

Access to Science and Scholarship: Key Questions about the Future of Research Publishing

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Access to Science and Scholarship: Key Questions about the Future of Research Publishing

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The health of the research enterprise is closely tied to the effectiveness of the scientific and scholarly publishing ecosystem. Policy-, technology-, and market-driven changes in publishing models over the last two decades have triggered a number of disruptions within this ecosystem:

<https://access-to-science.pubpub.org/>

The report's twofold objectives

- To present an historical overview of open access publishing in order to illustrate how researcher behavior, funder policies, and publisher business models and incentives interact.
- To provide a list of key questions for further investigation to understand, measure, and best prepare for the impact of new policies related to open access in research publishing.
- *Note, this is not an official MIT report, and these questions are set out to provide a research agenda, not to recommend particular strategies or practices.*

Research quality and integrity

At a time when advancing the verifiability of information and trust in science has never been more critical, we have seen a rise in publishing models that:

- incentivize article quantity over quality
- further stress an already strained peer review system
- drive industry consolidation at the risk of reducing high-quality publishing options for researchers



The screenshot shows the Pew Research Center website. At the top is the Pew Research Center logo and name. Below it are navigation links: RESEARCH TOPICS, ALL PUBLICATIONS, METHODS, and SHORT READS. A breadcrumb trail reads: Home > Research Topics > Science > Trust in Science. The report is dated NOVEMBER 14, 2023, and includes social media sharing icons. The title is "Americans' Trust in Scientists, Positive Views of Science Continue to Decline". A subtitle reads: "Among both Democrats and Republicans, trust in scientists is lower than before the pandemic". The authors are listed as BY BRIAN KENNEDY AND ALEC TYSON. A section titled "How we did this" with a plus icon is visible. The introductory text states: "A new Pew Research Center survey finds the share of Americans who say science has had a mostly positive effect on society has fallen and there's been a continued decline in public trust in scientists."

Growth in article output 1995-2022

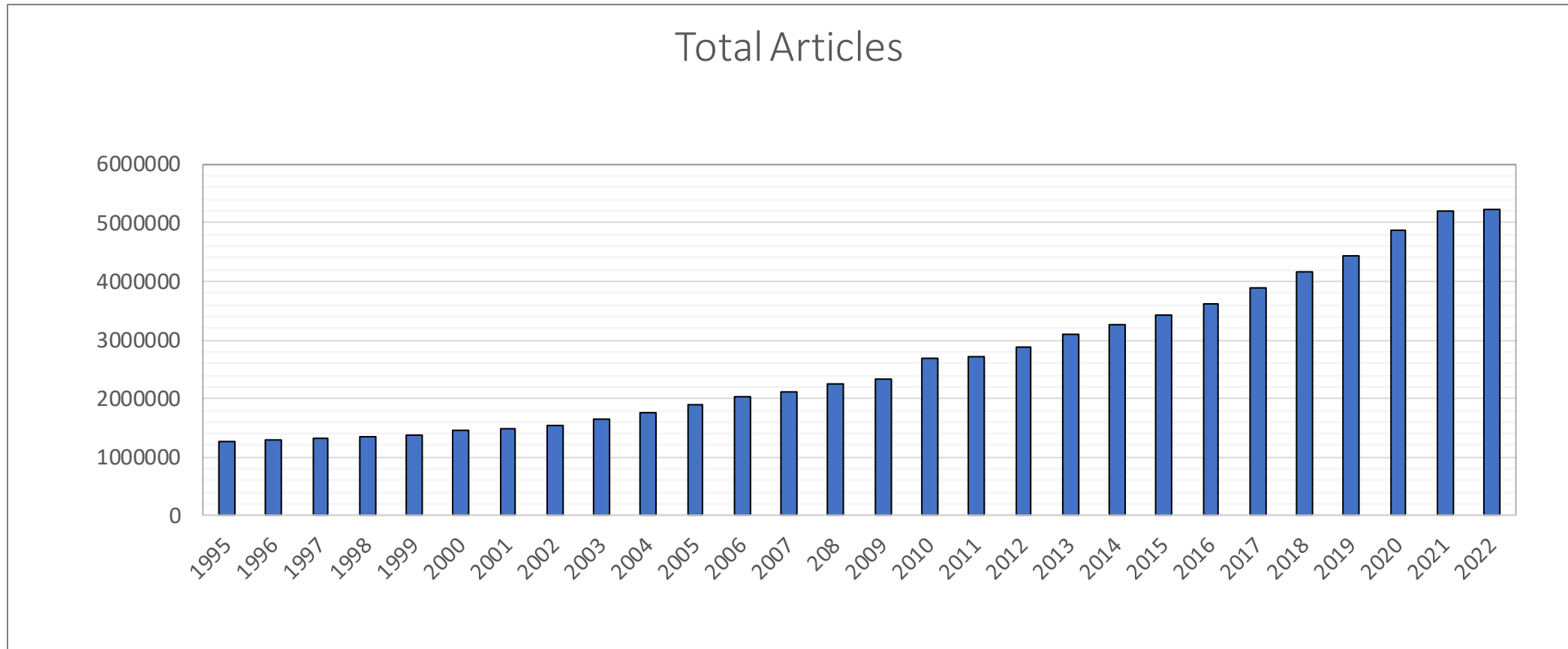


Figure 1. Source: Dimensions (Digital Science). Search limited to “articles”.

Growth in article output by country, 1998-2020

All fields	1998 — 2000 (PY) (Average)		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	203,669	27.9	1
Japan	64,752	8.9	2
Germany	51,597	7.1	3
U.K.	51,053	7.0	4
France	37,657	5.2	5
Italy	24,707	3.4	6
Canada	24,320	3.3	7
China	22,549	3.1	8
Russia	22,351	3.1	9
Spain	17,140	2.3	10

All fields	2008 — 2010(PY) (Average)		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	246,188	22.7	1
China	107,955	10.0	2
Japan	64,783	6.0	3
Germany	58,095	5.4	4
U.K.	54,116	5.0	5
France	42,811	4.0	6
Italy	36,858	3.4	7
India	35,150	3.2	8
Canada	34,913	3.2	9
Korea	31,650	2.9	10

All fields	2018 — 2020 (PY) (Average)		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
China	407,181	23.4	1
U.S.	293,434	16.8	2
Germany	69,766	4.0	3
India	69,067	4.0	4
Japan	67,688	3.9	5
U.K.	65,464	3.8	6
Korea	53,310	3.1	7
Italy	52,110	3.0	8
France	45,364	2.6	9
Canada	43,560	2.5	10

Figure 2. Average papers per year per country. Digest of Japanese Science and Technology Indicators 2022, Chart 15

Changes in publishing affect researchers

- Open access driven by an urgency to share research-based solutions to global crises, and the imperative of globally equitable access to knowledge.
- Increases in the cost of journal publishing, with models that shift costs from subscribers/readers to authors, have decreased the purchasing power of academic libraries relative to the quantity and cost of published research.
- Pay to publish models disadvantage less well-funded researchers, institutions, and fields.

