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The Impact of Academic Degrees on 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 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 comparing the works of two researchers working in the same field. The results of these analyses are vital for researchers when selecting research objects, methods and areas of study.

It's crucial 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 both the former Soviet Union and Europe [3,4]. However, the scope of research has expanded due to the need to solve global problems. Currently, thousands of researchers are involved in research conducted at *CERN*, and the analysis of the results obtained is therefore more interesting [5,6].

The development of information technology, particularly the rapid dissemination of information through

social networks, has led to research in this area in several fields. It has been established that the impact of social networks on the development of various economic sectors and tourism is significant. Therefore, extensive research is being carried out in this direction [7-9]. As modern technology advances, new challenges emerge 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 found that incorporating mobile phone capabilities can make the learning process more engaging for students. At this time, opportunities arise for the use of digital technologies in education, and cases of evasion from education are prevented [10]. As you can see, it is possible to enhance scientific indicators by leveraging 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 governing the awarding of academic degrees on changes in scientific indicators has not been studied. Therefore, this paper aims to examine the effect of academic degree requirements on scientific performance in Azerbaijan. The analysis will focus on changes in scientific indicators after the introduction of 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 identify 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 the new requirements were compared with those obtained under the old requirements, and the mechanism for changing the 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 took into account the influence of several factors, including the special quarantine regime and the rules for awarding academic degrees on scientific indicators.

3. Discussion of Results

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

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, one of which is the increase in the number of articles since 2016. The linear growth rate predicted the achievement of better results in the number of articles. Researchers’ use of information technology to access and publish information about indexed journals should have an impact on the number of articles published in a country. Additionally, an increase in scientists’ participation in international collaborations also leads to a rise in the number of articles. However, the results achieved in

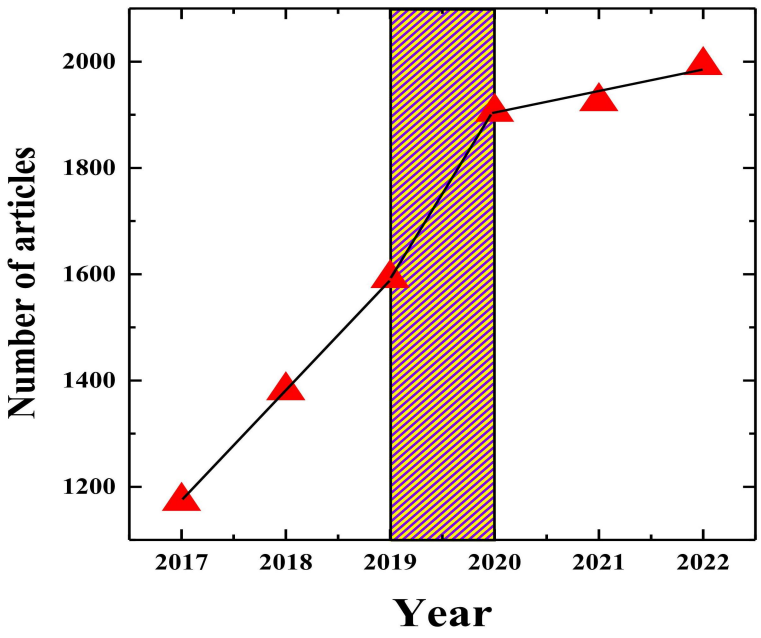

Figure 1. The mechanism for changing the number of scientific articles in Azerbaijan by year

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 the award of academic degrees in Azerbaijan. The new rules state that all research articles indexed in the Web of Science and Scopus databases are accepted. For the Doctor of Science degree, researchers must publish articles in these databases. At least three articles in the "Web of Science" system in the field of exact and natural sciences are required. For mathematics, physics, and chemistry, these articles should be in the "Science Citation Index Expanded (*SCIE*)" database. 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.

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

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

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	5	1
Pharmacology, Toxicology and Pharmaceutics	24	28	20	35	32	17
Physics and Astronomy	339	411	441	475	370	460
Psychology	2	5	8	4	7	10
Social Sciences	43	70	110	132	225	126
Veterinari	1	5	4	3	1	1

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

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 an indexed basis. It is important to note that not all of these articles were written in 2021 and 2022. Most of the articles were written in previous years, as the process of reviewing articles for publication in journals 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.

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 study 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 the performance of Azerbaijani scientists in nearly all fields of science increased significantly during the years 2017-2022. However, the number of papers in specific 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, a correlation has been established between the number of documents in a few scientific fields. 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 and 2023. The given correlations reveal significant changes in the number of articles in these areas of science during the specified time

interval, with substantial modifications identified in 2020 and 2021. To determine the reason for these changes, scientific indicators for each field of science were analyzed separately.

