

2022 Global OA Journals and APC Monitoring

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Abstract

[Objective] To investigate the global development of open access publishing and provide a decision-making basis for management departments at all levels. [Method] Based on SCIE data and information from OA journal websites, statistical analysis was conducted on global OA journal publishing, author article publication, APC reasonableness, as well as Chinese authors' OA article publication and APC expenditure. [Results] In 2022, 7,759 OA journals were indexed by SCIE globally, representing a 15% increase from 2021. Journals with reasonable APCs accounted for 66%. Global OA article volume increased by 6%, with Chinese corresponding authors contributing 29% of OA articles. Chinese corresponding authors published 269,800 articles in 4,936 OA journals, with APC expenditure of approximately 4.3 billion RMB, marking increases of 44% and 43% respectively compared to 2021. The National Natural Science Foundation of China is the primary funding agency for Chinese authors' OA publications, with an annual APC expenditure increase of 33%. [Conclusion] OA publishing has become the mainstream in global scholarly communication. Both Chinese OA article volume and APC expenditure are growing rapidly, showing a preference for international fully OA journals with low APCs and high publication volumes. The adaptive development of China's scientific journal market construction and open access-oriented research fund performance management requires timely advancement.

Full Text

Preamble

A Briefing Report on Monitoring Global Open Access Journals and APCs in 2022

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Abstract

[Purpose] To understand the development of global open access publishing and provide a decision-making basis for management departments at all levels. **[Methods]** Based on SCIE data and information from OA journal websites, we conducted statistical analysis on global OA journal publishing, author publications, APC reasonableness, as well as OA publication patterns and APC expenditures of Chinese authors. **[Findings]** In 2022, 7,759 OA journals worldwide were indexed in SCIE, representing a 15% increase from 2021. Journals with reasonable APCs accounted for 66% of the total. Global OA publication volume grew by 6%, with Chinese corresponding authors contributing 29% of this total. Chinese corresponding authors published 269,800 articles in 4,936 OA journals, with APC expenditures reaching approximately RMB 4.3 billion, representing year-over-year growth of 44% and 43% respectively. The National Natural Science Foundation of China was the primary funding source supporting Chinese authors' OA publications, with its annual APC expenditure increasing by 33%. **[Conclusions]** OA publishing has become the mainstream globally. Both China's OA publication volume and APC expenditure have grown rapidly, showing a tendency toward international full-OA journals with low APCs and high publication volumes. The adaptive development of China's scientific journal market construction and research fund performance management for open access needs to be promptly advanced.

Keywords: Open Science; Open Access Journals; OA Article Processing Charges (APC); Global Monitoring; Open Access Development

Global open science governance has entered a fast track, with China's Scientific and Technological Progress Law in 2021 explicitly promoting open science development. Regarding open science development, China urgently needs to provide answers and propose solutions for issues such as open access pathway selection and open science roadmaps. The National Science Library, Chinese Academy of Sciences (hereinafter referred to as "the Library") has been actively participating in open science research and practice in China. In response to the current status and existing problems of open access to Chinese research outputs, since 2019 the Library has developed the "Global APC Reasonableness Monitoring Platform" GoOA APCheck to monitor the development trends of global OA scientific journals and OA article processing charges (APC), and annually publishes the *Global OA Journals and APC Monitoring Report* to provide reference for China's OA model selection. This article is derived from the 2022 report.

1. Related Concepts and Analysis Methods

This section explains relevant concepts in the open access field, as well as data sources and analysis methods used in the *Global OA Journals and APC Monitoring Report*, to help readers understand the rigor of this work and its potential limitations.

1.1 OA Journal Data

Open Access (OA) journals refer to journals where authors can publish OA papers whose content can be freely, immediately, and permanently accessed and read by anyone. Current types of OA journals include full OA journals, hybrid OA journals, diamond OA journals, and delayed OA journals. The OA journal data analyzed in this report is based on the SCIE journal list released by Clarivate, supplemented with manually retrieved and collected journal data and APC information. We verified OA status and APC policies by checking each journal's website individually. Since this analysis focuses primarily on APCs of OA journals, delayed OA journals were excluded from the scope as they follow traditional publishing models, do not charge APCs, and only provide open access after an embargo period. The final analysis screened 7,759 OA journals, including hybrid OA journals and full OA journals.

