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New academic journals: an international overview of indexing and access models

Rosangela Rodrigues, Cristóbal Urbano, Patricia Neubert, José Miguel Rodríguez-Gairín and Marta Somoza-Fernández

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Abstract

Introduction. An international analysis of academic journals newly created in the period from 2011 to 2020 according to type of publisher, place of publication, their relationship with open access, and their indexing in databases. Studies of the issues of concentration of journal publisher ownership, uses of metrics, and access to titles reveal a changing landscape that is nevertheless still dominated by large commercial oligopolies. One notable trend is the creation of new titles in various configurations.

Method. To assess the global scenario, we analyse titles created from 2011 to 2020, focusing on indexing and access models. The methodology is multidimensional, predominantly bibliometric and quantitative. The data were collected from Crossref and other databases and processed with the resources of the Information Matrix for the Analysis of Journals.

Results. The findings confirm the expansion of the periodical publishing market, of which the academic journal market represents a small fraction (7.29%). Of the databases may be considered academic based on indexing in some database, most are open access, indicated by their presence in the Directory of Open Access Journals (55.21%). The analysis of publisher type confirmed the predominance of commercial publishers (44.57%), followed by universities (30.08%). The largest proportion of the titles are in the health field, compatible with the existing distribution of fields, followed by journals in the multidisciplinary and education fields.

Conclusion. In the expansion of the publishing market, academic journals represent a small fraction of the total. The main sources of new titles in open access with no processing charges for authors are universities in countries that are not home to large commercial publishers (Indonesia, Brazil, and Spain), all with government subsidies.

Introduction

To advance new research in any field of knowledge, researchers depend on access to academic journals. Changes to available technological resources and researcher evaluation systems and pressures from funders on access to documents have been studied from various perspectives, all of which find that publication in journals remains key as the foundation of communication among researchers for the advancement of science (Bernal, 1939; Meadows, 2008; Merton, 1973; Whitley, 2007; Ziman, 1979, 1981).

Studies of academic journals are justified by the important role of articles published in peer-reviewed journals as documents of research activity in all areas of knowledge and as records of authorship. Articles are the units that may be cited, and they reflect the need to publish research results for the recognition of research activity and the attribution of prestige to researchers and institutions (Beasley, 2016; Björk et al., 2010; Boyle, 2007; Guédon, 2001; Salager-Meyer, 2015).

Studies that consider journals as objects of analysis provide comprehensive coverage of the universe of academic publication, given that the journals are created and maintained by the communities of researchers themselves (Shen, 2017; Villarroya et al., 2015; Walters and Linvill, 2011). Researchers need a safe and reliable channel of discussion to record advances and consolidate methodologies and theories accepted by the community (Guédon, 2001, 2011, 2014, 2019; Merton, 1973). Articles published in journals enable access to research results, serve as the base documents for the discussions of researchers in the various areas of knowledge, and make it possible to leverage new studies while negotiating, criticizing, and establishing the languages and methodologies accepted and validated by the academic community (Whitley, 2007).

The growth in the number of articles and journals in recent years poses various kinds of challenges: the criteria used for the classification of journals as academic; the problem of predatory journals; the various types of institutions acting as publishers; and

the use of publication in titles indexed in large commercial databases as a criterion for evaluating the research activity of researchers and institutions (Appel and Albagli, 2019; Huang et al., 2020; Santos and Noronha, 2016; Somoza-Fernández, Rodríguez-Gairín, and Urbano, 2016; Urbano et al., 2020).

The use of publication in journals with high impact factors or in the first quartile as a key metric for evaluating researchers and research institutions worldwide is controversial because publications are a unit of symbolic capital. In the competition for funding, for professional opportunities among individual researchers and for prestige among higher education and research institutions, articles lie at the center of the evaluation process (Gingras, 2020).

Journals indexed in international databases and with high impact metrics are favoured by evaluation systems (Gingras, 2020; Huang et al., 2020) and tend to be in a better condition to select the best articles from among the many submissions they receive. New and yet non-indexed titles may find it hard to reject articles due to the need to publish regular issues, as researchers tend to send their best work to journals that will result in more positive evaluations for their careers and for their institutions (Haro, 2017; Huang et al. 2020; Lin & Zhan, 2016; MacRoberts and MacRoberts, 2017; Vessuri, Guédon and Cetto, 2013).

Plan S requires that all articles from publicly funded research be published in journals with immediate open access as of 2021. Some commercial publishers are resistant to this plan because it exposes the asymmetries inherent in the imposition of article processing charges and does not include journals classified as hybrids or with embargoes on open access (Abadal et al., 2019; Aspesi, 2020; Torres-Salinas, et al., 2019; Velterop, 2018). Research funders, especially in the scientific, technical and medical fields (STM), developed discussions on the costs of articles and the transition models to open access. Plan S prompted further debate about open-access alternatives, with questions raised about the capacity of the green route to bring about lasting changes in the academic publication

system and attention given to the strategies of research funding entities.

There are various arguments for the creation of a new journal, which do not necessarily have to do with the demands of researchers or areas of knowledge. Thanks to the ease of their creation, there has been an exponential growth in the number of academic journals (or journals intended to be academic) around the world in different areas of knowledge (Bernal, 1939; Rodrigues, et al., 2020; Urbano et al., 2020).

Emerging countries publish fewer journals that are considered international and valued by evaluation systems so that they may be prioritised by researchers concerned with the visibility of their careers and institutions.

Studies of the creation of new titles and the closure of journals are scarce, and some journals remain unindexed and with low citation rates for years, creating a category of journals about which there is very little research (Pereira, et al., 2020; Rodrigues et al., 2018; Urbano et al., 2020; Ziman, 1980).