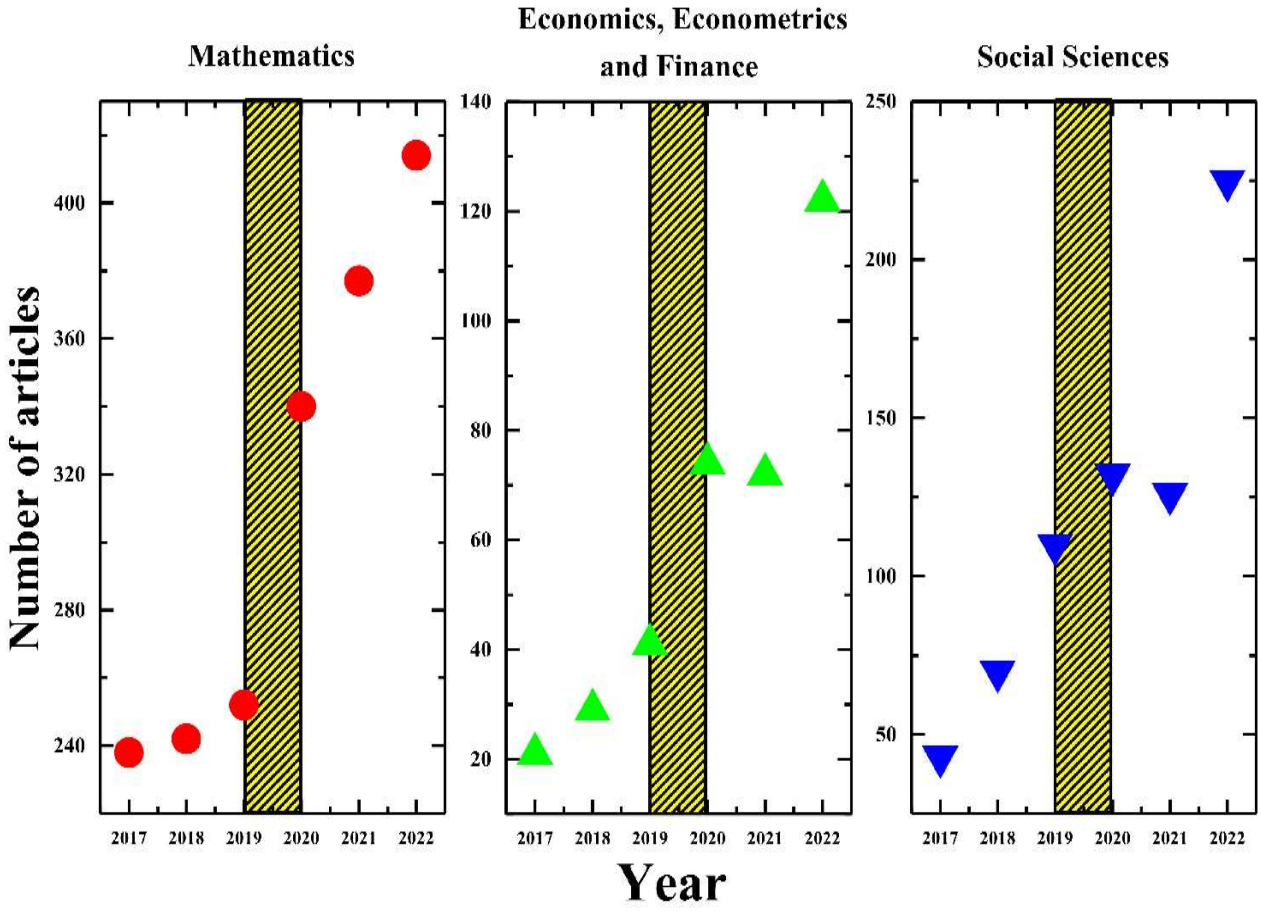

Figure 2. The mechanism for changing the number of articles by Azerbaijani scientists in the fields of "Mathematics", "Economics, Econometrics and Finance" and "Social Sciences" by year

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. As compared to other fields of science, mathematics has the highest number of indexed journals.

The number of articles written in the field of "Economics, Econometrics and Finance" has undergone complex changes from 2017 to 2022. Figure 2 shows that significant changes occurred after 2019. The number of articles increased significantly, from 21 in 2017 to 122 in 2022, a sixfold increase. Based on the dynamics of the rise in the number of 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 the field of economics. The main reason for this 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 in the direction of building financial 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; however, in 2021, there was a partial break in the trend, with fewer articles written compared to the previous year. This change can be attributed to the quarantine measures implemented in response to the *COVID*-19 pandemic. Social research involves surveying, collecting, and analysing 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 have arisen that 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 and 2020 was 89, but in 2021 and 2022 alone, the difference was 99. This indicates a higher increase in the number of articles in the last year compared to the previous five years.

It is worth noting that the number of articles written by Azerbaijani scientists increased between 2017 and 2022, a sign of the country's growing scientific research capabilities. This increase in the number of articles can be attributed to two factors: 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 scientific fields. The highest H-index of 117 is in the field of "Physics and Astronomy," which can be attributed to the participation of Azerbaijani scientists in international collaborations

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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 different fields of science are also sufficient. By analyzing these indicators, we can identify promising areas of scientific research. The citation of articles indicates that other researchers have read and discussed these findings.

After conducting 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 by those articles.

It is well-known that obtaining a scientific degree requires significant research. To enhance a country's overall scientific performance, guidelines for obtaining academic degrees should be established. These guidelines must be designed in a manner that has a positive impact on a country's scientific indicators.

4. Conclusion

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 been increasing in recent years. The factors that influence changes in these indicators have also been examined. The study reveals that stricter requirements for awarding academic degrees have had a significant impact on the number of published articles nationwide. The impact of the quarantine regime on the number of articles has also been analyzed. It was found that the quarantine regime did not significantly impact certain 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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