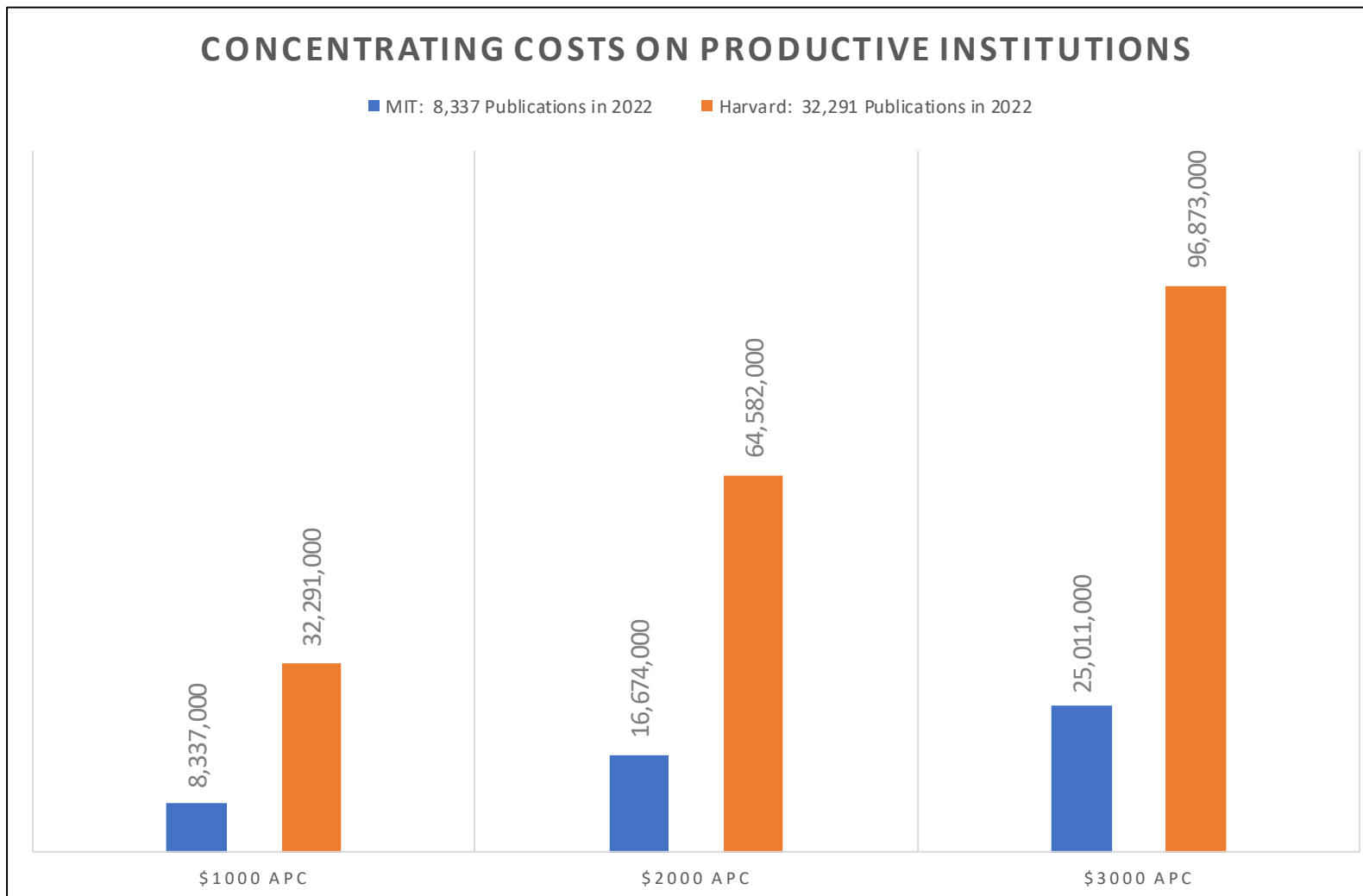


Figure 8. Productive institutions pay more under Gold OA. Data source: Dimensions (Digital Science). Search limited to “articles”.

Changes in publishing affect researchers

- Consolidation in the publishing industry, and a decline society-owned subscription journals that have subsidized scientific and scholarly societies, also decrease researcher publishing options.
- The dramatic increase article output puts added stress on the academic peer review system.

Publisher consolidation

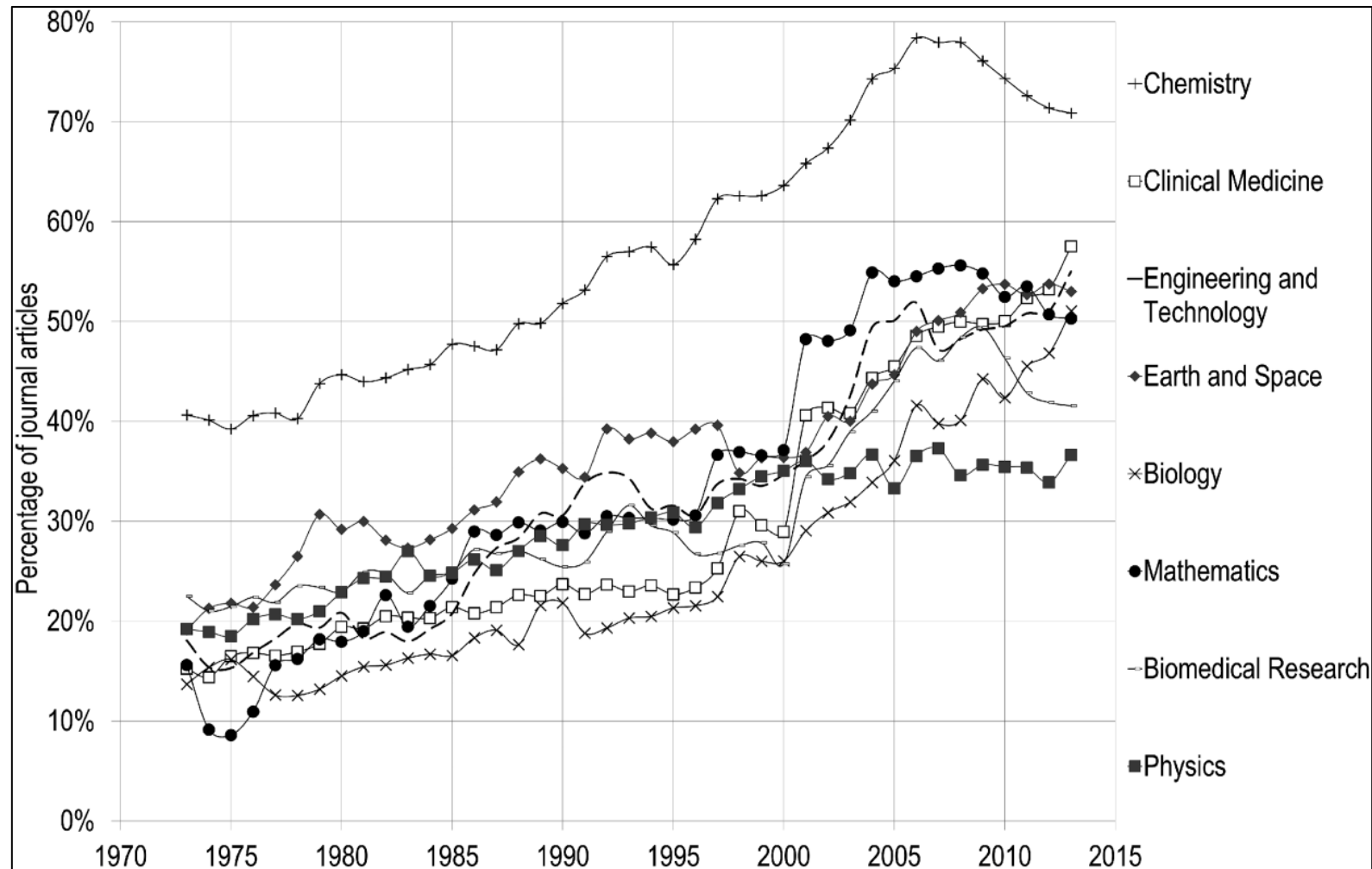


Figure 6. Percentage of papers published by the five major publishers, by discipline in the Natural and Medical Sciences, 1973–2013. Lariviere, et al. (2015) The Oligopoly of Academic Publishers in the Digital Era, *PLOS ONE*

Peer review system under strain

- Number of submissions has steadily increased, driven by growth in global research and increased emphasis on research productivity, leading to a backlog of submissions and longer review times
- A shortage of qualified reviewers to keep up with the increasing volume and complexity/interdisciplinarity of submissions, paired with a lack of incentives and training for peer reviewing
- Peer review process is often opaque and prone to unintentional biases
- Inconsistent quality of reviews impacts the integrity of scientific research

Largest publishers by volume, 2012 vs. 2022

Publisher	Publication Volume 2012	Publisher	Publication Volume 2022
Elsevier	514,157	Elsevier	782,636
Springer Nature	269,367	Springer Nature	448,643
Wiley	214,201	MDPI	300,366
Taylor & Francis	130,474	Wiley	243,955
Wolters Kluwer	81,276	Taylor & Francis	147,043
SAGE Publications	64,674	Frontiers	126,407
Oxford University Press	58,719	Wolters Kluwer	98,842
Trans Tech Publications	55,506	Oxford University Press	91,756
ACS	41,860	CABI Publishing	83,804
IEEE	37,499	SAGE Publications	79,310

Figure 12. Largest scholarly publishers by volume, 2012 and 2022. Data source: Dimensions (Digital Science; search limited to “articles”).

