural Sciences” and “Humanities and Social Sciences”, and the field of science carried out the assessment. The assessment also considered the influence of several factors, including the special quarantine regime and the rules for awarding academic degrees on scientific indicators.

3. Discussion of results

Azerbaijan’s scientific indicators were analysed using the “Scimago Journal & Country Rank” database. It has been established that starting in 2016, N > 1000 articles were published per year. In 2017, researchers published 1173 articles. By 2019, the number of articles was growing at a rate of *dN/dt* HH 200. In 2020, these figures increased at a rate of *dN/dt* HH 300 and reached a relatively stable level. In 2020-2022, the number of articles relatively stabilized, and *dN/dt* HH 100 grew rapidly and approached *N* ~ 2000. The mechanism for changing the number of articles over the years is shown in Figure 1.

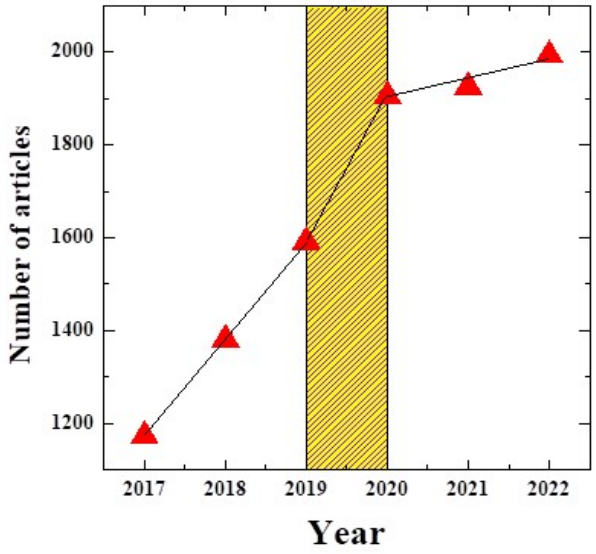

Figure 1. The mechanism for changing the number of scientific articles in Azerbaijan by year.

According to Figure 1, there have been significant changes in the number of articles published in the country after 2019. This can be attributed to several factors, including the increased number of articles since 2016. The linear growth rate predicted better results in the number of articles. Researchers use information technology to obtain information about indexed journals and publish them should impact the number of articles published in a country. Increased scientists’ participation in international collaborations also leads to increased articles. However, the results achieved in 2020 were higher than expected. The subsequent years also show continued growth in the number of articles.

It is worth noting that in 2019, significant changes were made to the rules governing academic degree awards in Azerbaijan. The new rules state that all research articles indexed in the Web of Science and Scopus databases are accepted. Researchers must publish articles in these databases for the Doctor of Sciences degree. At least three articles in the “Web of Science” system in the exact and natural sciences field are required. These articles should be in the “Science Citation Index Expanded

(SCIE)" database for mathematics, physics, and chemistry. In the fields of humanities and social sciences, at least one article in the "Web of Science" or "Scopus" system is required [13]. A study was conducted to determine the number of articles published by researchers adhering to these rules since their implementation, and the results are presented in Table 1.

Table 1. Number of articles by researchers who defended their dissertations in Azerbaijan in 2021 and 2022

Year	Databases	Exact and natural sciences		Humanities and Social Sciences		Total
		Doctor of Philosophy	Doctor of Sciences	Doctor of Philosophy	Doctor of Sciences	
2021	Scopus	323	424	14	47	808
	Web of Science	247	351	8	35	641
2022	Scopus	468	628	42	65	1203
	Web of Science	304	539	29	64	936

Based on the information provided in Table 1, it is evident that researchers who defended their dissertations in 2021 and 2022 have written a total of 808 and 1203 articles, respectively, on indexed bases. It is important to note that not all of these articles were written in 2021 and 2022. Most articles were written in previous years, as reviewing articles for journal publication can take several months or even years. However, with the increasing demand for more stringent article requirements, researchers are now writing more rigorous articles and publishing them in indexed journals. According to Table 1, approximately 92% of the researchers who defended their dissertations have written articles in the exact and natural sciences field.

Table 2. Number of published articles by year by branches of science in Azerbaijan

Science	Year					
	2017	2018	2019	2020	2021	2022
Agricultural and Biological Sciences	50	68	84	94	81	98
Arts and Humanities	24	37	37	52	60	49
Biochemistry, Genetics and Molecular Biology	34	72	68	91	63	84
Business, Management and Accounting	21	34	49	85	82	124
Chemical Engineering	88	102	119	145	163	210
Chemistry	179	206	226	261	340	368
Computer Science	129	98	197	268	293	289
Desicion Sciences	9	24	41	34	34	72
Dentistry	1	2	8	8	2	2
Earth and Planetary Sciences	64	77	120	138	135	163
Economics, Econometrics and Finance	21	29	41	74	72	122
Energy	65	105	143	181	158	216
Engineering	186	286	329	399	383	437
Environmental Science	32	56	63	153	148	193
Healts Professions	3	4	7	7	4	6
Immunology and Microbiology.	4	9	18	23	15	13
Materials Science	189	220	238	287	277	261
Mathematics	238	242	252	340	377	414
Medicine	195	209	247	296	260	266
Multidisciplinary	4	6	7	15	17	23
Neuroscience	3	5	4	5	9	9
Nursing	0	1	3	7	1	5
Pharmacology, Toxicology and Pharmaceutics	24	28	20	35	17	32
Physics and Astronomy	339	411	441	475	460	370
Psychology	2	5	8	4	10	7
Social Sciences	43	70	110	132	126	225
Veterinari	1	5	4	3	1	1

