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INTRODUCTION

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Economic perspectives on the future of academic publishing: Introduction to the special issue

1 | SCHOLARLY JOURNALS AND BOOKS AS MEDIA OF ACADEMIC PUBLISHING

Traditionally, there have been two important media of academic publishing: scholarly journals and scholarly books. The first *scholarly journal*, the *Journal des Sçavans*, was founded by *Denis de Sallo*, appeared already in January 1665 in Paris, reappeared after the French Revolution as the *Journal des Savants*, and still exists as a leading journal in the humanities. Only a few weeks later, *Henry Oldenbourg*, the first secretary of the Royal Society of London, established a second scholarly journal, the *Philosophical Transactions*, with a focus on science. The purpose of these journals was to formalize the extensive correspondence between philosophers and scientists.[1] In the 18th and the 19th century, more specialized journals gained in importance, most of which were published by learned societies. At the end of the 19th century, university presses too began to publish scholarly journals.

Another traditional means of academic publishing are the various types of *scholarly books*, in particular monographs, edited volumes, reference works (specialist dictionaries, encyclopedias, and specialty reference manuals), and technical handbooks.[2] A narrow definition of academic works would exclude textbooks and books for the broader public. Shavell (2010, 337–39) employs four criteria to determine whether a journal or book is academic in nature: (1) the authors and/or the publisher are usually academics; (2) the readers are mainly academics; (3) the content is academic in character; (4) only low royalties are paid, if any.

As of today, scholarly journals are the preferred mode of academic publishing in particular in the sciences and some social sciences (e.g., economics), whereas scholarly books still play an important role in the arts, the humanities, and part of the social sciences. Whereas scholarly books are published by a large number of small national publishers in a multitude of languages, the most important scholarly journals are typically in English language and published by a few large commercial publishers. Until the mid-20th century, the most important journals were published by learned societies, before commercial publishers began to enter the academic publishing market in the 1960s and 1970s by launching new titles or acquiring existing ones. This development has led to a significant concentration of (commercial) publishers in the academic journal market.[3] It is difficult to say for sure how many scholarly journals are available around the world. Some sources speak of more than 100,000, others of 87,000 or 73,000.[4] In August 2018, Ulrich's Web Directory listed 33,119 active scholarly peer-reviewed English-language journals with about 3 million articles a year, complemented by an additional 9,372 journals in other languages. As an important subset, 11,655 journals with 2.2 million articles were included in the Clarivate Analytics' Journal Citation Reports (STM, 2018, 25–26). The Web of Science (WoS) database counted almost 12,500 journals in 2019 (see below, Section 2.2.1).

2 | THE ACADEMIC PUBLISHING MARKET

2.1 | Developments in academic publishing since the mid-20th century

With the mass expansion of academic education and the increasing size of faculty after World War II, publications in peer-reviewed, highly ranked journals have become an important precondition for academic careers in many disciplines, in particular in the sciences, economics, and partly in the other social sciences. In 1964, *Eugene Garfield* launched the *Science Citation Index* to calculate the impact factors of journals in science, medicine, and technology. This index was later followed by the *Social Sciences Citation Index* in 1973, the *Arts & Humanities Citation Index* in 1978 (Regazzi, 2015, 86–88), and the *Emerging Sources Citation Index* in 2015. These indices led to the development of the *Journal Impact Factor* (JIF), a metric that serves to rank a scholarly journal based on the number of citations to articles in that journal by articles in other indexed journals within a certain time period.

During the same time, commercial publishers have increased their market shares to the detriment of non-for-profit publishers, such as learned societies and universities, becoming the dominant players in the market for scholarly journals. Today, the "big five" commercial academic publishers—Elsevier, Springer, Wiley, Taylor & Francis, and Sage—cover more than half of the market for scholarly journals. Since the 1980s, we have seen a sharp increase not just in the number of journals but in particular also in journal subscription prices, forcing many academic libraries to cancel serials subscriptions and to cut back

on new monographs (the so-called *serials crisis*, cf. Eger & Scheufen, 2018, 23–29).