The large publisher advantage

- Paid OA models create inequities in authorship and advantage larger publishers; smaller/non-profit publishers lack the resources to pivot quickly and compete at scale
- Larger publishers can ensure that once a manuscript is submitted to a journal in their portfolio, it stays in the portfolio, transferring to a less prestigious journal if rejected by a flagship journal; as a result, submissions to smaller publishers are declining
- A publishing ecosystem dominated by a few large publishers reduces researcher choice and control in publishing, and risks further disadvantaging less well-funded researchers

Illustrating vertical integration:

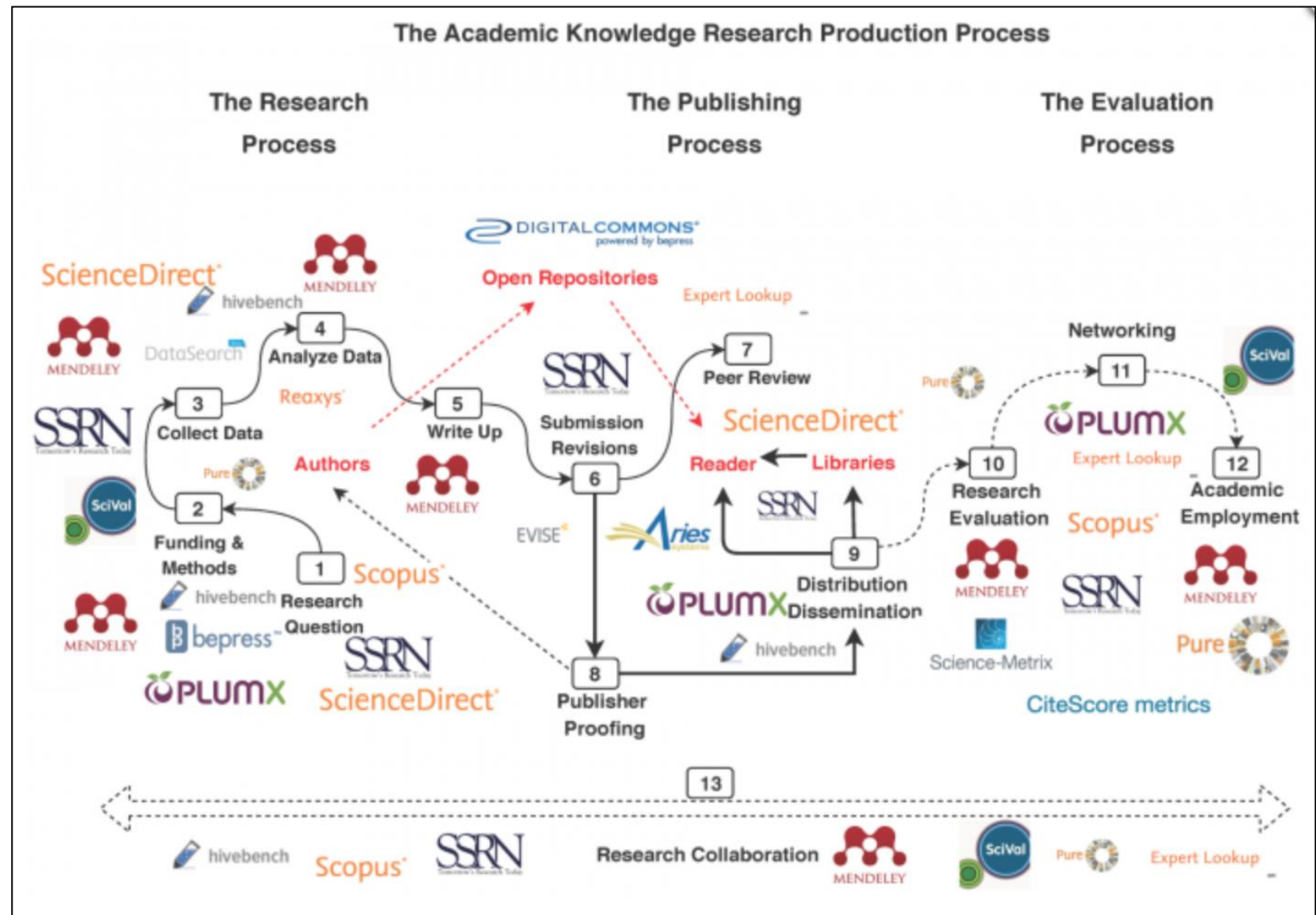


Figure 14. Elsevier presence throughout the research lifecycle. Source: Figure 5 in CHEN, George ; POSADA, Alejandro ; et CHAN, Leslie. *Vertical Integration in Academic Publishing: Implications for Knowledge Inequality*. In: *Connecting the Knowledge Commons— From Projects to Sustainable Infrastructure : The 22nd International Conference on Electronic Publishing– Revised Selected Papers Marseille* : OpenEdition Press, 2019.

Technologies driving change in publishing

- AI helps automate steps in the publishing process, such as plagiarism detection, manuscript formatting, peer reviewer selection, and article indexing; Gen-AI powers new tools for reviewers, such as chatbots that provide writing feedback and virtual assistants that assist with research
- Preprints servers for unpublished versions of articles speed the sharing of research prior to review and are a driving force in the development of open, community-based peer review models
- Data sharing platforms allow researchers to publish their data openly to increase the transparency and reproducibility of research

With the quality and integrity of research publishing at stake, we need answers to questions such as:

- How does open access impact the production, consumption, funding for, and pace of research?
- How can we assess whether OA policies are measurably improving equitable access and the overall research enterprise?
- How can we measure the impacts of research data sharing over time?
- What data management and storage infrastructures are needed to ensure long term access, discoverability, and integrity of research data?
- What experiments and technologies should be developed to improve the quality and efficiency of peer review?

Summary of key issues

- All stakeholders embrace the imperatives of open access and open science, but the path forward remains unclear.
- Dominant OA models are incentivizing quantity over quality in publishing, exacerbated by a strained peer review system.
- University leaders and researchers need to engage in the process of deciding how shifting models and costs will be managed.
- Scientific societies, university presses, and other non-profit publishers are at risk, given ongoing consolidation and vendor lock-in by larger publishers.
- The quality and integrity of research publishing — hence, research itself — is at stake.
- Policies driving change in research communication should be rooted in evidence on the costs and benefits to the research enterprise.



