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Scientific Production In The Main Ecuadorian Universities In The Period 2020 To 2022

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Summary
Studies on scientific production have been carried out over time and have been seen from different fronts. The advancement of scientific research in these times has allowed the implementation and development of several indicators that help measure its quality and have been determined by the databases where academic journals are located. The study underlines the need to strengthen national and regional indicator systems in the field of science, technology and innovation. Therefore, this article examines the scientific production of four Ecuadorian universities between 2020 and 2022, a period marked by the COVID-19 pandemic, using a descriptive approach with quantitative methods, based on scientific documents indexed in Scopus, whose authors were affiliated with these institutions. Major areas of production include life sciences, medicine, and computer science. Ecuadorian universities have increased their presence in high-impact journals (Q1 and Q2 quartiles). although its production is still modest compared to Brazil and Mexico. This study underscores the importance of scientific research as a driver of socio-economic progress and suggests the need to improve funding and resources for research in Ecuador.
Keywords: *Bibliometric Indicators, Research, Scientific Production, Academic Reviews, Ecuadorian Universities.*

INTRODUCTION

In the 21st century, the role of technology and science is extremely important for contemporary society, which has drastically transformed people's quality of life. In this context, societies demand the promotion of education in science, technology and innovation to contribute to well-being and social progress. In recent years, the generation of scientific knowledge in Latin America and the Caribbean has been impacted by the growth of the internet and open access. However, the evolution of this generation of knowledge has also been affected by limited investment in R+D+i, the lack of interest in scientific dissemination by some researchers, and the predominance of English in the main scientific journals (Leon González et al., 2020). Meanwhile, the publication of scientific articles in academic journals is crucial for the advancement of knowledge and political decision-making. This activity is influenced by structural factors that affect the choice of topics, methodology, and participants in the publication process (Sokil & Osorio, 2022, p. 2).

Theoretical Framework

Scientific production

Scientific production focuses on identifying trends in areas and subareas of research, considering the number of publications, supporting organizations, citation index, and influence on other research (Ruiz Mármol et al., 2022, p. 775). It is defined by its productivity measured in publications (Spinak, 1996, p. 188) and reflects the knowledge generated both in the academic field and outside it, being essential for the advancement of science as a social activity (Sena Correa & Ruiz Díaz, 2022, p. 59). In addition, it contributes to scientific progress through documents that explore new fields and demonstrate intellectual effort in specific areas (Piedra Salomón & Martínez Rodríguez, 2007, p. 34).

Scientific production is evaluated by bibliometric indicators that reflect the state of science, influenced by socioeconomic factors such as GDP, research funding, the active population and the number of researchers. These indicators help to identify key areas, prolific authors and relevant scientific behaviors (Ríos Gómez & Herrero Solana, 2005, p. 44).The process of scientific research seeks to solve problems and generate knowledge through various stages such as data collection, definition of facts, accumulation of data, interpretation and application, validation and verification. The results are disseminated in academic journals, theses and books, with academic-scientific journals being one of the main channels of communication and dissemination of research results, promoting the institutionalization of science in society and its public availability for evaluation by the scientific community (De la Torre, 2004)(Livia et al., 2022) with universities playing a key role in social and scientific advancement worldwide. These institutions bring together a large number of researchers who aspire to contribute to the progress of their countries by generating new scientific knowledge(Kunsch, 2021) (Barrientos-Báez et al., 2021).
The diversification of scientific production has expanded dissemination channels, such as patents, conferences, and publications, improving the transfer of information to the general public (Piedra Salomón and Martínez Rodríguez, 2007; Domínguez, 2022; León Cano et al., 2022)Despite the growth in scientific production, gender gaps persist in the fields of science, technology, and innovation in Latin America and the Caribbean. According to López-Bassols et al. (2018), women continue to be underrepresented in STEM disciplines and face structural barriers that limit their access to leadership opportunities and financing. The low representation of women in certain scientific fields and the unequal distribution of resources for research have an impact on the equity of academic and professional development.

Databases and scientific production

Scientific production is disseminated mainly through journals, both open access (Dialnet and Redalyc) and subscription (Scopus and Web of Science) (López-Cózar and Ruiz Pérez, 1995; Rodríguez Rosado, 2019). The SCImago Journal & Country Rank uses indicators such as SJR to classify the impact of journals according to some indicators such as citations, total citations, total documents, SJR and citations by documents, through this a minimum threshold is established for each indicator (SCImago, 2023; ULPGC, 2023), allowing comparisons between countries and time periods (De Moya-Anegón et al., 2011). To boost scientific production, it is crucial that governments fund research programs in both higher education institutions and other research centers, that journals attract contributions from both national and international authors, and that research staff be trained so that they can effectively communicate the results generated by turning their results into global solutions (Leon González et al., 2020).