Since the 1990s, digitization and the advent of the internet have had further considerable impact on academic publishing[5]:

- Most scholarly journals are available online. The few exceptions in particular concern some very small journals and some journals in the humanities. By contrast, the transition to scholarly e-books is much slower (STM, 2018, 28–29).
- Instead of purchasing tangible objects, such as books and journal issues, libraries increasingly negotiate digital licenses to access online content. Whereas most scholarly journals are primarily consumed online, many of them are still produced in print as well, but no new journal will be established in a print-only format. However, the print format still dominates scholarly book publishing.[6]
- The major commercial publishers began to offer the academic libraries bundles of digital journals within multiyear agreements ("big deals"). In return, the libraries agreed to pay annually increasing subscription prices and to keep these prices, which varied widely across institutions, confidential. The libraries initially considered the big deals advantageous, as the access to the publishers' electronic journal database was granted at a substantial discount. However, subsequent experience with this model revealed that the bundles often included a large share of lower value content and that the increasing prices detracted substantial library funds away from smaller journal publishers and expenditure on books (see, e.g., Bergstrom et al., 2014; Edlin & Rubinfeld, 2004, 2005).

These developments induced an increasing number of scholars, initially in the United States, to promote open access (OA) to scholarly articles as a replacement of or an addendum to the subscription model. After some individual initiatives in the late 1980s, the early 2000s saw the emergence of a global movement by scholars, librarians, and research sponsors, resulting in the "Budapest Open Access Initiative" (February 2002), the "Bethesda Statement on Open Access Publishing" (June 2003) and the "Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities" (October 2003).[7]

Two roads to OA can be distinguished[8]: First, *gold OA* refers to electronic journals with OA for all readers, often based on creative commons licenses. The publishers' costs are covered not by subscription fees but from other sources, such as article-processing charges (APCs)[9] paid by authors, libraries, learned societies, or research sponsors, or subsidies from learned societies and other sources. *Hybrid OA journals*, whose numbers are rising fast, allow the authors to choose between paying an APC, thereby granting the reader OA, or not paying an APC and requiring the reader to pay for access to the article.[10] A special branch of gold OA is *mega-journals*, the first one of which, *PLOS One*, was first published in 2006. In these journals, the peer review is restricted to examining only the soundness of the submitted articles but not their broader interest or impact. Also, mega-journals are not oriented towards a specific subject matter.

The second road, *green OA*, refers to authors self-archiving pre-prints or post-prints of their papers on so-called OA repositories, potentially in addition to publication in traditional subscription-based journals. OpenDOAR listed 5,713 repositories in July 2021, of which 5,073 were classified as *institutional repositories* managed by universities, faculties, or other academic institutions, 364 as *disciplinary (subject) repositories* which aggregate research papers in specific disciplines (e.g., PubMed Central, arXiv, SSRN, and RepEc), 138 as *aggregating repositories* (including Academia and Scielo), and 139 as *governmental repositories*.[11] Whereas institutional and disciplinary repositories generally respect the authors' or publishers' copyright, so-called *Robin Hood* or *Pirate* OA repositories do not. The most prominent example is *Sci-Hub*, founded in 2011 by Alexandra Elbakyan, a young scholar from Kazakhstan, which made over 60 million journal articles publicly available. Due to complaints by academic publishers, Sci-Hub had to switch domains several times.[12] Recent years have seen the emergence of *academic social networks* such as Research Gate and Mendeley, as well as a stream of new forms of disseminating scientific content, including *blogs*, *podcasts*, and *Facebook posts* by prominent scholars. Regarding *OA books*, the Directory of Open Access Books (DOAB) in June 2021 listed 43,036 academic peer-reviewed books from 621 publishers.[13]

2.2 | Some statistics on the journal publishing market

2.2.1 | General observations

The number of academic journals, as listed in the WoS database, has been growing steadily over the past two decades, from around 5,000 in 2000 to almost 12,500 in 2019 (Figure 1).[14]

The academic journal market is dominated by a few large commercial publishers, with the "big five" accounting for more than half of the academic journals listed by the WoS in 2019: Elsevier (1,754 journals), Springer (1,406), Wiley Blackwell (1,242), Taylor & Francis (1,199), and Sage (642).[15] However, due to a downturn by Elsevier that began around 2006, this dominance has declined from around 60% in 2000 to around 51.7% in 2019 (Figure 2).

Coupled with the advent of the internet and the concurrent increasing digitization of academic works, which through the bundling of different journals and/or formats ("big deals") facilitated second-degree price discrimination, this dominance has led to a drastic increase in subscription prices since the early 1990s (Bergstrom, 2013; Eger & Scheufen, 2018; Ramello, 2010). The resulting serials crisis—with academic libraries having to cut their journal portfolio—gave rise to a new publishing regime that offers OA to journal content. The share of pure (i.e., non-hybrid) OA journals as listed by the Directory of Open Access Journals (2021) has been increasing steadily, from around 3% of all WoS-listed journals in 2000 to more than 10% in 2019 (Figure 3).