REPORT TO THE U.S. CONGRESS ON FINANCING MECHANISMS FOR OPEN ACCESS PUBLISHING OF FEDERALLY FUNDED RESEARCH

A Report by the
WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

NOVEMBER 2023

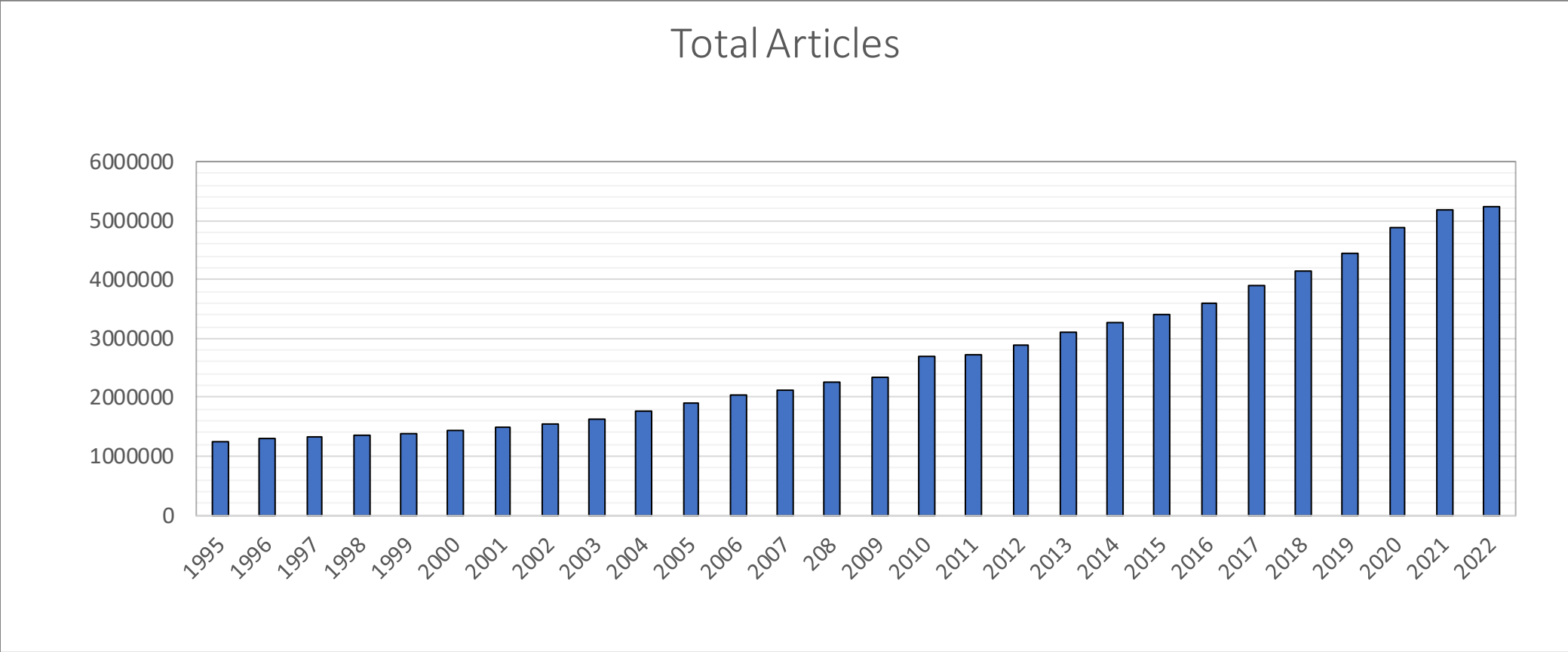


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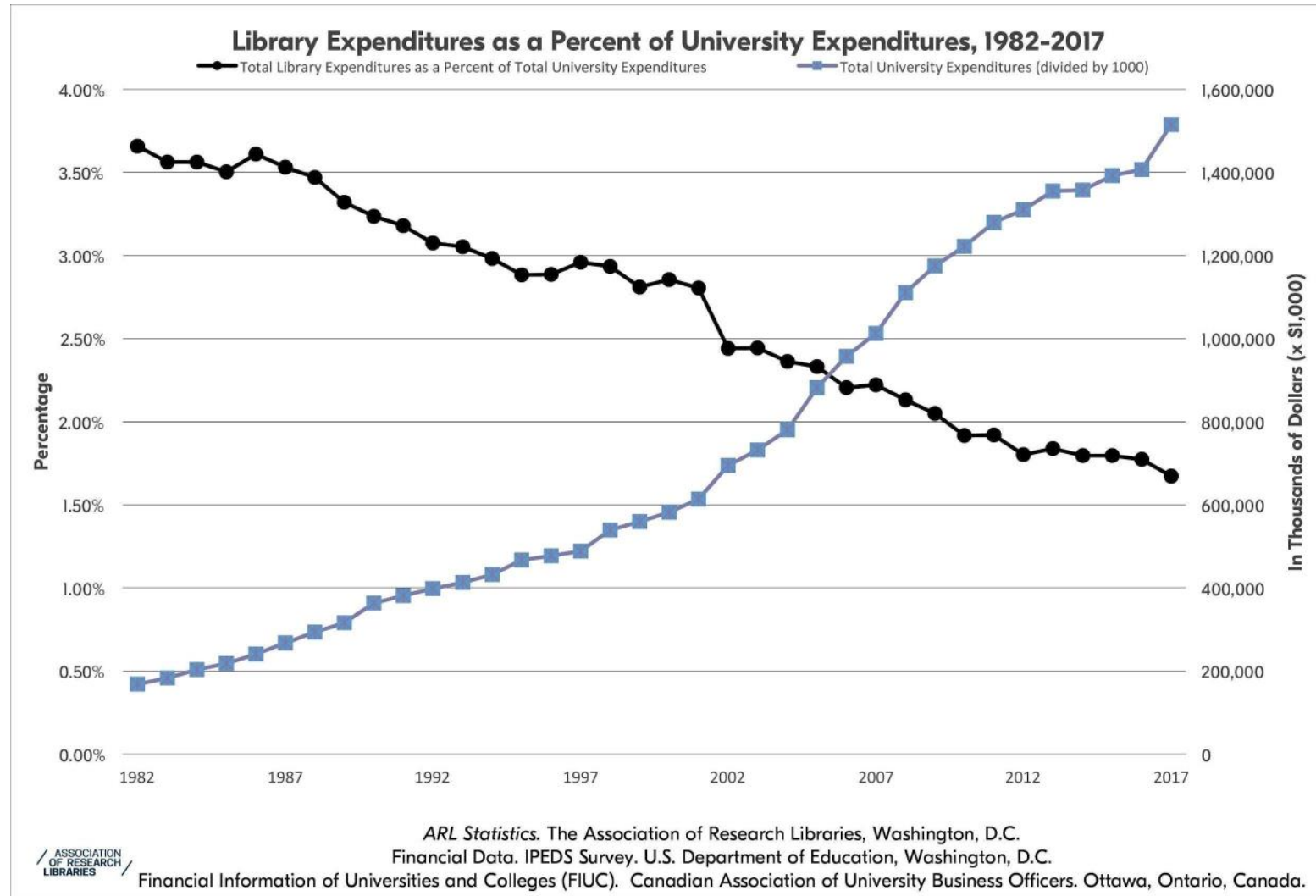


Figure 3. Library expenditures as a percent of university expenditures, 1982-2017, Association of Research Libraries

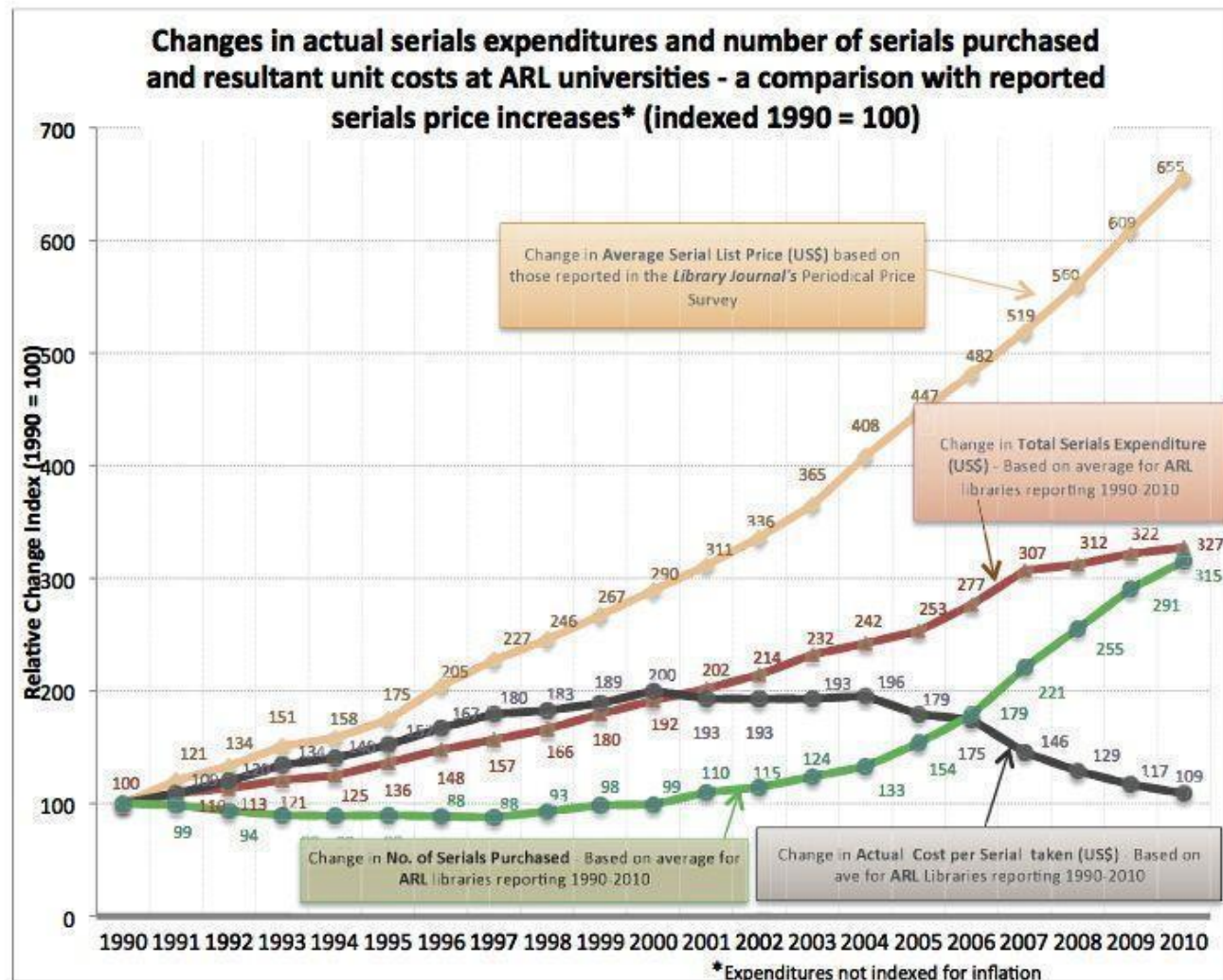


Figure 4. Changes in Expenditures, Gantz, P. (2013) Journal print subscription price increases no longer reflect actual costs. *Learned Publishing* 26, p. 155-231