1.2 APC Data

In international journal publishing, "Article Processing Charges (APC)" refers to the fees for processing and publishing OA articles. OA journals primarily employ two APC pricing models: a standard APC price, where a fixed APC amount is charged per OA article; and a non-standard APC price, where the APC for each article is determined based on the submitted manuscript's characteristics and selected OA options. The APC amounts used in this report follow these principles: based on the fees required for ordinary Chinese authors publishing in these journals, excluding special requirements such as cover articles, with article characteristics being black-and-white pages, 10,000 words, 10 pages, 5 figures, and 5 tables, and without institutional characteristics (no membership or institutional discounts).

1.3 APC Reasonableness Calculation Method

Based on the research paper *Global OA Scientific Journals APC Monitoring and Anomaly Early Warning Model* published by our project team, we normalized the Google H5 index and SCI impact factor of OA journals within the same discipline to obtain the OA journal's influence index. We then fitted the journal influence and APC amount data using the least squares method to obtain a fitting function for each discipline: y (APC amount) = ax (influence) + b , where we derived the value of a (the slope) for each function, representing the magnitude of influence of the influence index on journal APC within that discipline. Fitting was performed separately for the 172 disciplinary fields to which

SCIE-sourced OA journals belong, and we found that over 90% of disciplinary fields had positive slopes, indicating that APCs of OA journals are positively correlated with their OA influence index within a discipline, unless there are too few OA journals in that field or the OA level in that field is very low. Therefore, APC-reasonable journals refer to those whose APC falls within or below the reasonable APC range among all journals in their discipline; a journal's reasonable APC refers to the APC fee within the reasonable APC range for its discipline.

1.4 Chinese Corresponding Author OA Publication Data

Journal publication data were obtained from WoS, with data retrieval conducted on January 30, 2023. The database selected was Web of Science Core Collection, with document types refined to “Articles” and “Review Articles,” and Chinese corresponding authors were filtered, yielding 340,000 publication records. These publication data were matched with the OA journal data obtained in Section 1.1, resulting in 4,936 matching journals. These journals constitute the OA journals in which Chinese corresponding authors published, and Chinese corresponding author publication data and APC payment data were calculated based on these journals.

2. Global OA Journal Publishing Market

In 2022, 7,759 OA journals worldwide were indexed in SCIE, accounting for 80% of all SCIE-indexed journals. Compared with 2021, the number of OA journals increased by 1,051, representing a growth rate of 15.6%. Since some journals were no longer indexed in SCIE in 2022, the actual increase in OA journals was 1,164.

2.1 Hybrid OA Journals Account for Over 70%

Among the 7,759 OA journals, the ratio of full OA journals to hybrid OA journals is 1:2.8. There are 2,016 full OA journals (26%) and 5,743 hybrid OA journals (74%). Among the 1,164 newly added OA journals in 2022, 546 (47%) were hybrid OA journals and 618 (53%) were full OA journals.

2.2 Publisher Distribution

The 7,759 OA journals are distributed across 715 publishers. Internationally renowned publishers still occupy a large share of the OA publishing market. The four traditional publishers—Elsevier, Springer Nature, Wiley, and Taylor & Francis—have 1,638, 1,552, 1,046, and 659 OA journals respectively, with their combined total accounting for 63% of the 7,759 journals. The two full-OA publishers, MDPI and Frontiers, have 93 and 48 OA journals respectively.

2.3 Disciplinary Concentration and Publisher Layout Differences

The top 10 disciplinary fields by OA journal quantity are: Mathematics, Pharmacology and Pharmacy, Plant Sciences, Engineering (Electrical and Electronic), Oncology, Surgery, Neuroscience, Environmental Sciences, Public, Environmental and Occupational Health, and Materials Science (Multidisciplinary). Each of these fields has more than 100 OA journals [Figure 1: see original paper].