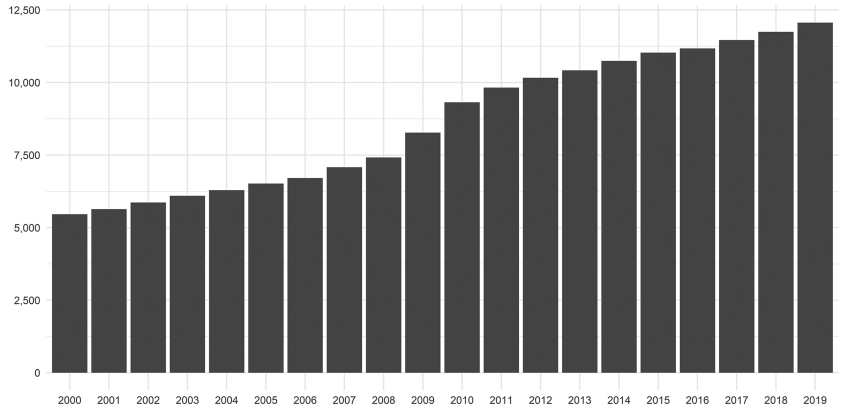


FIGURE 1 Development of the number of journals in the Web of Science. Source: Author's calculations based on data from Web of Science (2021)

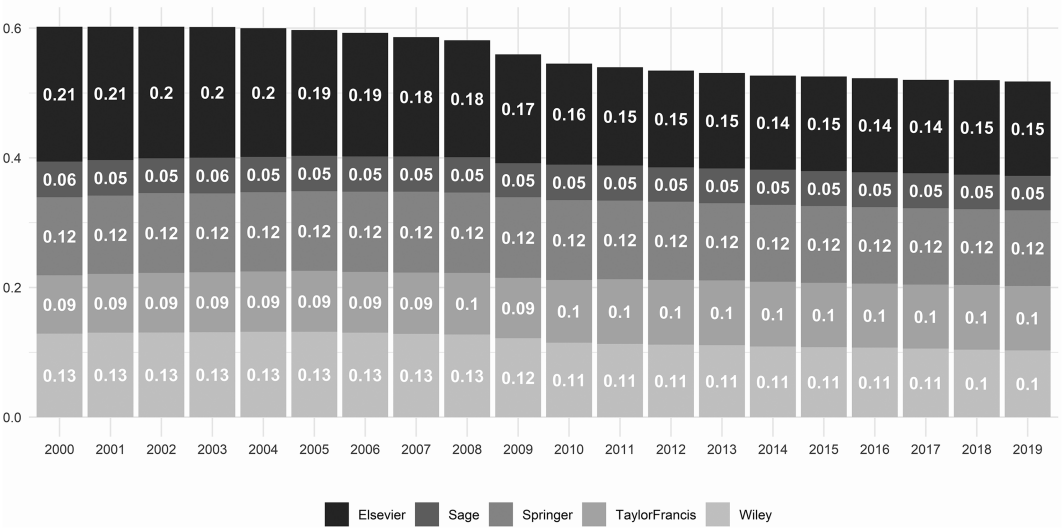


FIGURE 2 Market shares of the big five publishers. *Source*: Author's calculations based on data from Web of Science (2021)

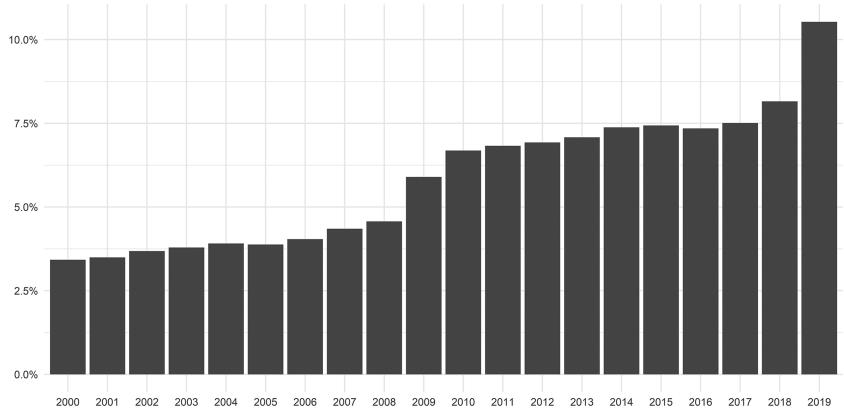


FIGURE 3 Share of OA journals in the Web of Science. *Source*: Author's calculations based on data from Web of Science (2021) and DOAJ (2021)