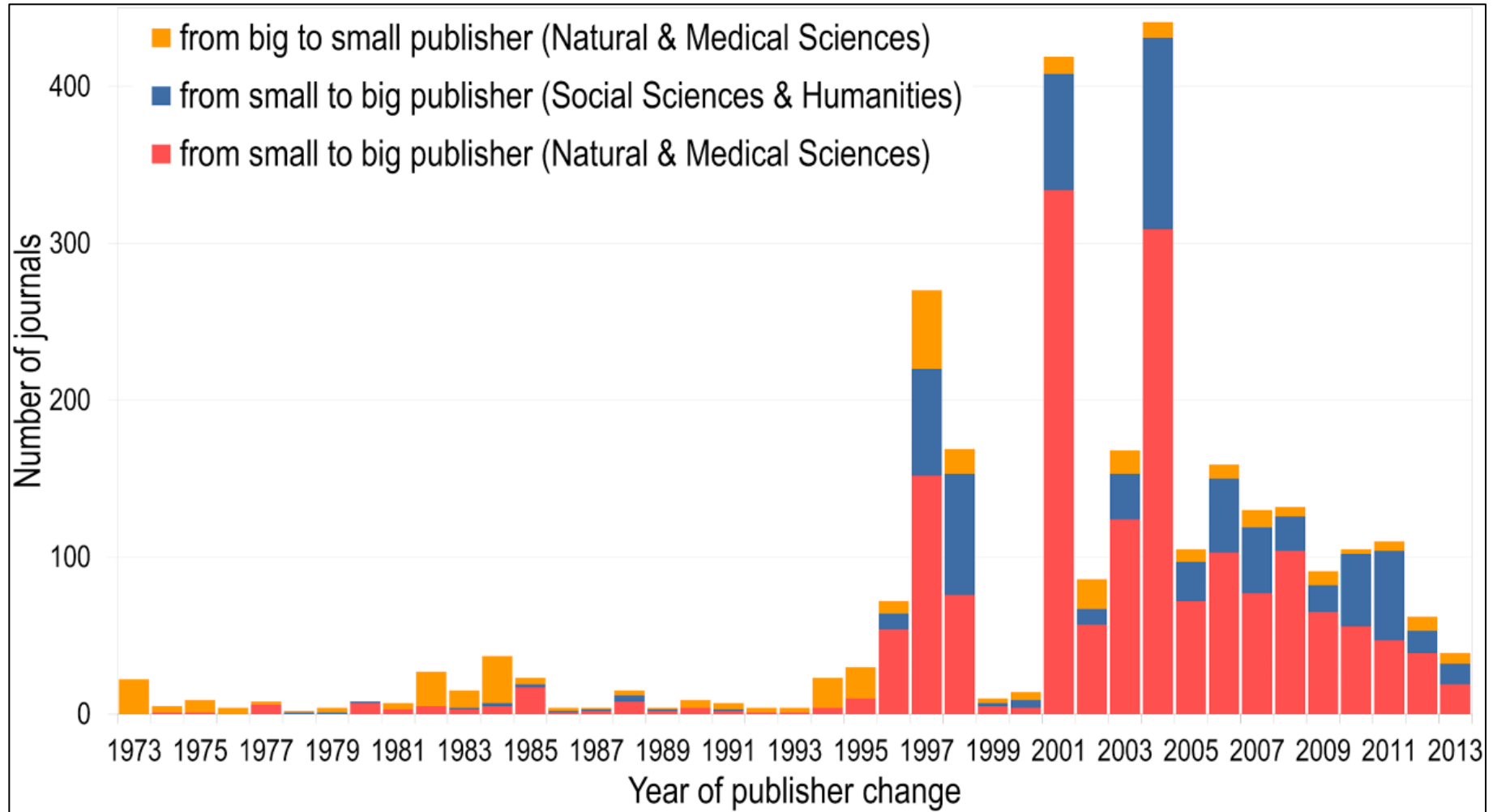


Figure 5. Lariviere, et al. (2015) The Oligopoly of Academic Publishers in the Digital Era, *PLOS ONE*