Scientific production in Latin America and Ecuador during the COVID-19 pandemic.

The difference in scientific production capacity between Latin American countries is widely recognized. If we were to classify the countries that have published more than 1000 documents during the period 2015-2019 into quartiles, we would find Brazil and Mexico in the first quartile, Argentina, Chile, Colombia and Ecuador in the second quartile, Peru, Cuba, Uruguay, Venezuela, Puerto Rico and Costa Rica in the third quartile, and the other countries in the last quartile. The results show that Latin American countries experience uneven growth rates in terms of the volume and frequency of scientific publications, which leads to changes in their relative position. In addition, it is important to note that, in the region, the open access modality has become the predominant way of disseminating scientific knowledge. The same study mentions that despite a significant increase in the number of scientific publications produced in Latin America over the last decade, compared to global production, the region's numerical contribution is not substantial. Although Latin America ranks fourth in terms of percentage of participation, countries in the top positions are notably ahead, with differences of 9.27%, 22.11% and 52.91%, which highlights that the region has a long way to go to approach the levels of research production of global leaders (Tibaná Herrera, 2021) (González-Parias et al., 2022). In the

period 2020-2022, Ecuador is ranked seventh in the ranking of Latin American countries in scientific production. While, worldwide in 2020 Ecuador was in sixty-fifth place, in 2021 it was in sixty-seventh place and by 2022 it was sixty-sixth. Another analysis The study mentions that in the period 2017-2019 in the ranking of Latin American countries of scientific production Ecuador was ranked sixth and worldwide in 2017 Ecuador was in sixty-sixth place, in 2018 it was ranked sixty-two and by 2019 in sixty-fourth place. Although scientific and technological advances have a more significant impact on developed countries, over time, Latin American countries have also made progress in these areas, promoting scientific growth in academic and university institutions. In this sense, although it is true that scientific production in Latin American countries has made significant progress in Ecuador, scientific production in the period 2020-2022 has been lower than in the period 2017-2019 at the level of Latin America and worldwide. The outbreak of the pandemic caused by the COVID-19 virus presented an unprecedented challenge for both society and the scientific community. On the one hand, both public and private initiatives were promoted to immediately allocate resources to research areas closely linked to the COVID-19 emergency. However, research in many fields that are not directly related to the pandemic was relegated to the background (SCImago, 2023)(SCImago, 2023)(Riccaboni y Verginer, 2022). In this sense, scientific production in Ecuador it was a challenging time for researchers, especially those engaged in experimental research. In many cases, their projects were forced to be suspended, and in other cases, their focus had to be shifted to COVID-19 related issues. As a result, some scientists with good intentions and genuine experience in a field had to get involved in areas where they lacked the necessary training and expert knowledge. In addition, in many countries, the pandemic led to the allocation of additional or specific resources to boost research in COVID-19-related areas. However, in the case of Ecuador, the situation was different, since, instead of increasing support, regulations and obstacles were established that made it difficult to carry out research on the pandemic. Nonetheless, despite these difficulties, Ecuadorian scientists took the opportunity to review and use the data they had stored, catch up on their pending projects, or even strengthen their collaborations. (Pai, 2020)(Terán, 2021)Taking into account that universities are key to innovation and scientific production, as they contribute to socioeconomic development and improve the public policies of each nation (Yong Amaya et al., 2017; Rivera García et al., 2017; Rincón Soto, 2009), in Ecuador, universities such as the Pontificia Universidad Católica, the National Polytechnic School, and the Universidad San Francisco de Quito stand out in the World University Rankings 2022 (Galarza Ramírez et al., 2020)The objective of this research is to analyze the scientific production in public and private universities in Quito, Ecuador, between 2020 and 2022, considering the impact of COVID-19, using bibliometric indicators based on articles indexed in Scopus and SCImago data.

METHODOLOGY

This research adopted a descriptive approach with quantitative methods, using scientific papers registered in Scopus between 2020 and 2022, with authors affiliated with the four selected universities.