The existence of different types of publications that claim to be academic in a rapidly changing context suggests a need for categorization of journals and publishers. To develop a clearer understanding of how new journals perform, the general objective of this study is to analyse titles created in the period from 2011 to 2020 with a focus on indexing and access models. To this end, the following specific objectives were established: a) to identify the percentage of journals created in the period of study that are indexed in some form of abstracting and indexing database; b) to classify the journals according to country, type of publisher and area of knowledge; c) to identify the distribution of the journals in the various indexing bibliographic databases; d) to analyse the journals' use of article processing charges.

Methodological procedures

This study uses what Cronin (2014, p.28) calls 'multidimensional measures', adapting the available tools to the purposes of the research since the data were collected through various channels and processed with different tools to compare the categories.

The list of journals included in the study is based on titles with a Digital Object Identifier active in Crossref (the official DOI records agency (<https://www.crossref.org/>)). According to international standards, a DOI is necessary for a journal to be considered academic (not necessarily of good quality) (ISO, 2019). The complete list of journal titles that began registering DOIs in the period from 2011 to 2020 was selected; the total obtained was 51,383 titles, after cleaning the data by eliminating duplications and titles without an ISSN (International Standard Serial Number).

Data from the Information Matrix for the Analysis of Journals (<https://miar.ub.edu/>) (hereafter, "the Matrix") was used to identify where the titles are indexed. The Matrix is an initiative of the University of Barcelona, a matrix with indexing data from more than 100 international databases containing records of over 48,000 journals. The ISSN matrix allows the identification of the presence of journals in the databases.

The 51,383 journals with a DOI in the period 2011-2020 identified in Crossref were compared to the data on each title's indexing status in the Matrix. Of the titles created in the period studied, only 3,742 (just 7.2%) were found to be indexed in at least one database.

The categorization of publishers as associations, higher education institutions (HEIs), or commercials was carried out based on the Matrix data. All publishers with terms such as Association or Society in their names were classified as associations, while those with University in their names were classified as higher education institutions. For the other publishers, the nature of each institution was verified by consulting its website.

The classification was imported from the Matrix (scope variable) to identify the knowledge area. The study was limited to the period from 2011 to 2020 to analyze journals that are relatively new but that have had enough time to make it possible to identify their acceptance by the academic community and their compliance with the criteria of the consolidated indexing databases. The type of access was classified by identifying the title's

presence in the DOAJ using the Matrix indexing data.

Results and discussion

The existence of non-academic journals posing as academic journals is a challenge for researchers, authors, and readers. The wide use of DOIs in the journal editing software facilitates the development of both academic and non-academic initiatives, making it difficult to distinguish academic journals from among many similar, predatory publications.

Participation of indexed titles in the Crossref DOI records

According to Crossref data, the adoption of DOIs among journals grew from 2016 onwards: 62.58% of the titles used them from 2016 to 2020. This increase has been observed in other studies and associated with the advantages of identification and access to digital documents

for publishers and authors (Baudry and Charton, 2017; Gorraiz et al., 2016; Tiliute, 2016).

Despite the increasing use of DOIs, which is considered a requirement for ensuring the technical quality of periodical publications (International Standards Organization, 2019), only 3,742 journals, or 7.29% of the 51,383 titles that registered DOIs in the last decade, are indexed in recognized databases, i.e., those that may be considered academic. These data show that although there is significant adherence to DOIs, demonstrated here by the Crossref data, most journals (92.71%) are not indexed in any database registered by the MIAR, and therefore cannot be classified as academic (Figure 1). The fact that it is so easy to create a journal results in a huge number of titles and makes it difficult to identify those that are really academic, due to the proliferation of publications that claim to be academic, without observing any scientific criteria for production and certification of content, including the evaluation process.

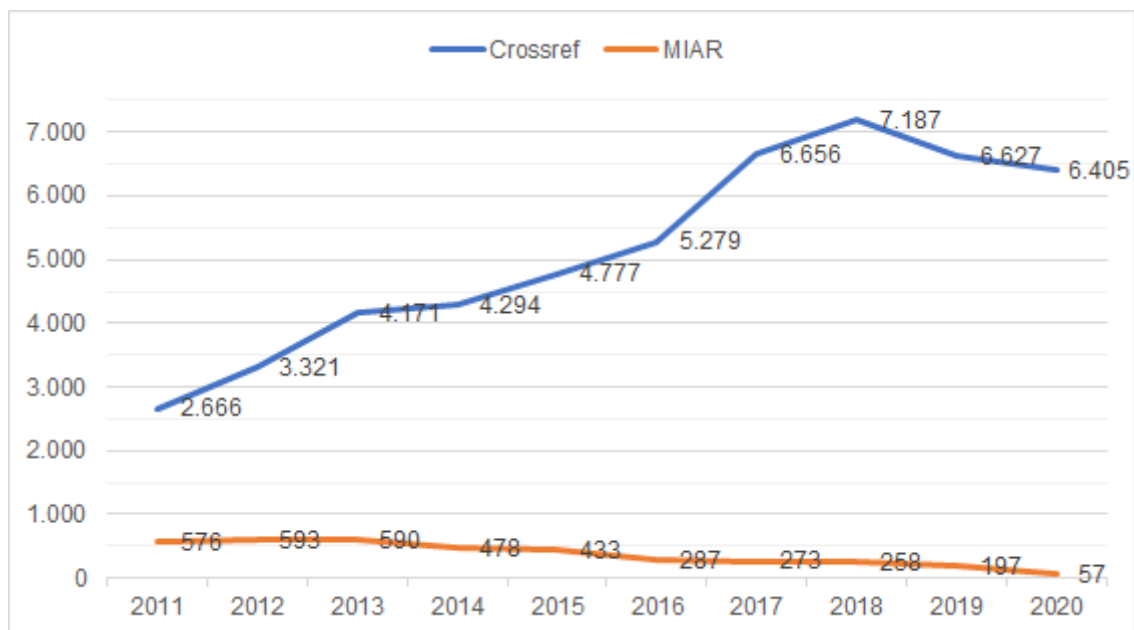


Figure 1. Journals created from 2011 to 2020 in Crossref according to the first year of DOI assignment and according to their start date in the Information Matrix for the Analysis of Journals. Source: Study data.