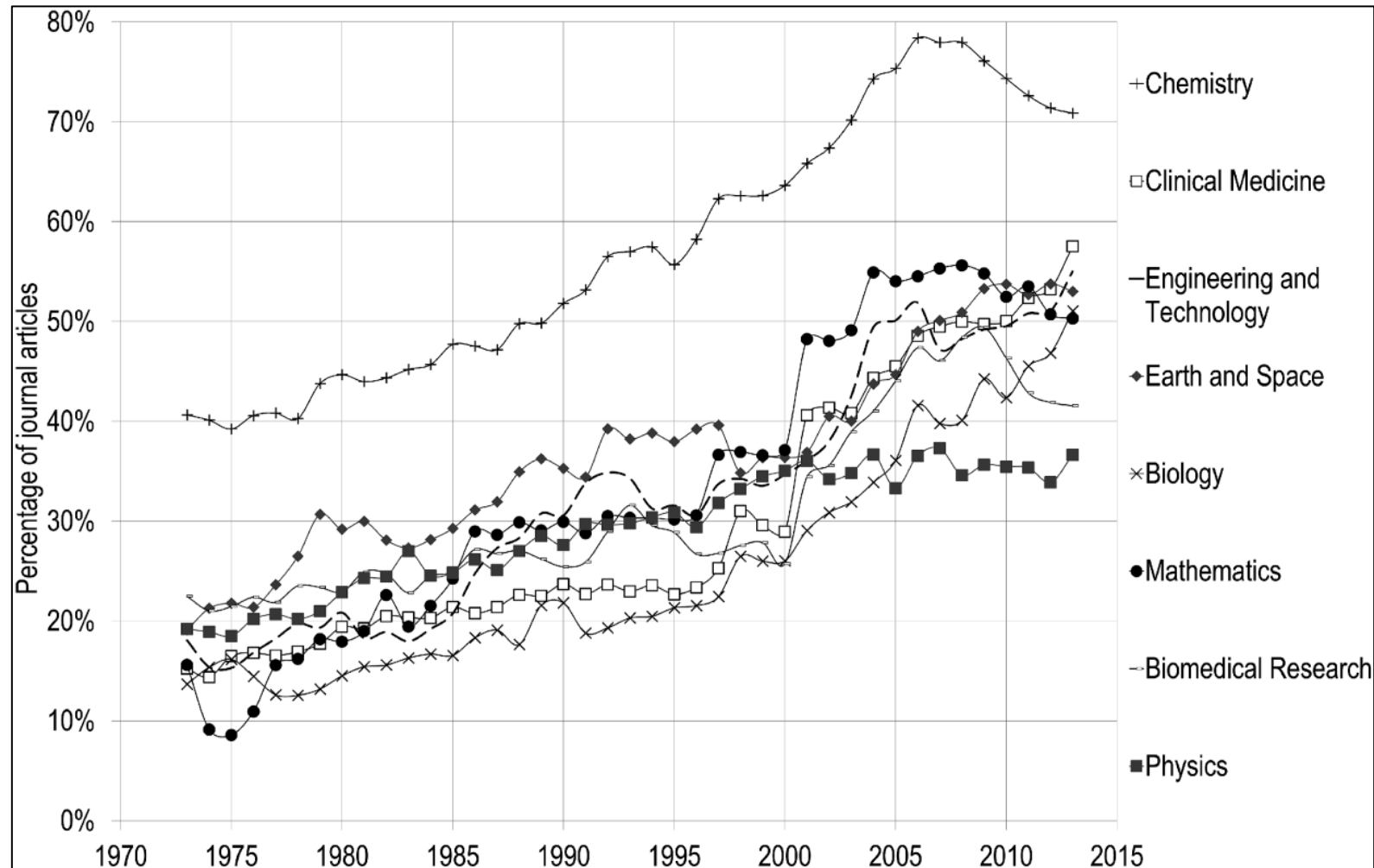


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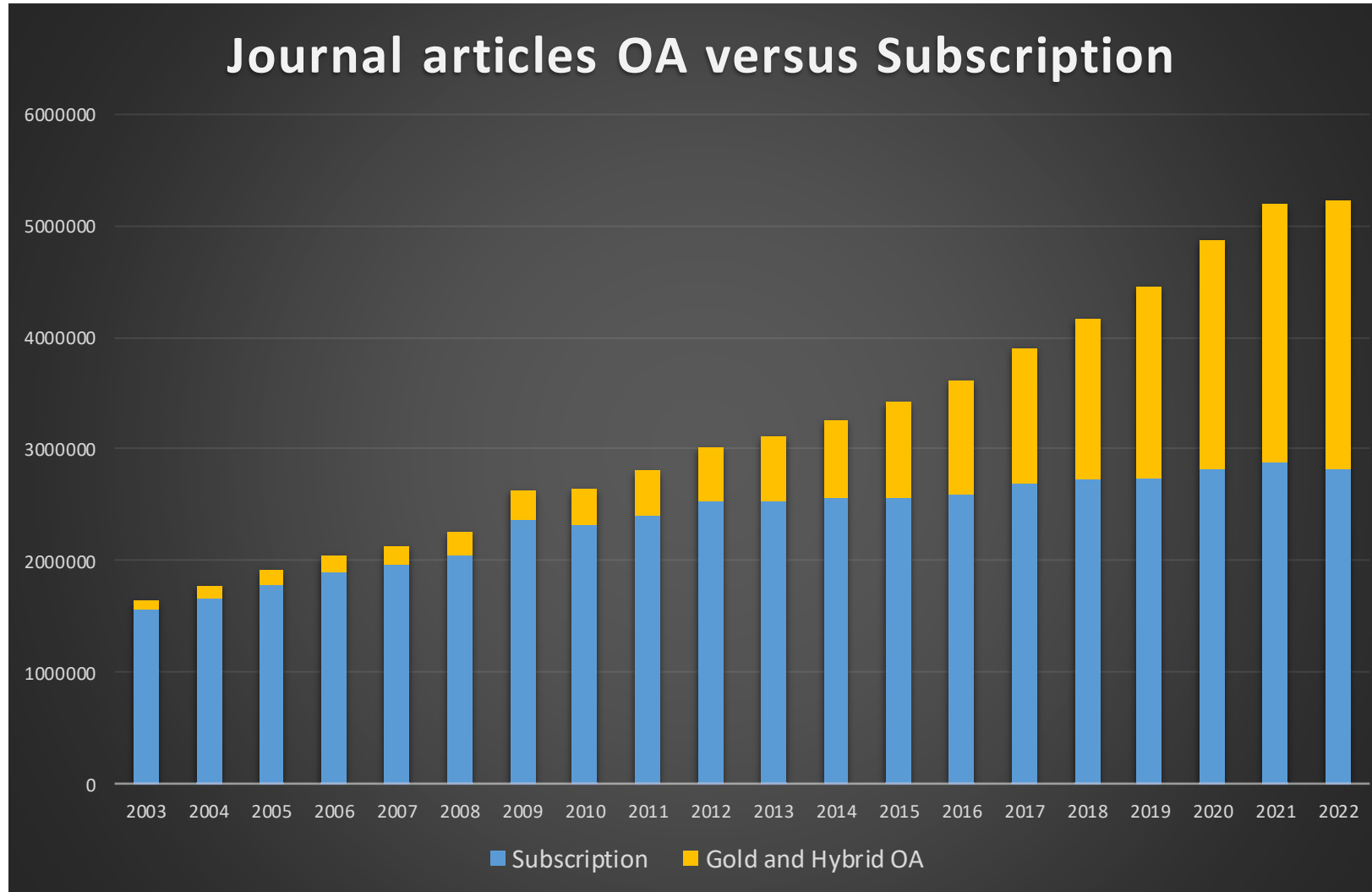


Figure 7. OA was largely additive until policies came into effect circa 2013. Data source: Dimensions (Digital Science). Search limited to “articles” AND “Gold OA” AND “Hybrid OA” OR excluding “Gold OA” AND “Hybrid OA”.

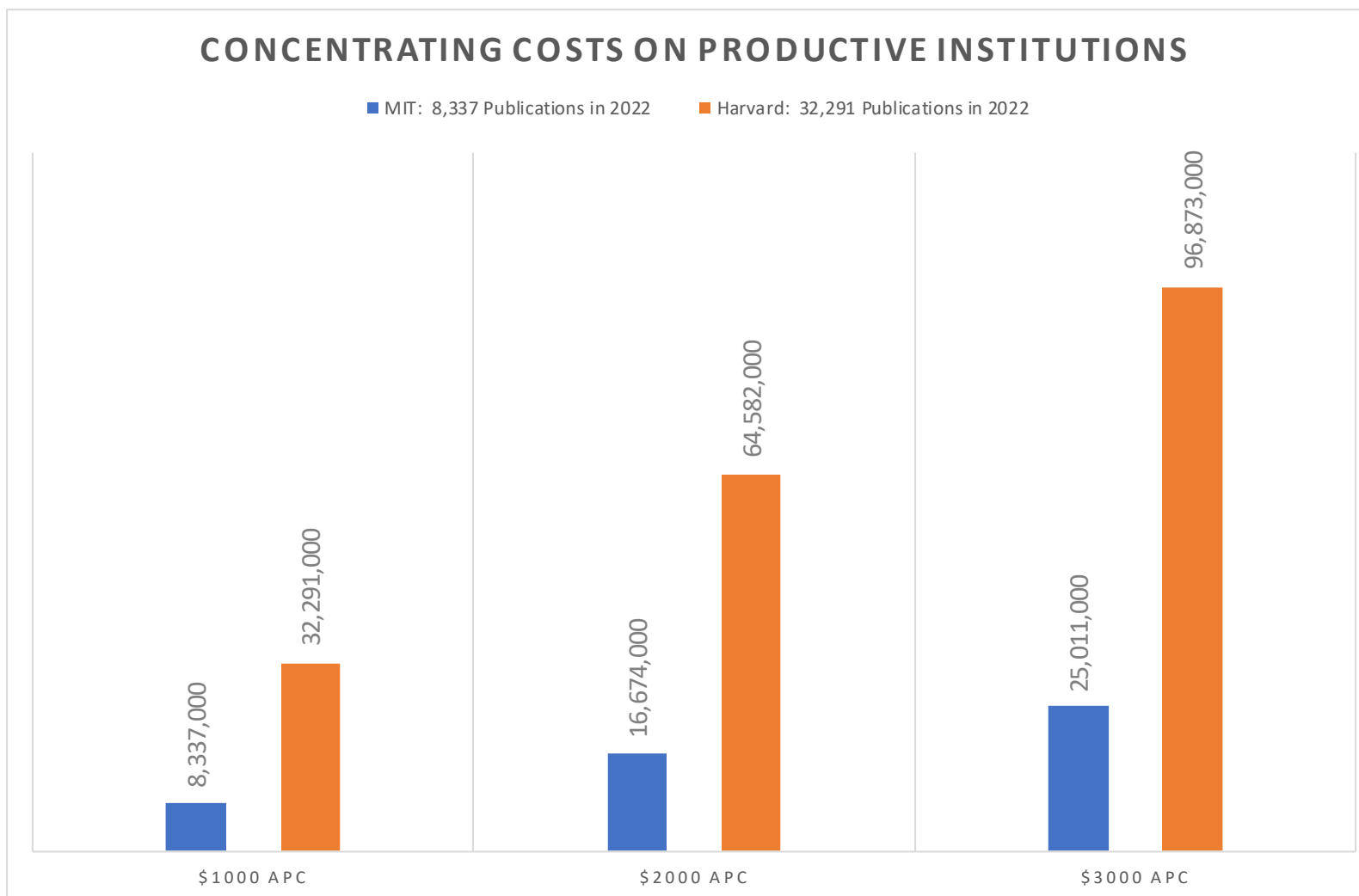


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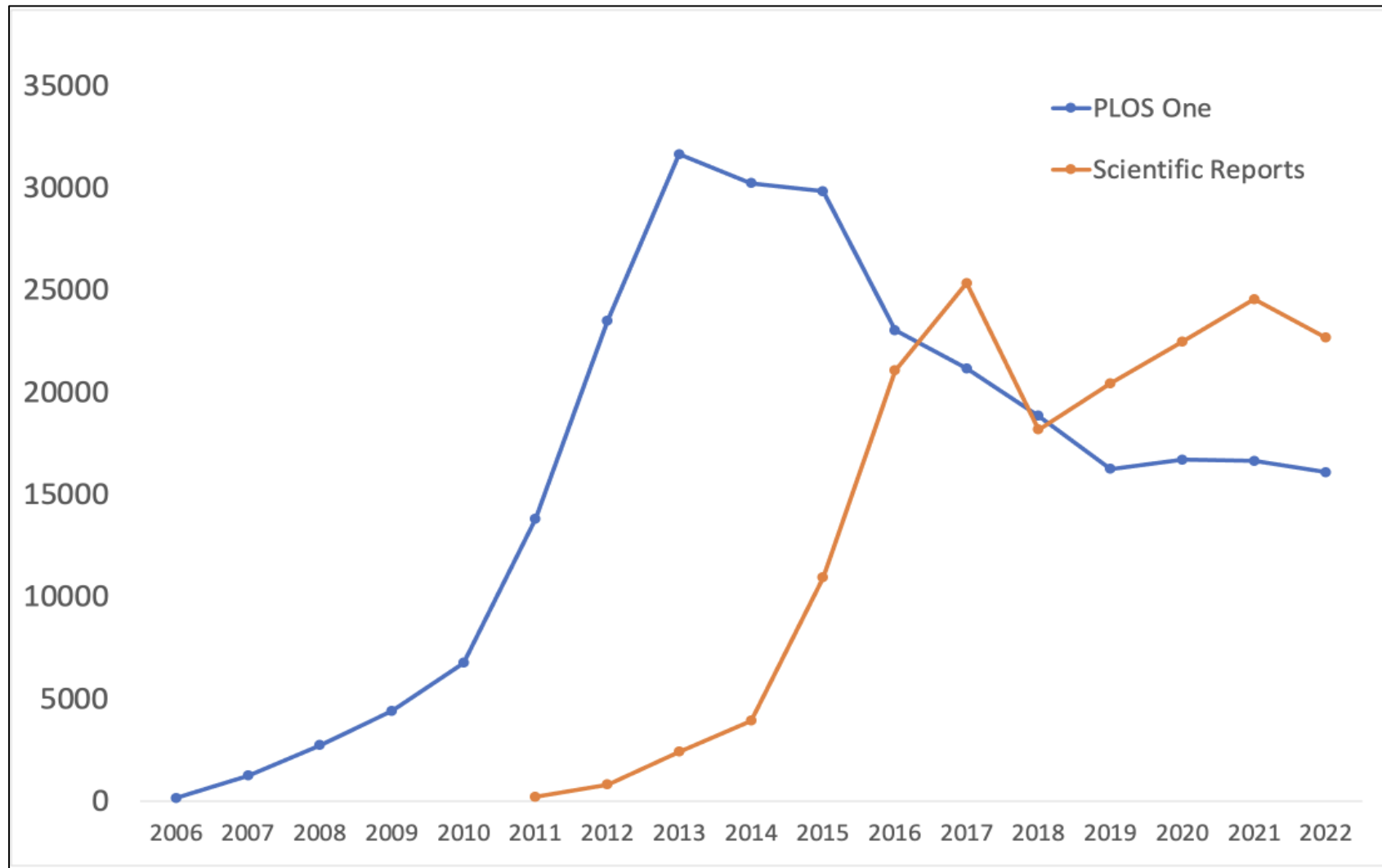