Sample

Data collection was based on the authors' affiliation with four educational institutions in Quito: the Pontificia Universidad Católica del Ecuador (PUCE), the Universidad de las Américas (UDLA), the Universidad San Francisco de Quito (USFQ) and the Escuela Politécnica Nacional (EPN), selected for their prestige and feasibility to obtain information. The EPN is a public higher education institution of great importance at the national level that houses approximately 8000 undergraduate students, it is a pioneer in scientific research in various areas at the service of the country, with a high academic level and research and innovation plans, generators of national technological and productive development. For the analysis, the list of tenured professors was consulted, which consists of 348 professors, of which 266 are male and 82 are female (Escuela Politécnica Nacional, 2023)

The Universidad San Francisco de Quito (USFQ) is positioned as an international benchmark in education, research, artistic expression, entrepreneurship and the defense of freedom in Latin America. Its main objective is to cultivate people with the ability to think independently, generate innovation, manifest creativity and develop companies, all within the context of the Liberal Arts and following the values on which it was founded. For the USFQ, the collection of information was carried out through the 2019 accountability report, which mentions that it has 900 teachers, of which 569 are male and 331 are female.(Universidad San Francisco de Quito, 2019)The University of the Americas (UDLA) encourages constant evolution and change in all members of its university community. It stimulates the implementation of innovative educational models, advanced services and sustainable improvements. For the collection of information from UDLA, the Rector's Management Report in 2021 was consulted, which mentions that it has 1223 professors, of which 636 are male and 587 are female.(Universidad de las Américas, 2021)PUCE is a higher education institution and also the oldest private university in Ecuador. It is an educational entity managed by the Society of Jesus. Because of this affiliation, its focus on integral education is based on the Ignatian Pedagogical Paradigm, which is composed of four interconnected attributes: utilitas (education with practical utility), justitia (education for justice), humanitas (education in human values), and fides (education in Christian faith and beliefs). For PUCE, the collection of information was carried out through the accountability report for the year 2019, in which it is mentioned that it has 2254 teachers, of which 1291 are male and 963 are female.(Pontificia Universidad Católica del Ecuador, 2021)

Tools for information gathering

For the download of information was done from the Scopus database, in advanced search the following script was generated to generate the exploration by year, AFFILCITY (quito) AND (LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (AF-ID , "Universidad San Francisco de Quito" 60072059) OR LIMIT-TO (AF-ID , "Escuela Politécnica Nacional" 60072054) OR LIMIT-TO (AF-ID , "Universidad de las Américas - Ecuador" 60104441) OR LIMIT-TO (AF-ID , "Pontificia Universidad Católica del Ecuador" 60072063)). In addition, the information generated by the Scimago Journal & Country Rank tool was downloaded for each year.

Procedure

Data were collected and downloaded from Scopus and Scimago on articles published between 2020 and 2022 by authors affiliated with the four selected universities. The data were processed in Excel, assigning a tab to each indicator, and statistical techniques were applied to analyze the bibliometric indicators of scientific production, as shown in Table 1.

Table 1.*Bibliometric indicators of scientific production of Scopus.*

Indicators	Description
TITLE	Document Title
SOURCE TITLE	Source Title, Title indexed in Scopus
AFFILIATIONS	AFFIL is a combined field that searches the following author address fields: AFFILCITY, AFFILCOUNTRY and AFFILORG. When searching in the AFFIL field, you can specify whether you want all of your search terms to be in the same affiliation.
CORRESPONDENCE ADDRESS	List the address of a corresponding author
AUTHORS	A combined field that searches the following author fields: AUTHLASTNAME and AUTHFIRST.

AUTHORS ID	The Scopus Author ID distinguishes between ambiguous names by assigning each author in Scopus a unique number and grouping all documents written by that author together.
AUTHORS WITH AFFILIATIONS	Find all the names of the authors with their respective affiliations (AFFIL)
SJR BEST CUARTIL	The set of journals has been classified according to their SJR and has been divided into four equal groups, four quartiles. Q1, Q2, Q3, Q4. These quartiles organize journals from highest to lowest in relation to their impact factor or index: Q1, encompasses the top 25% of the journals on the list. Q2, represents the average 25 to 50%. Q3, includes the group between 50 and 75%. Q4, contains the bottom 25% of the ordered ranking. The most outstanding publications in a topic are those present in the first quartile, Q1, and their relevance decreases as they are placed in the subsequent quartiles. (SCImago, 2023)
JR	It uses an algorithm to give weight to citations according to the influence of the journal they come from
CITED	Number of citations of an article
TOTAL NUMBER OF PUBLICATIONS	This index is valid for both individuals and groups and is based solely on the number of items you produce. Its calculation follows scientific productivity, which refers to the number of authors who have published an N papers on a topic and which is inversely proportional to the square of those N published papers.