Despite the recognition of DOIs as one of the technical requirements for the publication of an academic journal, having a DOI is not synonymous with the scholarly nature of the journal, as demonstrated by the indexing data

of these titles. Incorporating the URL identifier in an electronic document is not costly, which is why even predatory publications have it, and it is often incorporated more quickly in publications created by the activity of

commercial publishers (Baudry and Charton, 2017). Although it is small, cost may be one of the factors preventing the adoption of DOIs by open-access academic journals, especially those that promote the platinum or diamond route. (Pires et al., 2017; Tiliute, 2016).

Journals by publisher type, country, and area of expertise

Commercial publishers account for the largest proportion of new journals (44.57%, 1,661 titles), followed by universities (30.08%, 1,121 titles). Possibly due to their traditionally limited role in the publication of journals, associations are responsible for only 8.74%, while the remaining 13.52% are produced by other types of publishers. The potential profits offered by this market attract commercial publishers, while universities, especially in regions considered peripheral, are interested in opening up channels for scientific communication.

The data on the nationality of the journals reveal the predominance of countries with a traditional role in commercial academic publishing: the United States (15.62%), the United Kingdom (11.51%), the Netherlands (6.67%), Switzerland and Germany, although among titles published by higher education institutions Spain and Brazil also stand out (Table 1). The results show the continued

predominance of the same countries: notable among the countries with more than 5% of the total is Indonesia, which is also the country with the highest number of titles in the DOAJ (a consultation carried out in August 2022 identified 2,035 titles from Indonesia, followed by the United Kingdom with 1,959 titles, and Brazil with 1,625). Notably absent here are several countries with significant percentages of articles published in Scopus (Schneegans, et al., 2021), such as China (24.5%), India (6.1%), Japan (4.5%), France (3.8%), Australia (3.3%), and South Korea (3.1%).

The lack of a relationship between the number of published articles and the number of new academic journals reflects the continuity of the oligopoly of large commercial publishers based in the United Kingdom, the United States, and the Netherlands, which account for more than half of all articles published in the world today. The traditionally predominant publisher type in each country is also found to be unchanged, with the United States, the United Kingdom, and the Netherlands dominated by commercial publishers and Brazil and Spain favoring universities. Among the new players, it is worth highlighting Indonesia, whose university editors are also increasing the number of titles published in the country.

Country	Association		Commercial		Government		Higher Ed.		Other		Total	
	N	%	n	%	n	%	n	%	n	%	n	%
United States	96	2.57	361	9.65	43	1.15	50	1.34	32	0.86	582	15.55
United Kingdom	31	0.83	324	8.66	6	0.16	53	1.42	15	0.40	429	11.46
Spain	14	0.37	42	1.12	8	0.21	269	7.19	31	0.83	364	9.73
Brazil	55	1.47	10	0.27	4	0.11	129	3.45	83	2.22	281	7.51
Netherlands	3	0.08	233	6.23	1	0.03	3	0.08	8	0.21	248	6.63
Indonesia	13	0.35	3	0.08	13	0.35	115	3.07	37	0.99	181	4.84
Switzerland	1	0.03	172	4.60	0	0.00	1	0.03	2	0.05	176	4.70
Germany	2	0.05	108	2.89	1	0.03	3	0.08	4	0.11	118	3.15
Turkey	5	0.13	13	0.35	1	0.03	15	0.40	78	2.08	112	2.99
Ecuador	0	0.00	12	0.32	5	0.13	38	1.02	22	0.59	77	2.06
Ukraine	1	0.03	15	0.40	2	0.05	48	1.28	11	0.29	77	2.06
India	6	0.16	48	1.28	0	0.00	3	0.08	18	0.48	75	2.00
Poland	2	0.05	14	0.37	1	0.03	42	1.12	12	0.32	71	1.90
Russian Federation	1	0.03	25	0.67	2	0.05	32	0.86	9	0.24	69	1.84
Colombia	1	0.03	1	0.03	1	0.03	56	1.50	9	0.24	68	1.82
Mexico	6	0.16	4	0.11	2	0.05	34	0.91	13	0.35	59	1.58
Peru	2	0.05	0	0.00	2	0.05	46	1.23	3	0.08	53	1.42
China	1	0.03	42	1.12	1	0.03	0	0.00	0	0.00	44	1.18
Canada	15	0.40	18	0.48	0	0.00	3	0.08	6	0.16	42	1.12
Other (< 1%)	72	1.92	216	5.77	34	0.91	181	4.84	113	3.02	616	16.46
Total	327	8.74	1661	44.39	127	3.39	1121	29.96	506	13.52	3742	100

Table 1. Journal publisher types categorized by nationality. Source: Study data

The most prominent area of knowledge is health, representing 20.47% of the new titles, mostly by commercial publishers. Health is the area with the highest number of publications in all publisher categories and this trend has only increased since the beginning of the COVID

pandemic in 2019 (UNESCO, 2021). In second place are titles classified as multidisciplinary (15%), a strategy that may help new titles achieve recognition in more than one area of knowledge, followed by education (10%).