An analysis was conducted to compare the number of articles in various fields of science with the total number of articles in the country. The analysis was based on data from the "Scimago Journal & Country Rank" database, which covers fields such as Agricultural and Biological Sciences, Biochemistry, Genetics and Molecular Biology, Chemical Engineering, Chemistry, Computer Science, Decision Sciences, Dentistry, Earth and Planetary Sciences, Energy, Engineering, Environmental Science, Health Professions, Ýmmunology and Microbiology, Materials Science, Mathematics, Medicine, Neuroscience, Nursing, Pharmacology, Toxicology and Pharmaceutics, Physics and Astronomy, Veterinary, Social and Humanities: Arts and Humanities, Business, Management and Accounting, Economics, Econometrics and Finance, Psychology, Social Sciences. The analysis was conducted for each year, and the results are presented in Table 2.

It is evident from Table 2 that there was a rise in the performance of Azerbaijani scientists in nearly all fields of science during the years 2017-2022. However, the number of papers in certain fields of science, such as "Veterinary," "Nursing," and "Dentistry" has decreased due to a limited number of scientists working in these areas. When these scientists leave for research centres in other countries, the number of articles in these fields changes dramatically. To better illustrate the change in the number of papers in these scientific areas over the years, the correlation between the number of papers in a few scientific fields has been established. Figure 2 portrays the mechanism of change in articles written by Azerbaijani scientists in the fields of "Mathematics," "Economics, Econometrics and Finance," and "Social Sciences" between 2017-2023. The given correlations reveal significant changes in the number of articles in these areas of science during the specified time interval, with major changes identified in 2020 and 2021. To determine the reason for these changes, scientific indicators for each field of science were analyzed separately.

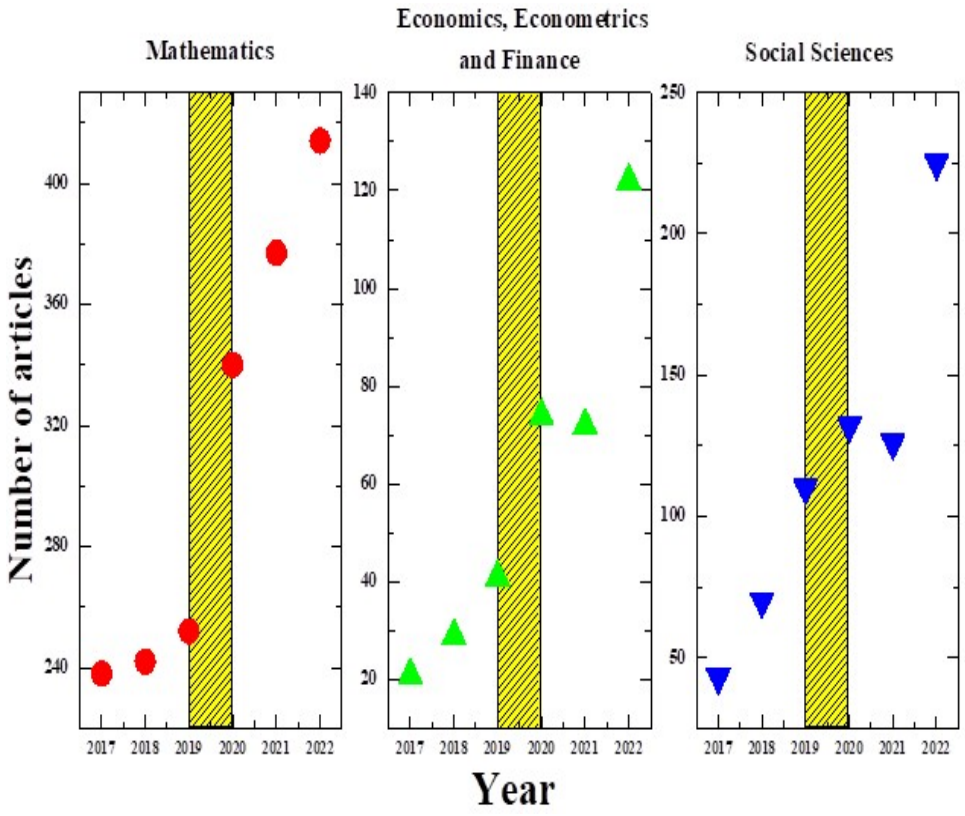

Figure 2. The mechanism for changing the number of articles by Azerbaijani scientists in the fields of "Mathematics", "Economics, Econometrics and Finance," and "Social Sciences" by year