Source: Authors.By using these bibliometric indicators, it is possible to carry out comparisons and analyses of a researcher's scientific output.

Data analysis

The research used a descriptive approach to analyze the main indicators of scientific production, verifying the frequency distribution of the indicators with filtered records for the years 2020, 2021 and 2022.

RESULTS AND DISCUSSION

Based on the delimited indicators and the findings obtained in the review of the scientific articles published in Scopus, the following results are presented.

Results

Distribution of authors by university

Table 2 shows the percentage distribution of authors from each university according to the Scopus database in the years 2020-2022.

Table 2.*Percentage distribution of authors by university 2020-2022.*

YEAR	EPN	PUCE	UDLA	USFQ
2020	27.76%	21.58%	16.11%	34.55%
2021	28.24%	18.73%	19.82%	33.21%
2022	24.91%	16.70%	25.72%	33.30%

Source: Authors.

In 2020, 987 authors of articles were registered in Scopus; in 2021, the total was 1,105, and in 2022, 1,108. The table shows the percentage distribution of authors by university, highlighting that USFQ had the highest percentage of academic authors who publish each year analyzed, followed by EPN in 2020 and 2021. while UDLA ranked second in 2022, showing a progressive increase in its publications. Overall, the number of authors increased from 987 in 2020 to 1,108 in 2022, reflecting a growth in academic production and a notable participation of UDLA in 2022.

Distribution of articles by university

Table 3 presents the percentage distribution of articles from each university according to the Scopus database in the years 2020-2022.

Table 3.*Percentage distribution of articles by university 2020-2022.*

YEAR	EPN	FLEA	UDLA	USFQ
2020	30.01%	23.33%	24.06%	31.71%
2021	26.49%	20.75%	25.39%	32.89%
2022	23.12%	20.62%	28.01%	37.66%

Source: Authors.

In 2020, a total of 823 articles were published in Scopus, for the year 2021 there were a total of 906 articles published, while in 2022 a total of 839 articles were published. USFQ was the one that published the largest number of academic articles in each year analyzed, followed by EPN in 2020 and 2021, behavior that was modified in 2022 where UDLA was the university that followed USFQ in number of publications. Likewise, it can be identified that there was an increase in articles published in 2021 compared to 2020 and 2022.

Distribution of articles by university

Table 4 shows the percentage of corresponding authors from each university in the Scopus database in the years 2020-2022.

Table 4.*Distribution of authors with the highest number of corresponding authors by university in the years 2020-2022.*

	EPN		FLEA		UDLA		USFQ	
YEARS	Total Authors	% of Correspondence Authors	Total Authors	% of Correspondence Authors	Total Authors	% of Correspondence Authors	Total Authors	% of Correspondence Authors
2020	274	37%	213	36%	159	60%	341	33%
2021	312	33%	207	36%	219	59%	367	32%
2022	276	30%	185	36%	285	44%	369	38%

Source: Authors.

Distribution of articles by university

Table 5 shows the percentage of authors for each SJR Quartile of the Scopus database in the years 2020-2022.

Table 5.*Distribution of authors by quartiles by university in the years 2020-2022.*

SJR	UNIVERSITIES	2020	2021	2022
Q1	EPN	13%	12%	13%
	FLEA	9%	8%	8%
	UDLA	7%	11%	16%
	USFQ	19%	19%	18%
Q2	EPN	8%	9%	7%
	FLEA	6%	5%	4%
	UDLA	5%	6%	6%
	USFQ	8%	8%	12%
Q3	EPN	5%	3%	3%
	FLEA	4%	5%	3%
	UDLA	3%	2%	4%
	USFQ	5%	5%	2%
Q4	EPN	2%	1%	0%
	FLEA	3%	2%	2%
	UDLA	3%	2%	2%
	USFQ	2%	3%	1%

Source: Authors.