Area of knowledge	Association		Commercial		Government		Higher Ed.		Other		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Medical and Health sciences	65	1.74	508	13.58	17	0.45	91	2.43	82	2.19	763	20.39
General multidisciplinary /	25	0.67	137	3.66	18	0.48	275	7.35	97	2.59	552	14.75
Education	20	0.53	64	1.71	11	0.29	121	3.23	55	1.47	271	7.24
Science in general	20	0.53	104	2.78	4	0.11	49	1.31	36	0.96	213	5.69
Biology	10	0.27	159	4.25	5	0.13	21	0.56	16	0.43	211	5.64
Economics	10	0.27	76	2.03	4	0.11	63	1.68	35	0.94	188	5.02
Law	44	1.18	24	0.64	4	0.11	77	2.06	30	0.80	179	4.78
Philology	7	0.19	43	1.15	4	0.11	53	1.42	19	0.51	126	3.37
Physics	22	0.59	73	1.95	5	0.13	3	0.08	7	0.19	110	2.94
Computer science	19	0.51	41	1.10	21	0.56	15	0.40	9	0.24	105	2.81
Industrial engineering, electronics and telecommunications	4	0.11	60	1.60	11	0.29	11	0.29	9	0.24	95	2.54
Art	6	0.16	18	0.48	2	0.05	51	1.36	9	0.24	86	2.30
Agronomy	6	0.16	33	0.88	4	0.11	15	0.40	17	0.45	75	2.00
Psychology	11	0.29	31	0.83	2	0.05	17	0.45	10	0.27	71	1.90
History	2	0.05	16	0.43	1	0.03	36	0.96	13	0.35	68	1.82
Chemistry	18	0.48	40	1.07	0	0.00	6	0.16	2	0.05	66	1.76
Geology	7	0.19	43	1.15	0	0.00	7	0.19	2	0.05	59	1.58
Politics	0	0.00	17	0.45	2	0.05	34	0.91	5	0.13	58	1.55
Mathematics	9	0.24	28	0.75	2	0.05	9	0.24	8	0.21	56	1.50
Architecture and urbanism	1	0.03	14	0.37	0	0.00	31	0.83	6	0.16	52	1.39
Social communication	2	0.05	10	0.27	0	0.00	31	0.83	7	0.19	50	1.34
Documentation	3	0.08	15	0.40	0	0.00	22	0.59	8	0.21	48	1.28
Sociology	2	0.05	18	0.48	2	0.05	21	0.56	4	0.11	47	1.26
Philosophy	3	0.08	15	0.40	0	0.00	21	0.56	4	0.11	43	1.15
Civil engineering	3	0.08	25	0.67	1	0.03	7	0.19	2	0.05	38	1.02
Other (< 1%)	8	0.21	38	1.02	7	0.19	34	0.91	12	0.32	99	2.65
Uncategorized	0	0.00	11	0.29	0	0.00	0	0.00	2	0.05	13	0.35
Total	327	8.74	1661	44.39	127	3.39	1121	29.96	506	13.52	3742	100

Table 2. Journal publisher types categorized by area of knowledge. Source: Study data

The ongoing oligopoly of commercial publishers among new titles reflects the expansion of the commercial publishing business, especially in traditional areas of knowledge such as health and among the growing number of “multidisciplinary” journals. The multidisciplinary trend may be the product of efforts to cut management costs and facilitate more submissions to maintain the journal’s importance in a diverse range of areas (based on the mega journal strategy). The absence of countries with high article publication rates in this list reflects the perpetuation of their dependence on the

oligopoly of transnational commercial companies to publish their research, instead of investing in their own titles.

Indexing of the journals

A higher proportion of the new journals are indexed in the DOAJ, indicating that many new journals are open access.

The older a journal is, the more likely it is to be indexed in a database. A much bigger percentage of titles created in the period from 2011 to 2013 are registered in Scopus, Web of Science and/or DOAJ.

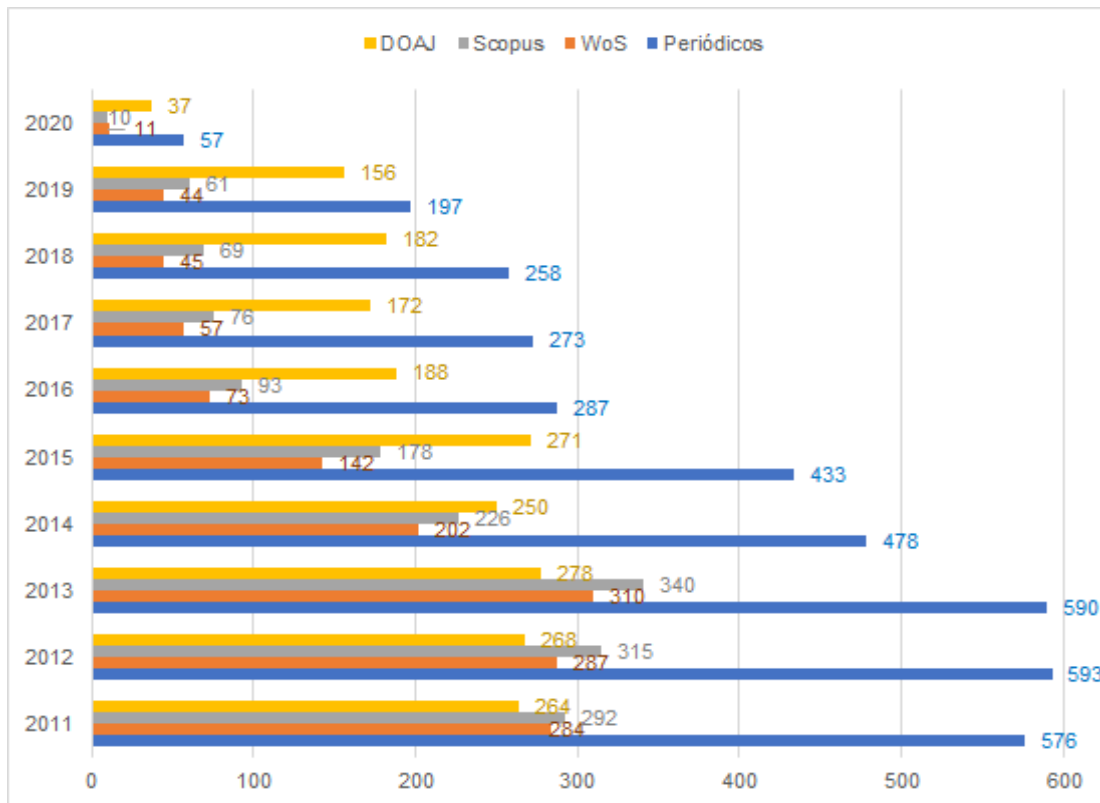


Figure 2. Journals in MIAR with a start date from 2011 to 2020 indexed in the Web of Science, Scopus and/or DOAJ databases. Source: Study data