Based on the dependencies illustrated in Figure 2, it's evident that there have been significant changes in the number of articles related to mathematics after the year 2019. The reason behind this change can be attributed to two factors. Firstly, the academic degree awarding regulations have set high criteria for this field of science. To be granted a doctorate in science, one must have published at least three articles in the "Science Citation Index Expanded (SCIE)" on the "Web of Science" platform in a specific field of science. Secondly, there are six scientific journals in the field of mathematics indexed in Azerbaijan, and most Azerbaijani scientists publish their work in these journals. Compared to other science fields, mathematics has the highest number of indexed journals.

The number of “Economics, Econometrics and Finance” articles has undergone complex changes from 2017 to 2022. Figure 2 shows that significant changes occurred after 2019. The number of articles increased significantly, with only 21 articles written in 2017, compared to 122 articles in 2022, which is six times more. Based on the dynamics of the increase in articles, it is evident that fundamental changes began in 2019. This may be due to the requirement for articles in the “Web of Science” or “Scopus” databases according to the rules for awarding academic degrees. The second effect was observed in 2020. Compared to 2019, there was a slight decrease in the number of articles written by Azerbaijani scientists in economics. The main reason may be the introduction of a quarantine regime in the country due to the “COVID-19” virus. Scientific institutions were closed, and researchers had difficulties conducting statistical studies, surveys, and observing economic processes. Consequently, research began to build economic models that can work primarily online. However, research into the preparation, application, and analysis of the results obtained from these models requires a certain time. Therefore, there was a relative decrease in the number of published articles in this direction in 2020.

According to Figure 2, there has been an increase in the number of scientific articles in both the “Social Sciences” and “Economics, Econometrics and Finance” fields. The growth has been continuous since 2017, but in 2021, there was a partial break in the trend, and fewer articles were written than in the previous year. This change could be attributed to the quarantine measures implemented due to the COVID-19 pandemic. Social research involves surveying, collecting, and analyzing statistical data, which can be challenging during quarantine conditions. However, new problems have emerged in the field of social sciences due to the changes in people’s communication and social environment caused by quarantine measures. With restrictions on social gatherings, new social problems require exploration. Figure 2 shows that the number of articles written in the field of social sciences has increased significantly in 2022, reflecting the importance of addressing these new problems. The difference in the number of articles written between 2017-2020 was 89, but in 2021-2022 alone, the difference was 99. This indicates a higher increase in articles in the last year compared to the previous five years.

It is worth noting that there has been an increase in the number of articles written by Azerbaijani scientists between 2017 and 2022, a sign of the country’s growing scientific research capabilities. This increase in articles can be attributed to changes in the rules for awarding academic degrees and a special quarantine regime. It is important to note that the quality of these articles is also noteworthy, not just the quantity. Therefore, the citation dynamics of articles written by Azerbaijani scientists between 2017 and 2020 were also analyzed. The country has an H-index of 141, but this varies across different fields of science. The highest H-index of 117 is in the “Physics and Astronomy” field, which can be attributed to the participation of Azerbaijani scientists in international collaborations.

Articles that receive a significant number of citations are often based on either the selection of a new research object or the use of a new research method. For instance, a 2019 article on the study of topological insulators received 652 links, while a 2017 article on the study of multiferroics received 118 links in the Scopus database [14, 15]. Other researchers primarily provide these links. Dissertations covering the research mentioned in these articles were defended in 2021. References to articles written in other fields of science are also sufficient. By analyzing these indicators, we can identify promising areas of scientific research. The citations of the articles indicate that other researchers have read and discussed these findings.

After an analysis, it was discovered that a country’s scientific performance can be evaluated by examining the number of scientific articles published and the number of citations received. It is well-known that obtaining a scientific degree requires significant research. To improve a country’s overall scientific performance, guidelines for obtaining academic degrees should be established. These guidelines must be designed to have a positive impact on a country’s scientific indicators.

4. Conclusions

This study examines the statistical indicators of articles published by Azerbaijani scientists between 2017 and 2022. The analysis is based on data obtained from scientometric databases. The study reveals that the number of articles published in the country has increased recently. The factors that influence changes in these indicators have also been examined. The study shows that the stricter requirements for awarding academic degrees have significantly impacted the number of published articles nationwide. The impact of the quarantine regime on the number of articles has also been analysed. It was found that the quarantine regime did not affect some areas of science, particularly those related to theoretical studies and research that can be conducted remotely. The study collected scientometric data for different years and fields of science and demonstrated methods for identifying priority areas based on statistical data.

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