The four traditional publishers—Elsevier, Springer Nature, Wiley, and Taylor & Francis—have distinct dominant and priority fields. For Elsevier, OA journals are concentrated in Pharmacology, Neuroscience, and Environmental Sciences. For Springer Nature, they are concentrated in Mathematics, Botany, and Applied Mathematics. For Wiley, they are concentrated in Engineering (Electrical and Electronic), Nursing, and Veterinary Medicine. For Taylor & Francis, they are concentrated in Pharmacology and Pharmacy, Statistics & Probability, and Environmental Sciences.

3. APC Characteristics

3.1 Overall APC Features

(1) 5% of journals have zero APC. OA journals that do not charge any APC typically fall into several categories: journals that publishers choose to publish for free during their initial establishment period; journals supported by academic societies or institutions that cover publication costs; journals sponsored by funds; journals where institutional subscription fees offset APCs; and journals offering waivers for low-income countries. In 2022, the vast majority of zero-APC OA journals were supported by funds or sponsoring institutions. The proportion of zero-APC OA journals is higher among full OA journals.

(2) The global average APC for OA journals is \$2,754. In 2022, the global average APC for OA journals was approximately RMB 18,524. The average APC for full OA journals was \$1,691, significantly lower than the \$3,126 average for hybrid OA journals and the overall average. The average APC for the four traditional publishers (Elsevier, Springer Nature, Wiley, and Taylor & Francis) was \$3,118. Among them, Springer Nature had the highest average APC at \$3,242 (18% above the average), while Taylor & Francis had the lowest at \$2,960 (7% above the average). The full-OA publishers MDPI and Frontiers had average APCs of \$1,930 and \$2,823 respectively, with the former 30% below the global average and the latter 2.5% above.

(3) Different publishers adopt different APC pricing strategies. The APC distributions of the four major traditional publishers show distinct patterns. Springer Nature and Taylor & Francis exhibit step-like distributions, where each price tier includes many journals, showing a “clustering” pattern. Elsevier and Wiley have relatively flat APC distribution curves, approximating a normal distribution. The maximum APCs of the full-OA publishers MDPI

and Frontiers are far lower than those of traditional publishers.

3.2 APC Reasonableness of OA Journals

(1) 60% of OA journals have reasonable APCs. Among the 7,759 OA journals, 5,122 journals (66%) had reasonable APCs, while 2,634 journals (34%) had unreasonable APCs. The average APC of reasonable journals was \$2,288, representing 83% of the overall average.

(2) Full OA journals show a higher proportion of reasonable APCs. Among full OA journals, 1,849 journals (92%) had reasonable APCs. Among hybrid OA journals, 3,273 journals (57%) had reasonable APCs.

(3) Large traditional publishers have relatively low proportions of reasonable APC journals. The three traditional publishers Springer Nature, Wiley, and Taylor & Francis had reasonable APC journal proportions of 47–48%, while Elsevier's proportion was 81% . Among full-OA publishers, MDPI and Frontiers had reasonable APC journal proportions exceeding 90% .

(4) The proportion of reasonable APC journals is relatively low in the top 10 disciplines by OA journal count. For the top 10 disciplinary fields by OA journal quantity, the proportion of reasonable APC journals is relatively low, with only the ENGINEERING, ELECTRICAL & ELECTRONIC field exceeding the average proportion .

3.3 Publisher APC Revenue

In 2022, the top 7 publishers by Chinese author publication volume included four traditional publishers (Elsevier, Springer Nature, Wiley, and Taylor & Francis), two full-OA publishers (Frontiers and MDPI), and one academic society (IEEE). Globally, Springer Nature's APC revenue exceeded \$470 million, MDPI's exceeded \$460 million, and Elsevier and Frontiers ranked third and fourth with over \$330 million and \$290 million respectively. MDPI ranked first in China by publication volume but second in APC revenue (exceeding \$130 million). Frontiers ranked second in Chinese publication volume but first in APC revenue (exceeding \$140 million), with Chinese authors' publication share at Frontiers rapidly increasing to 50%, significantly higher than other publishers.