Caption: in blue are the total numbers of journals with DOIs present in any of the databases or directories analysed by the Information Matrix for the Analysis of Journals, even if they are not indexed in DOAJ, Scopus, or Web of Science.

Scopus is the database that indexes the most significant number of new journals: 44.36% (1,660) of the titles. As the Matrix includes other databases beyond DOAJ, Web of Science and Scopus, the total number of unique titles in these three databases is less than the total. The total number of indexed journals includes titles indexed in databases other than those shown in Table 3.

Although most new journals are not indexed in Web of Science and Scopus, it is worth highlighting the proportion of new titles by commercial publishers (44.39%), almost half of which are open access. The presence of journals in DOAJ identifies them as open access, a category that excludes hybrid and embargo titles and the various classifications other than immediate open access to all journal content.

Publisher Type	Total		DOAJ		Web of Science		Scopus		WoS and Scopus	
	n	%	N	%	n	%	n	%	n	%
Association	327	8.74	179	4.78	138	3.69	151	4.04	129	3.45
Commercial	1661	44.39	750	20.04	936	25.01	1132	30.25	847	22.63
Government	127	3.39	68	1.82	52	1.39	57	1.52	48	1.28
HEI	1121	29.96	774	20.68	227	6.07	200	5.34	138	3.69
Other	506	13.52	295	7.88	102	2.73	120	3.21	68	1.82
Total	3742	100	2066	55.21	1455	38.88	1660	44.36	1230	32.87

Table 3. Indexing of journals by publisher type (2011–2020). Source: study data

Of the new titles, almost 70% of those published by universities (which represent 29.96% of the total) are open access (774 of 1,121 titles).

The countries with the most significant number of indexed titles are the same ones with the largest proportion of new titles overall, with the United States and the United Kingdom in first and second place, respectively. Worth highlighting here are the statistics on journals indexed in the DOAJ, as the top seven countries all have significant numbers of titles, including

four new countries: Spain, Brazil, Indonesia and Switzerland. In Spain, newly created open-access titles have to meet a set of conditions established in 2011 by the Spanish Foundation of Science and Technology (FECYT) to receive its seal of approval of the editorial and scientific quality of Spanish academic journals, aligned with the DOAJ. In Indonesia and Brazil, most of the new publishers are universities, which have expanded their publishing activity significantly in recent years. The position of Switzerland may be explained, at least partly, by the growth of MDPI, a commercial open-access publisher.

Country	Total		DOAJ		Web of Science		Scopus		WoS and Scopus	
	n	%	N	%	n	%	n	%	n	%
United States	582	15.55	173	4.62	340	9.09	413	11.04	318	8.50
United Kingdom	429	11.46	200	5.34	313	8.36	342	9.14	294	7.86
Spain	364	9.73	210	5.61	99	2.65	87	2.32	57	1.52
Brazil	281	7.51	217	5.80	30	0.80	20	0.53	10	0.27
Netherlands	248	6.63	86	2.30	151	4.04	196	5.24	149	3.98
Indonesia	181	4.84	166	4.44	5	0.13	10	0.27	4	0.11
Switzerland	176	4.70	138	3.69	147	3.93	135	3.61	126	3.37
Germany	118	3.15	51	1.36	86	2.30	90	2.41	79	2.11
Turkey	112	2.99	68	1.82	14	0.37	17	0.45	7	0.19
Ecuador	77	2.06	27	0.72	3	0.08	1	0.03	0	0.00
Ukraine	77	2.06	69	1.84	5	0.13	12	0.32	4	0.11
India	75	2.00	22	0.59	10	0.27	19	0.51	6	0.16
Poland	71	1.90	46	1.23	15	0.40	26	0.69	13	0.35
Russian Federation	69	1.84	42	1.12	17	0.45	23	0.61	10	0.27
Colombia	68	1.82	51	1.36	13	0.35	3	0.08	3	0.08
Mexico	59	1.58	26	0.69	4	0.11	0	0.00	0	0.00
Peru	53	1.42	28	0.75	4	0.11	1	0.03	0	0.00
China	44	1.18	26	0.69	25	0.67	31	0.83	20	0.53
Canada	42	1.12	17	0.45	8	0.21	15	0.40	7	0.19
Other * (< 1%)	616	16.46	403	10.77	166	4.44	219	5.85	123	3.29
TOTAL	3742	100	2066	55.21	1455	38.88	1660	44.36	1230	32.87

Table 4. Indexing of journals by nationality (2011–2020). Source: Study data

The distribution of knowledge areas follows the global pattern, with health having the most titles, followed by the multidisciplinary area. It is important to highlight the percentage of titles indexed in DOAJ, indicating that just over half (55%) of all new titles are open access. This figure is higher than the percentage of titles

indexed in SCOPUS (44%), and significantly higher than those indexed in Web of Science (38%). In the case of the 32% indexed in both databases, it may be inferred that most are produced by commercial publishers, which are more experienced with indexing procedures than universities or associations.