Figure 9. Megajournal publication volumes. Data source: Dimensions (Digital Science). Search limited to “articles”.

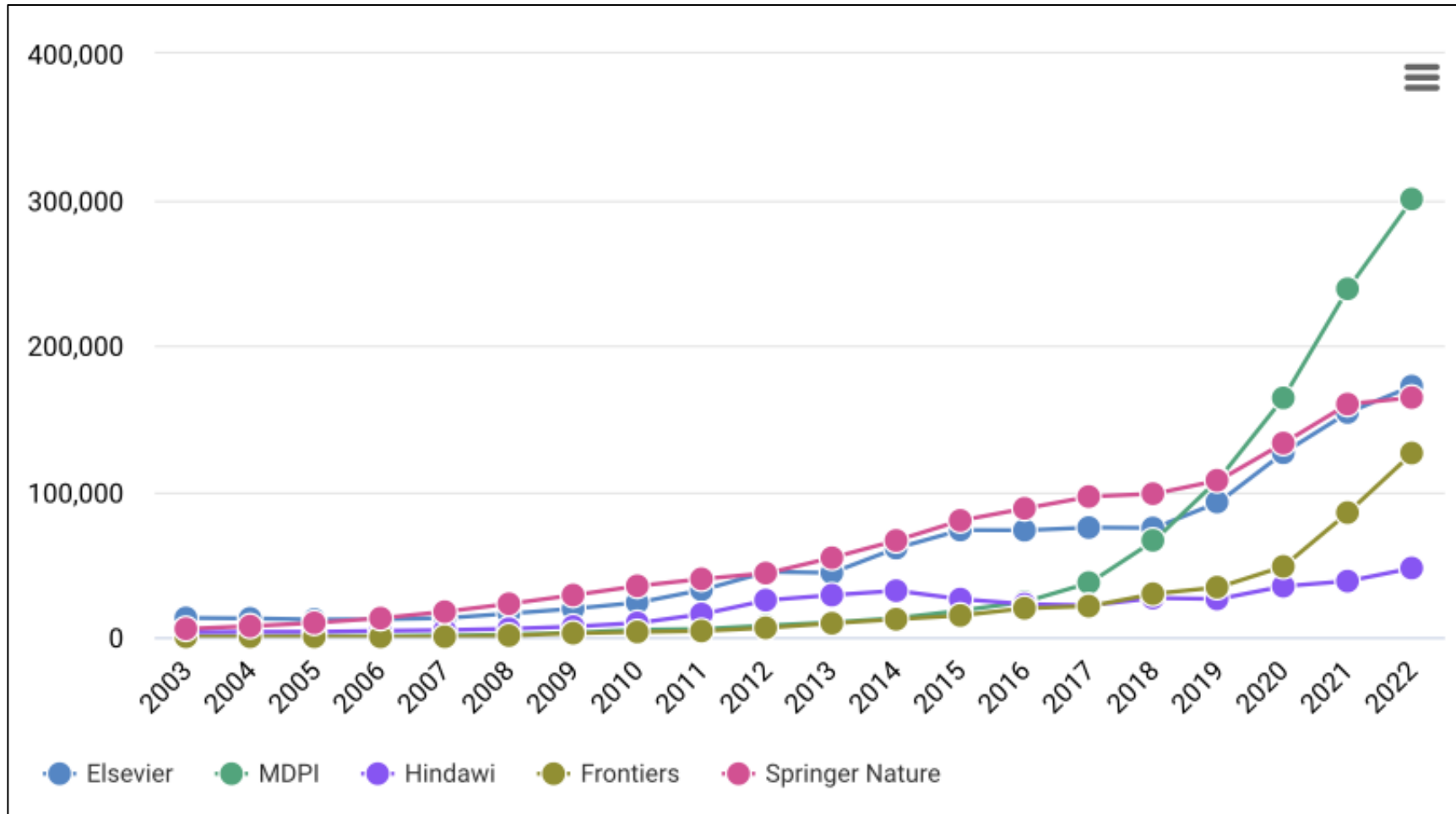


Figure 10. MDPI and Frontiers are the fastest growing OA publishers. Data source: Dimensions (Digital Science). Search limited to “articles” and “Gold OA” or “Hybrid OA”.