In 2022, the average global growth rate of APC revenue for these seven publishers was 18%, exceeding the 2021 average of 14%. The average growth rate in China was 51%, significantly higher than the global average, with this gap widening annually (the 2021 growth rate was 28%) .

4. Chinese Authors' OA Publishing and APC Expenditure

4.1 OA Publication Volume

In 2022, Chinese corresponding authors published 269,812 OA articles, a 43.7% increase from 2021 (187,671 articles), distributed across 4,936 OA journals.

Among these journals, 3,414 (69%) had reasonable APCs.

Chinese authors published 230,000 articles (83% of the total) in 1,533 full OA journals and 40,000 articles (17% of the total) in 3,403 hybrid OA journals .

4.2 APC Expenditure

In 2022, Chinese authors paid \$650 million (approximately RMB 4.3 billion) in APCs to OA journals, representing a 43% annual increase. Approximately RMB 3.9 billion (91%) was paid to reasonable APC journals, while about RMB 400 million was paid to unreasonable APC journals.

Chinese authors paid approximately RMB 3.5 billion (80% of total payments) to publish 230,000 articles in 1,533 full OA journals, with 91% of these journals having reasonable APCs and 96% of APC payments going to reasonable journals. They paid approximately RMB 900 million (20% of total payments) to publish 40,000 articles in 3,403 hybrid OA journals, with 59% of these journals having reasonable APCs and 69% of APC payments going to reasonable journals .

4.3 Top Journals for Chinese Authors

The top 10 journals for Chinese corresponding authors came from three publishers: five from MDPI, four from Frontiers, and one from Springer Nature. The journal with the highest Chinese author publication volume was MDPI's *Sustainability*, with an APC of \$1,992, 5,879 Chinese-authored articles, and total APC payments of approximately RMB 80 million.

In 2022, the journal with the highest APC payments from Chinese authors was *Frontiers in Oncology*, with an APC of \$2,950 and total payments of \$13.93 million (approximately RMB 90 million) from Chinese authors .

4.4 Top Disciplinary Fields for Chinese Authors' APC Payments

Among the disciplinary fields of OA articles published by Chinese authors in 2022, nine fields had APC payments exceeding \$15 million . Environmental Sciences was the highest-paying field, while the other eight fields were concentrated in biomedicine-related areas. The fields of MEDICINE, GENERAL & INTERNAL and ENGINEERING, ELECTRICAL & ELECTRONIC had reasonable APC proportions below the average level of 91%.

4.5 Top Institutions

In 2022, the top 8 institutions by Chinese author OA publication volume each had APC expenditures exceeding \$10 million. The Chinese Academy of Sciences spent \$64.05 million (approximately RMB 430 million), with an annual growth rate of 26%.

4.6 Funding Sources

In 2022, the National Natural Science Foundation of China was the primary funding source for Chinese authors' APC payments, funding 124,000 OA articles with total APC expenditures of \$300 million (approximately RMB 2 billion), representing a 33% annual increase. Among these payments, 26% went to OA journals with APCs exceeding RMB 20,000.

5. Main Monitoring Results

(1) Global OA Journal Publishing Market

OA publishing has become a global trend, while questionable journals and publishers continue to exist. In 2022, SCIE indexed 7,759 OA journals, with hybrid OA journals accounting for 80%. The disciplinary distribution of OA journals shows certain concentration. The average APC for OA journals in 2022 was \$2,754, with approximately 66% of journals having reasonable APCs. Traditional publishers remain the main force in OA journal publishing, with the four traditional publishers continuing to expand their OA journal portfolios and maintaining differentiated disciplinary layouts. In 2022, the two full-OA publishers demonstrated outstanding performance in both global and Chinese markets, exceeding most traditional publishers in absolute publication volume and annual growth rate, as well as in absolute APC revenue and annual growth rate.

These findings indicate that OA publishing has become a global trend, publishers' APC policies remain unclear, the reasonableness of OA journal APCs is concerning, and full-OA journals are expanding their influence or profitability through strategies combining high volume, low price, and comprehensive or interdisciplinary coverage despite their currently low influence. This raises demands for transparency and reasonableness of APCs for global OA journals.