Area of knowledge	Total		DOAJ		Web of Science		Scopus		WoS and Scopus	
	N	%	N	%	n	%	n	%	n	%
Medical and Health sciences	763	20.39	420	11.22	407	10.88	477	12.75	359	9.59
General/multidisciplinary	552	14.75	317	8.47	117	3.13	130	3.47	84	2.24
Education	271	7.24	164	4.38	52	1.39	54	1.44	31	0.83
Science in general	213	5.69	137	3.66	95	2.54	89	2.38	73	1.95
Biology	211	5.64	110	2.94	119	3.18	144	3.85	110	2.94
Economics	188	5.02	94	2.51	43	1.15	56	1.50	37	0.99
Law	179	4.78	113	3.02	32	0.86	37	0.99	25	0.67
Philology	126	3.37	66	1.76	38	1.02	49	1.31	30	0.80
Physics	110	2.94	44	1.18	78	2.08	87	2.32	75	2.00
Computer science	105	2.81	55	1.47	50	1.34	68	1.82	47	1.26
Industrial engineering, electronics and telecommunications	95	2.54	40	1.07	59	1.58	70	1.87	55	1.47
Art	86	2.30	51	1.36	20	0.53	21	0.56	12	0.32
Agronomy	75	2.00	43	1.15	27	0.72	28	0.75	21	0.56
Psychology	71	1.90	34	0.91	33	0.88	36	0.96	30	0.80
History	68	1.82	40	1.07	23	0.61	26	0.69	17	0.45
Chemistry	66	1.76	27	0.72	49	1.31	47	1.26	46	1.23
Geology	59	1.58	30	0.80	33	0.88	35	0.94	30	0.80
Politics	58	1.55	41	1.10	19	0.51	19	0.51	13	0.35
Mathematics	56	1.50	23	0.61	32	0.86	37	0.99	32	0.86
Architecture and urbanism	52	1.39	32	0.86	13	0.35	17	0.45	9	0.24
Social communication	50	1.34	32	0.86	12	0.32	13	0.35	7	0.19
Documentation	48	1.28	32	0.86	10	0.27	16	0.43	9	0.24
Sociology	47	1.26	21	0.56	13	0.35	18	0.48	11	0.29
Philosophy	43	1.15	22	0.59	16	0.43	17	0.45	12	0.32
Civil engineering	38	1.02	15	0.40	19	0.51	19	0.51	14	0.37
Other** (< 1%)	99	2.65	54	1.44	37	0.99	39	1.04	32	0.86
Uncategorized	13	0.35	9	0.24	9	0.24	11	0.29	9	0.24
Total	3742	100.00	2066	55.21	1455	38.88	1660	44.36	1230	32.87

Table 5. Indexing of journals by area of knowledge (2011-2020). Source: Study data

Indexing is crucial for ensuring a journal's visibility and credibility.

Article Processing Charges

The article processing charges were identified for each of the 2,066 journals registered as open access. The information was collected by combining DOAJ data and data from the Matrix and manually converting the values to US dollars based on the September 2022 exchange rates.

Table 6 presents the APC amounts of open access titles broken down by publisher type, revealing that while commercial publishers and university publishers are responsible for a similar number of titles, the latter represent a much higher percentage of the titles without APCs (33% of all open access titles). It is also significant that 66% of all titles identified as open access have no APCs. The highest APCs are charged by commercial publishers, with nearly half of all titles in this category charging more than US\$1,000 per article.

Publisher Type	No charge		Level of article processing charge in US dollars									Total DOAJ										
			1-499		500-999		1000-1499		1500-1999		2000-2499			2500-2999		3000-3499		3500-3999		4000 and +		
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Association	133	6.44	14	0.68	3	0.15	5	0.24	7	0.34	4	0.19	3	0.15	4	0.19	3	0.15	3	0.10	179	8.66
Commercial	261	12.63	64	3.10	69	3.34	84	4.07	111	5.37	83	4.02	40	1.94	17	0.82	9	0.44	12	0.15	750	36.3
Government	50	2.42	8	0.39	1	0.05	3	0.15	5	0.24	1	0.05	-	-	-	-	-	-	-	-	68	3.3
Higher Edcn.	682	33.01	60	2.90	8	0.39	6	0.29	8	0.39	5	0.24	1	0.05	3	0.15	1	0.05	-	-	774	37.46
Other	239	11.57	40	1.94	6	0.29	4	0.19	3	0.15	1	0.05	1	0.05	0	0.00	1	0.05	-	-	295	14.28
Total	1365	66.07	186	9.00	87	4.21	102	4.94	134	6.49	94	4.55	45	2.18	24	1.16	14	0.68	15	0.73	2066	100

Table 6. Article processing charge by publisher type. Source: study data

Cross-checking the data on processing charges by publisher type in Table 6 with the breakdown by country in Table 7, three countries stand out in terms of both the total number of open-access titles and the option of not charging: Brazil, Spain, and Indonesia. Brazil (and Latin America in general) has a long and well-documented history of open access with the leadership of the SciELO (<https://scielo.org>) database and the participation of universities. In Spain, open

access was embraced by universities, associations, and research centers in an active and militant way through their adoption of the diamond route. The situation in Indonesia is recent; Noorden (2019) attributes the growth of open access there to the government subsidies that allow titles to adopt open access without having to charge fees to authors. Almost all Indonesian journals published by universities, professional associations, and research institutes are open access (Irawan et al., 2021).