Regarding the analysis of authors by quartile SJR during the period 2020 - 2022, it is verified that USFQ and UDLA stand out for their growth and consolidation in the publication of articles in high-impact journals (Q1), while EPN maintains a stable participation in this quartile. PUCE has a constant participation, but with lower percentages in all quartiles. Overall, there is a trend towards improvement in the quality of scientific publications, with a greater concentration in the upper quartiles (Q1 and Q2) in all universities, reflecting an advance in scientific production with a greater impact.

Distribution of articles by areas

Table 6 presents in descending order, the percentage of articles published in each Area according to the Scopus database in the years 2020-2022.

Table 6.*Distribution of articles by areas by university in the years 2020-2022.*

Areas	2020	University with the highest percentage of publications in the area	2021	University with the highest percentage of publications in the area	2022	University with the highest percentage of publications in the area
Agricultural and Biological Sciences	19.68%	USFQ	22.30%	USFQ	15.14%	USFQ
Medicine	12.15%	USFQ	13.91%	USFQ	18.95%	USFQ
Computer Science	10.09%	EPN	6.29%	EPN	7.75%	USFQ
Earth and Planetary Sciences	6.93%	EPN	6.29%	EPN	6.91%	USFQ

Biochemistry, Genetics and Molecular Biology	6.80%	USFQ	5.63%	USFQ	13.35%	USFQ
#N/A	6.44%	EPN	5.96%	EPN	0.24%	FLEA
Chemical Engineering	4.25%	EPN	2.65%	EPN	5.48%	EPN
Chemistry	4.01%	EPN	2.21%	EPN	2.86%	USFQ
Engineering	3.77%	EPN	3.09%	EPN	4.05%	USFQ
Environmental Science	3.77%	USFQ	5.41%	USFQ	3.93%	EPN
Immunology and Microbiology	3.65%	USFQ	3.09%	USFQ	5.48%	UDLA
Multidisciplinary	2.92%	UDLA	3.53%	USFQ	5.72%	EPN
Mathematics	2.67%	FLEA	1.77%	EPN	0.83%	USFQ
Energy	1.94%	EPN	1.88%	EPN	1.31%	UDLA
Business, Management and Accounting	1.70%	EPN	1.88%	USFQ	1.43%	UDLA
Physics and Astronomy	1.58%	USFQ	1.99%	USFQ	0.24%	USFQ
Materials Science	1.46%	EPN	0.77%	EPN	0.83%	USFQ
Arts and Humanities	1.34%	FLEA	2.21%	USFQ	0.12%	UDLA
Psychology	1.09%	EPN	1.55%	UDLA	2.03%	EPN
Health Professions; Medicine	0.97%	USFQ	0.66%	UDLA	0.12%	FLEA
Economics, Econometrics and Finance	0.85%	UDLA	1.77%	UDLA	0.36%	FLEA
Social Sciences	0.85%	FLEA	2.65%	FLEA	0.83%	USFQ
Veterinary	0.36%	USFQ	0.33%	USFQ	0.83%	USFQ
Decision Sciences; Mathematics	0.24%	EPN	1.77%	EPN	0.12%	USFQ
Neuroscience	0.24%	USFQ	0.88%	USFQ	0.00%	
Dentistry; Engineering; Materials Science	0.12%	USFQ	0.99%	USFQ	0.72%	EPN
Pharmacology, Toxicology and Pharmaceutics	0.12%	FLEA	0.22%	UDLA	0.36%	EPN

Source: Authors.

The table shows that USFQ consistently stands out in scientific production in several key areas throughout the years 2020-2022. In 2020, USFQ led in Agricultural and Biological Sciences (19.68%) and Medicine (12.15%), while EPN stood out in Computer Science (10.09%). In 2021, USFQ continued to dominate in Agricultural and Biological Sciences (22.30%) and Medicine (13.91%), with EPN maintaining its leadership in Computer Science (6.29%). For 2022, USFQ maintained its

leadership in Medicine (18.95%) and Agricultural and Biological Sciences (15.14%), and also stood out in Biochemistry, Genetics and Molecular Biology (13.35%).

Distribution of articles by areas

Table 7 shows the percentage of scientific articles published in each journal (Source Title) of the Scopus database for the years 2020-2022.