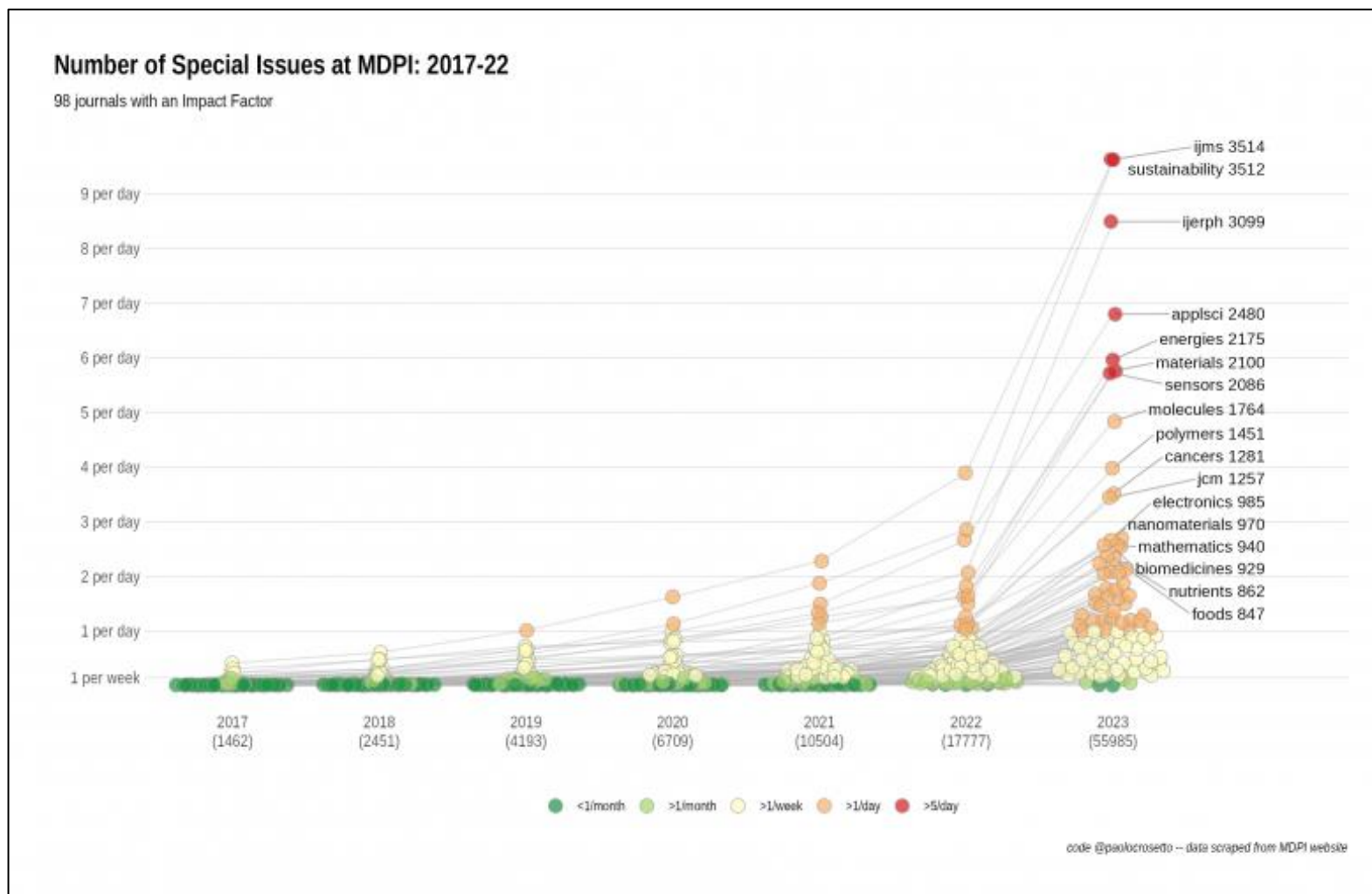


Figure 11. MDPI Special Issues. Source: Paolo Crosetti

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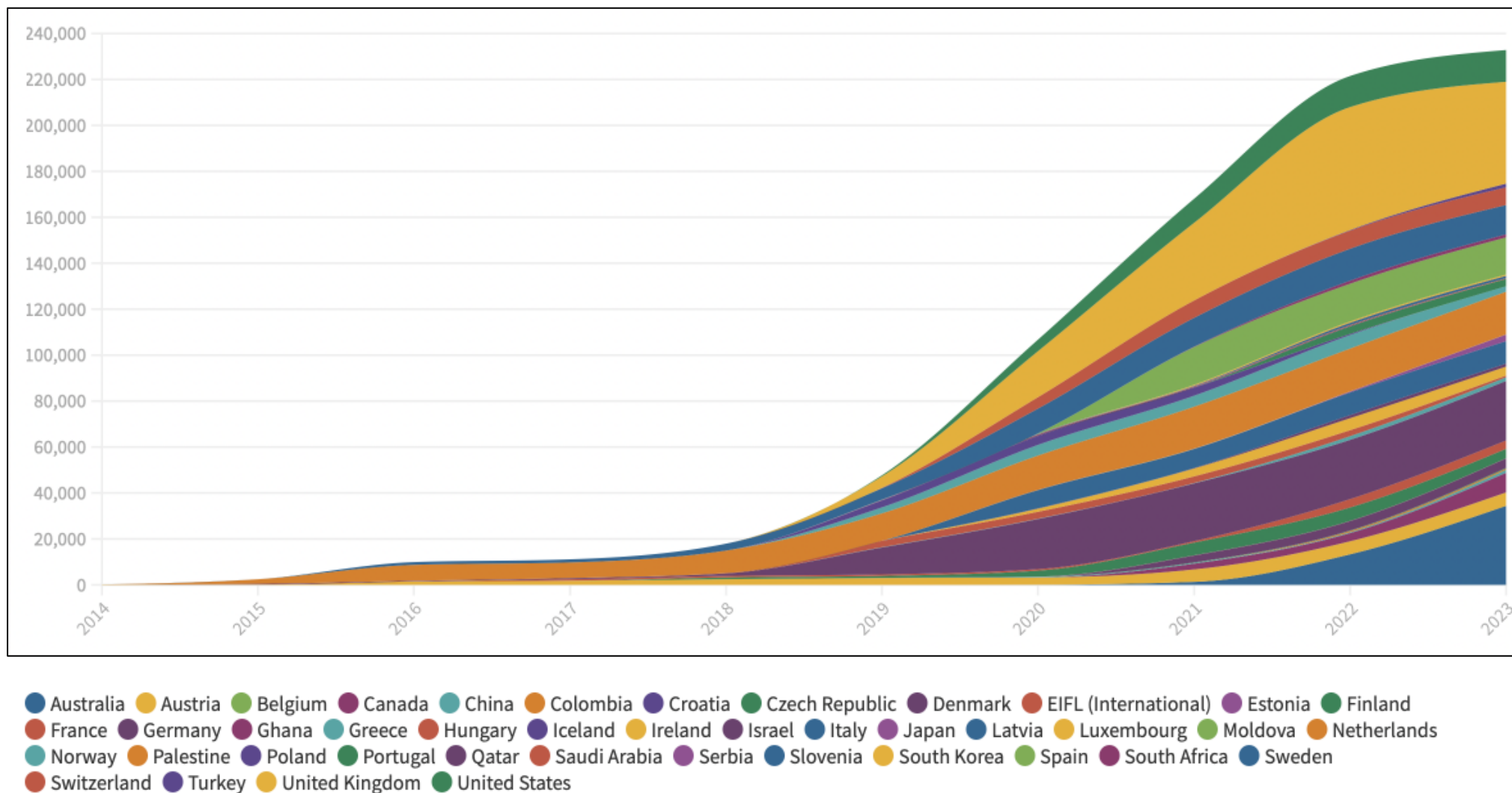


Figure 13. Articles published via Transformative Agreement per year 2014 - 2023. Source: ESAC Transformative Agreement Registry (Data current as of 21 April 2023)

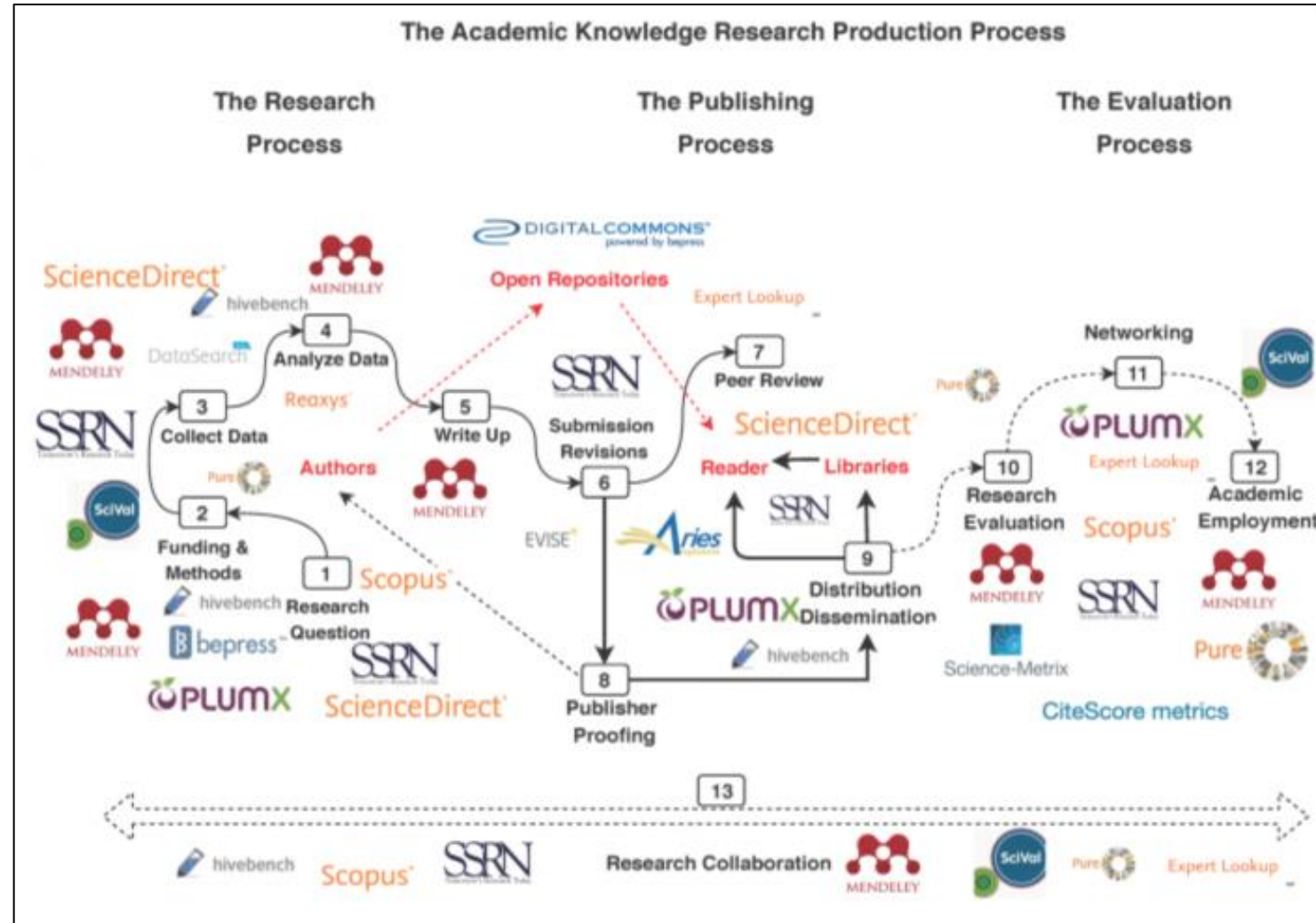


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