Country	No charge		Level of article processing charge in US dollars									Total DOAJ										
			1-499		500-999		1000-1499		1500-1999		2000-2499			2500-2999		3000-3499		3500-3999		4000 and +		
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
United States	63	3.05	8	0.39	10	0.48	14	0.68	23	1.11	25	1.21	10	0.48	9	0.44	6	0.29	5	0.25	173	8.37
United Kingdom	49	2.37	8	0.39	24	1.16	32	1.55	32	1.55	24	1.16	16	0.77	9	0.44	1	0.05	5	0.25	200	9.7
Spain	200	9.68	5	0.24	3	0.15	1	0.05	1	0.05	-	-	-	-	-	-	-	-	-	-	210	10.1
Brazil	206	9.97	9	0.44	-	-	2	0.10	-	-	-	-	-	-	-	-	-	-	-	-	217	10.5
Netherlands	27	1.31	2	0.10	15	0.73	2	0.10	18	0.87	10	0.48	4	0.19	3	0.15	3	0.15	2	0.10	86	4.16
Indonesia	109	5.28	56	2.71	-	-	-	-	-	-	1	0.05	-	-	-	-	-	-	-	-	166	8.0
Switzerland	27	1.31	2	0.10	9	0.44	32	1.55	32	1.55	24	1.16	10	0.48	-	-	1	0.05	1	0.05	138	6.68
Germany	23	1.11	3	0.15	2	0.10	7	0.34	9	0.44	1	0.05	2	0.10	2	0.10	-	-	2	0.10	51	2.47
Turkey	60	2.90	5	0.24	1	0.05	-	-	-	-	1	0.05	-	-	1	0.05	-	-	-	-	68	3.29
Ecuador	27	1.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	1.31
Ukraine	47	2.27	22	1.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69	3.34
India	18	0.87	3	0.15	1	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	1.065
Poland	32	1.55	10	0.48	2	0.10	-	-	1	0.05	1	0.05	-	-	-	-	-	-	-	-	46	2.27
Russia	39	1.89	3	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	2.03
Colombia	51	2.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	2.46
Mexico	23	1.11	2	0.10	-	-	-	-	-	-	-	-	1	0.05	-	-	-	-	-	-	26	1.26
Peru	28	1.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	1.35
China	22	1.06	-	-	2	0.10	-	-	-	-	1	0.05	-	-	-	-	1	0.05	-	-	26	1.26
Canada	8	0.39	1	0.05	-	-	-	5	0.24	1	0.05	1	0.05	-	-	-	1	0.05	-	-	17	0.82
Other (≤ 1%)	306	14.81	47	2.27	18	0.87	12	0.58	13	0.63	5	0.24	1	0.05	-	-	1	0.05	-	-	403	19.5
TOTAL	1365	66.07	186	9.00	87	4.21	102	4.94	134	6.49	94	4.55	45	2.18	24	1.16	14	0.68	5	0.24	2066	100

Table 7. Article processing charges by publisher country. Source: study data

Article processing charges of over US\$2,000 are charged by journals mainly in the health field, which also accounts for 20% of all open-

access titles, followed by biology, which accounts for 5%.

Area of knowledge	No charge		Level of article processing charge in US dollars										Total DOAJ									
			up to 499		500–999		1000–1499		1500–1999		2000–2499				2500–2999		3000–3499		3500–3999		4000 and +	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Medical sciences	183	8.86	33	1.60	27	1.31	21	1.02	63	3.05	43	2.08	21	1.02	14	0.68	7	0.34	8	0.15	420	20.33
Multidisciplinary	260	12.5	26	1.26	14	0.68	11	0.53	4	0.19	-	-	1	0.05	-	-	-	-	-	-	317	15.34
Education	132	6.39	24	1.16	3	0.15	4	0.19	-	-	-	-	-	1	0.05	-	-	-	-	164	7.93	
Science in general	82	3.97	18	0.87	2	0.10	14	0.68	9	0.44	4	0.19	3	0.15	2	0.10	1	0.05	2	0.10	137	6.63
Biology	27	1.31	12	0.58	10	0.48	7	0.34	13	0.63	23	1.11	9	0.44	4	0.19	3	0.15	1	0.05	110	5.32
Economics	67	3.24	18	0.87	3	0.15	3	0.15	1	0.05	2	0.10	-	-	-	-	-	-	-	-	94	4.55
Law	106	5.13	5	0.24	-	-	1	0.05	1	0.05	-	-	-	-	-	-	-	-	-	-	113	5.47
Philology	57	2.76	6	0.29	2	0.10	1	0.05	-	-	-	-	-	-	-	-	-	-	-	-	66	3.19
Physics	11	0.53	4	0.19	4	0.19	12	0.58	5	0.24	3	0.15	2	0.10	2	0.10	-	-	1	0.05	44	2.13
Computer science	33	1.60	7	0.34	1	0.05	7	0.34	5	0.24	2	0.10	-	-	-	-	-	-	-	-	55	2.66
Engineering	23	1.11	6	0.29	3	0.15	3	0.15	4	0.19	1	0.05	-	-	-	-	-	-	-	-	40	1.93
Art	49	2.37	-	-	-	-	1	0.05	1	0.05	-	-	-	-	-	-	-	-	-	-	51	2.46
Agronomy	29	1.40	6	0.29	1	0.05	3	0.15	3	0.15	1	0.05	-	-	-	-	-	-	-	-	43	2.08
Psychology	25	1.21	2	0.10	3	0.15	1	0.05	-	-	2	0.10	1	0.05	-	-	-	-	-	-	34	1.64
History	34	1.65	4	0.19	2	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	1.93
Chemistry	7	0.34	3	0.15	2	0.10	1	0.05	7	0.34	4	0.19	2	0.10	-	-	1	0.05	-	-	27	1.30
Geology	18	0.87	1	0.05	1	0.05	1	0.05	5	0.24	1	0.05	1	0.05	-	-	2	0.10	-	-	30	1.45
Politics	33	1.60	4	0.19	2	0.10	1	0.05	-	-	-	-	-	-	-	-	-	-	-	-	40	1.93
Mathematics	13	0.63	2	0.10	1	0.05	3	0.15	2	0.10	2	0.10	-	-	-	-	-	-	-	-	23	1.11
Architecture and urbanism	27	1.31	-	-	1	0.05	2	0.10	1	0.05	1	0.05	-	-	-	-	-	-	-	-	32	1.54
Social communication	31	1.50	-	-	-	-	1	0.05	-	-	-	-	-	-	-	-	-	-	-	-	32	1.54
Documentation	28	1.36	-	-	1	0.05	1	0.05	2	0.10	-	-	-	-	-	-	-	-	-	-	32	1.54
Sociology	20	0.97	-	-	1	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	1.01
Philosophy	19	0.92	1	0.05	1	0.05	-	-	-	-	1	0.05	-	-	-	-	-	-	-	-	22	1.06
Civil engineering	10	0.48	-	-	-	-	1	0.05	1	0.05	1	0.05	-	-	-	-	-	-	-	-	14	0.67
Other** (< 1%)	39	1.89	4	0.19	2	0.10	2	0.10	4	0.19	2	0.10	2	0.10	1	0.05	-	-	-	-	56	2.71
Uncategorized	2	0.10	-	-	-	-	-	-	3	0.15	1	0.05	2	0.10	-	-	-	-	-	-	9	0.43
Total	1365	66.07	186	9.00	87	4.21	102	4.94	134	6.49	94	4.55	45	2.18	24	1.16	14	0.68	12	0.68	2066	100