Table 7.*Distribution of articles by journals by university in the years 2020-2022.*

MAGAZINES	PARENTS	2020	UMPR	2021	UMPR	2022	UMPR
RISTI - Iberian Journal of Information Systems and Technologies	PORTUGAL	3.89%	UDLA	0.44%	EPN	0.48%	FLEA
IEEE Access	USA	2.43%	EPN	1.32%	EPN	0.72%	EPN
Applied Sciences (Switzerland)	SWITZERLAND	1.34%	UDLA	0.99%	UDLA	0.72%	EPN
PLoS ONE	USA	1.34%	UDLA	1.43%	USFQ	2.26%	USFQ
Sensors (Switzerland)	SWITZERLAND	1.22%	UDLA	0.00%		0.00%	
Molecules	SWITZERLAND	1.09%	EPN	0.66%	UDLA	0.60%	USFQ
International Journal of Environmental Research and Public Health	SWITZERLAND	0.97%	USFQ	1.88%	UDLA	1.79%	UDLA
Scientific Reports	UNITED KINGDOM	0.97%	UDLA	1.10%	USFQ	1.43%	USFQ
Sustainability (Switzerland)	SWITZERLAND	0.97%	UDLA	1.10%	UDLA	1.43%	EPN
American Journal of Case Reports	USA	0.85%	USFQ	0.00%	-	0.00%	-
Polymers	USA	0.85%	EPN	0.66%	EPN	0.36%	EPN
Bionatura	ECUADOR	0.73%	UDLA	0.55%	USFQ	0.00%	
Journal of Volcanology and Geothermal Research	NETHERLANDS	0.73%	EPN	0.33%	EPN	0.36%	EPN
Neotropical Biodiversity	ECUADOR	0.73%	FLEA	1.43%	FLEA	0.48%	USFQ
Phytotaxa	NEUVA ZEALAND	0.73%	FLEA	0.00%	-	0.72%	UDLA
PLoS Neglected Tropical Diseases	USA	0.73%	UDLA	0.33%	UDLA	0.48%	UDLA
American Journal of Tropical Medicine and Hygiene	USA	0.61%	USFQ	0.77%	UDLA	0.00%	-
Energies	SWITZERLAND	0.61%	UDLA	0.22%	EPN	0.48%	EPN
Frontiers in Earth Science	SWITZERLAND	0.61%	EPN	0.22%	EPN	0.00%	
Growth Hormone and IGF Research	UNITED KINGDOM	0.61%	USFQ	0.00%	-	0.00%	-

Zootaxa	NEW ZEALAND	0.61%	FLEA	0.44%	FLEA	0.12%	EPN
Advances in Science, Technology and Engineering Systems	USA	0.49%	EPN	0.00%	-	0.00%	-
Atmosphere	USA	0.49%	EPN	0.00%	-	0.00%	-
Infection, Genetics and Evolution	NETHERLANDS	0.49%	FLEA	0.00%	-	0.00%	-
International Journal on Advanced Science, Engineering and Information Technology	INDONESIA	0.49%	UDLA	0.44%	EPN	0.95%	EPN
Operational Research	CUBA	0.49%	FLEA	0.00%	-	0.00%	-
Nanomaterials	SWITZERLAND	0.49%	EPN	0.00%	-	0.00%	-
Parasites and Vectors	UNITED KINGDOM	0.49%	FLEA	0.00%	-	0.00%	-
PeerJ	USA	0.49%	USFQ	0.55%	USFQ	0.83%	FLEA
Physics of the Dark Universe	NETHERLANDS	0.49%	USFQ	0.00%		0.00%	
Science of the Total Environment	NETHERLANDS	0.49%	EPN	0.33%	EPN	0.00%	
ZooKeys	BULGARIA	0.49%	FLEA	0.00%		0.60%	USFQ
European Physical Journal C	GERMANY	0.36%	USFQ	0.44%	USFQ	1.19%	USFQ
Ecuadorian Journal of Neurology	ECUADOR	0.36%	FLEA	0.77%	FLEA	0.00%	
Symmetry	SWITZERLAND	0.36%	FLEA	0.00%		0.60%	FLEA
Polytechnic Journal	ECUADOR	0%		1.77%	EPN	1.43%	EPN

Source: Authors.

*Nota_ UMPR indicates the university with the highest percentage of publications in the journal.