(2) Chinese Contributions to OA Publishing and APC Payments

In 2022, Chinese corresponding authors published 269,800 OA articles, accounting for 36% of total Chinese author publications with a 44% annual growth rate. Chinese corresponding authors spent approximately RMB 4.3 billion from research funds provided by the National Natural Science Foundation of China and other funding agencies. Approximately 91% (RMB 3.9 billion) was paid to reasonable APC journals, while 9% (RMB 400 million) was paid to unreasonable APC journals. Chinese corresponding authors' APC payments primarily flowed to seven publishers and mainly to biomedicine-related journals. These seven publishers earned \$550 million (approximately RMB 3.7 billion) in the Chinese market, a 61% increase from 2021. *FRONTIERS IN ONCOLOGY* was the journal receiving the highest APC payments from Chinese corresponding authors.

These findings indicate that Chinese corresponding authors actively published

OA articles in 2022, maintaining a large publication volume, with approximately 43% of OA articles submitted to the two full-OA publishers MDPI and FRONTIERS. It is necessary to strengthen recommendations for high-quality OA journals and improve author training in OA journal selection, impact enhancement, and APC payment processes. Meanwhile, the time has come to consider separating research output publication from dissemination, and it is necessary to build new platforms for open publishing and academic exchange within certain scientific communities to reduce research communication costs and allocate research funds more effectively.

6. Recommendations for China's Sci-Tech Journal OA Publishing and Author OA Publishing

Based on these statistical analysis results and to advance open science development, we propose the following recommendations for China's scientific journal development and research fund management to adapt to global open access development:

- (1) We recommend that relevant Chinese research stakeholders actively cooperate to seek high-quality development of Chinese publishing and OA publishing, and gradually eliminate negative factors in the global publishing market dominated by traditional publisher profits.
- (2) We recommend that capable research institutions, organizations, and publishers collaborate to build an autonomous and controllable OA publishing platform to support China's growing demand for open publishing of scientific achievements, while accelerating the construction of global open academic exchange communities/platforms to deeply expand international dissemination influence.
- (3) We recommend that funding agencies, research institutions, and research infrastructure promptly formulate and issue open access policies for publicly funded research outputs, encourage evaluation methods for scientific achievements through data, equipment, and tool sharing, and promote sustainable use of research funds. Simultaneously, funding agencies should study and clarify the proportion and upper limit of APC expenditures in research funds.
- (4) We recommend organizing recommendation efforts for high-quality OA journals both domestically and internationally, increasing training for authors in OA journal selection, impact enhancement, and APC payment processes, and developing open access support tools.

English Title

A Briefing Report on Monitoring the Global Open Access Journals and APCs in 2022

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[Purposes] The development of global open publishing is analyzed to provide decision-making basis for management personnel at all levels. **[Methods]** Based on SCIE data and website information of each OA journal, statistical analysis was conducted on the global publication of OA journals, author publications, and APC reasonableness, as well as the OA publications and APC expenditures of authors in China. **[Findings]** In 2022, 7,759 global OA journals were indexed in SCIE, an increase of 15% compared to 2021. APC reasonable journals account for 66%. The global OA publication volume has increased by 6%, with Chinese authors accounting for 29% of the total OA publication volume. Chinese authors have published 269,800 articles in 4,936 OA journals, with an APC expenditure of approximately RMB 4.3 billion yuan, an increase of 44% and 43% respectively compared to 2021. The National Natural Science Foundation of China is the main fund supporting Chinese authors to publish OA papers, with an annual APC expenditure increase of 33%. **[Conclusions]** OA publishing has become the mainstream of global publishing, and China's OA publication volume and APC expenditure have both grown rapidly, tending towards international full-OA journals with low APC and high publication volume. In China, the construction of Sci-Tech journals market and the performance management of research fund need to be promoted in time to adapt to the development of open access.

Keywords: Open Science; Open access journals; OA paper processing fee (APC); Global monitoring; Open Access Development

Note: Figure translations are in progress. See original paper for figures.

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