Table 8. Article processing charges by journal area of knowledge. Source: Study data

Conclusions

The creation of new journals demonstrates the expansion of the publishing market, of which academic journals represent but a small fraction. The need for researchers to publish and the growing number of universities and researchers worldwide inevitably leads to the creation of new titles, not all of which meet the minimum criteria to be classified as academic, defined in this study by being indexed in at least one of the leading international databases, irrespective of the use of DOIs. The countries where the largest number of new titles are being created are the same that have traditionally been global leaders in journal publishing.

An analysis of publisher type confirms that commercial publishers account for a large proportion of new titles, almost half of which are open access, universities also make a significant, and almost 70% of their titles are indexed in DOAJ. The largest percentage of new titles are in the health field, consistent with the predominance of this area of knowledge among

older journals. The multidisciplinary area is also well represented, possibly because of journals adopting the PLOS One (<https://journals.plos.org/plosone/>) model, as it enables the publication of thousands of articles in a single title. It is also worth noting the significant proportion of titles in the field of education, which, like most areas of applied human and social sciences, is usually not so well represented. Newer titles are more likely to be indexed in DOAJ, while older titles are more common in SCOPUS and Web of Science.

An analysis of processing charges reveals that universities in countries that are not home to large commercial publishers (Indonesia, Brazil, and Spain) play a vital role in the creation of new open-access journals with no author processing charges, thanks in all cases to government subsidies. When governments analyse the costs of each publication model to evaluate the necessary reliability and independence of their researchers, they might make better use of public money by keeping research results out of the hands of transnational commercial companies. In this

way, open access may effectively change the scene of academic publication.

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About the authors

Dra. Rosângela Schwarz Rodrigues (<https://orcid.org/0000-0002-9639-6390>) holds a degree in Social Communication, a master's degree, and a doctorate in Production Engineering from the Federal University of Santa Catarina. Full professor at the graduate Program in Information Science at the Federal University of Santa Catarina. Completed a post-doctoral research internship in librarianship and documentation at the Universitat de Barcelona. Participated in the editorial board of the UFSC Journals Portal from 2012 to 2022. Regularly evaluates projects for funding agencies and articles for national and international periodicals. Have experience in Information Science, working mainly with: open access, scientific journals, scientific communication and scientific publishing. Contact rosangela.rodrigues@ufsc.br.

Dr. Cristóbal Urbano (<https://orcid.org/0000-0003-0935-6436>) is a professor at the Universitat de Barcelona, Departament de Biblioteconomia, Documentació i Comunicació Audiovisual (Barcelona, Spain). His research interests include scientific Communication and journals evaluation, metrics on the use of digital Information, digital analytics, information use and Information seeking behavior studies. He can be contacted at urbano@ub.edu

Dra. Patricia Neubert (<https://orcid.org/0000-0002-8909-1898I>) is a professor at the graduate Program in Information Science at the Federal University of Santa Catarina, Brasil. Her research interests include scientific communication, scientific journals and their editorial structure, metrics of scientific production, open access and publication in Latin America. She can be contacted at patricia.neubert@ufsc.br

Dr. Josep-Manuel Rodríguez-Gairín (<https://orcid.org/0000-0001-8375-7911>). Doctor in documentation from the Universitat de Barcelona and professor at Universitat de Barcelona, Departament de Biblioteconomia, Documentació i Comunicació Audiovisual (Barcelona, Spain), where he also coordinates computer science classrooms and advises on technological aspects. He has carried out the infrastructure of projects such as digital journals of library science and documentation (TEMARIA); Revista BID; Information matrix for the evaluation of journals (MIAR); Online resources for preparing research papers (Alehoop); Directory of experts in information (EXIT); International registry of authors-Links to identify scientists (IraLIS), etc. He is a member of CIEPI, ThinkEPI and the technical council of the E-LIS repository. CEO of Kronosdoc company, dedicated to consulting and developing library management programs as GTbib.

Dra. Marta Somoza-Fernández (<https://orcid.org/0000-0002-4769-9010>). She has a degree in Contemporary History (1989) and Cultural Anthropology (1995) and a doctorate in documentation (2009) from the Universitat de Barcelona (UB). She was responsible for the Teledocumentation Service of the Health Sciences Area of the UB library until 2002. Since 1999 she has been a professor at the Department of Library and Documentation of the UB. His lines of research focus on bibliographic databases, information retrieval, bibliometric studies, and user training.

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