For the year 2020, the total number of journals is 536, of which the Iberian Journal of Information Systems and Technologies stands out in descending order with 3.89%, of which UDLA stands out with a higher percentage of articles, the IEEE Access journal with 2.43%, which stands out with a higher percentage of articles, UDLA and EPN and the journal PLoS ONE with 1.34%, which stands out with a higher percentage of articles. articles UDLA. On the other hand, in 2021 the total number of journals is 575, of which the International Journal of Environmental Research and Public Health stands out in descending order with 1.88%, which stands out with a higher percentage of articles from USFQ, the Polytechnic Journal with 1.77%, which stands out with a higher percentage of articles, the EPN and the journal PLoS ONE with 1.43%, which stands out with a higher percentage of articles the USFQ. On the other hand, in 2022 the total number of journals is 526, of which the journal PLoS ONE stands out in descending order with 2.26%, which stands out with a higher percentage of articles the USFQ, the International Journal of Environmental Research and Public Health with 1.79%, which stands out

with a higher percentage of articles, the UDLA and the Polytechnic Journal with 1.43%, which stands out with a higher percentage of articles. articles the EPN.

DISCUSSION

The results obtained reveal an interesting dynamic in the scientific production of the universities analyzed, highlighting differentiated patterns in the evolution of the number of authors and articles published. A steady growth in the number of authors is observed over time, while the number of articles varied, with a peak in productivity in 2021. This trend is consistent with Choueiry's observation, who notes that single-author articles are becoming less common, which may explain the discrepancy between the number of publications and the increase in authors in this research.(2022)In particular, it is interesting that, despite the global impact of the COVID-19 pandemic, the findings differ from what was pointed out by Estrada Araoz and Gallegos Ramos (2021), who mentioned an increase in publications related to the pandemic. In Ecuador, the main areas of publication continued to be agribusiness, computing, and medicine. This coincides with the trends observed in the USFQ and EPN publications, especially in the areas of agricultural, biological and computer sciences. These areas, together with publications in journals such as PLoS ONE, are key to addressing global challenges, such as climate change and sustainability, central issues to meet the Sustainable Development Goals (SDGs), as they point out (Herrera-Franco et al., 2021, p. 1).Finally, the positioning of USFQ and EPN in the Q1 and Q2 quartiles of the SJR, considered the most prestigious, underscores the importance of publishing in high-impact journals, which not only increases the visibility of these institutions, but also their academic reputation nationally and internationally. This reaffirms that the quality and quantity of scientific publications are critical factors for institutional recognition in the global scientific community.

CONCLUSIONS

This study presents the context of scientific production in Ecuador and its relevance for social and academic development. Then, the importance of scientific production, bibliometric indicators, and databases used to evaluate the quality of publications are explained. In addition, the descriptive and quantitative approach used, based on data obtained from Scopus and SCImago, is detailed. The selection criteria for the universities analysed are also described. Subsequently, the distribution of authors, articles, research areas and scientific journals is examined, comparing trends between 2020 and 2022. Finally, the findings obtained are evaluated and improvements in research and funding policies in Ecuador are suggested. This study makes important contributions to the analysis of scientific production in Ecuador. First, it examines how the COVID-19 pandemic affected the publication of scientific articles in the country, identifying changes in research trends. It also evaluates the presence of Ecuadorian universities in high-impact journals (Q1 and Q2), which provides valuable information on the quality and visibility of national research. In addition, it identifies the main areas of scientific production, highlighting growth in fields such as biology, medicine and computer science. Finally, it emphasizes the need to strengthen funding policies and incentives for research in Ecuador, in order to improve the country's competitiveness in the academic and scientific fields.Despite its contributions, the study has some limitations. First, its scope is limited, as it only analyzes four Ecuadorian universities, leaving out other institutions that could have enriched the findings. Another limitation is that the study period is short, covering only the years 2020-2022. This prevents a more complete evaluation of the evolution of scientific production in Ecuador before and after the pandemic. Finally, the study focuses on a quantitative analysis, without delving into qualitative factors that could have influenced scientific production, such as institutional policies, barriers to publication or access to funding.

Based on this study, several future lines of research can be proposed. A first step would be to expand the analysis to more Ecuadorian universities to obtain a more representative view of scientific production in the country. It would also be valuable to evaluate the impact of government and university policies on the development of scientific research, considering factors such as economic incentives and publication regulations. Another interesting line of study would be to conduct qualitative research to identify the challenges faced by Ecuadorian researchers in the publication of their work. Finally, a comparison could be made between the scientific production of Ecuador and other developing countries with similar conditions, in order to identify successful strategies that can be replicated.In Ecuador, scientific production also reflects these gender gaps, evidencing the need to implement strategies that promote greater inclusion of women in the field of research. Incorporating indicators that analyze scientific production with a gender perspective would allow a more complete analysis of the impact of research on the development of higher education and society in general.

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