Interestingly, pure OA journals also gained ground in terms of quality. Figure 4 shows boxplots of the impact factors[16] of closed access (CA) versus OA journals over time. While CA journals enjoyed an impact factor advantage over OA journals for a long time—all location scales of the impact factor for CA journals being above the ones for OA journals—OA journals are nowadays of the same quality, notwithstanding considerable differences between disciplines (see the contribution by Eger et al. to this issue). In 2019, impact factor distributions of both OA and CA journals are at the same level. Thus, advancing both in quantity and in quality, OA journals are becoming ever more relevant. The literature has identified the following advantages of an OA regime for academic works: (1) OA publications

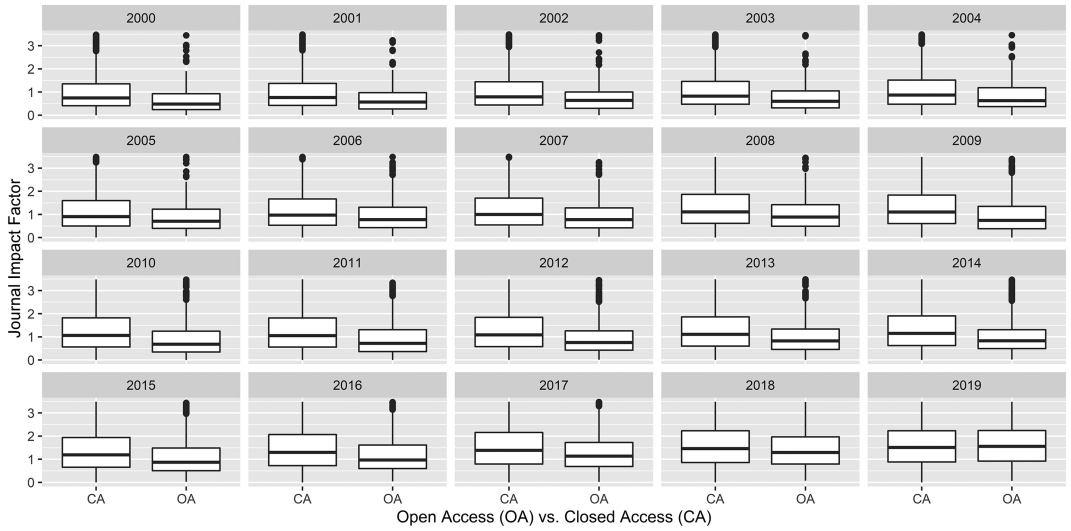
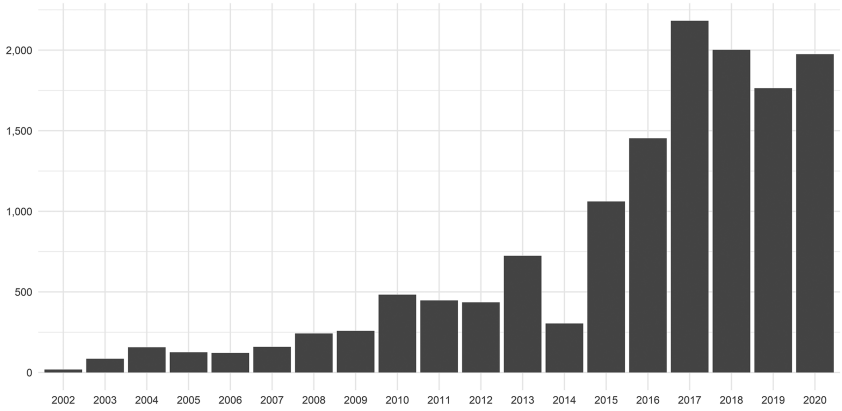


FIGURE 4 Impact factor distributions for CA versus OA journals. *Source*: Author's calculations based on data from Web of Science (2021) and DOAJ (2021)

FIGURE 5 Number of new OA journals added to the DOAJ database each year. *Source*: Author's calculations based on data from DOAJ (2021)



are likely read and therefore (2) cited more widely,[17] which in turn (3) raises the incentives for academic authors to publish their research results as citations increase their reputation. These observations led to a broad discussion in academia as to whether the copyright regime may impede the evolution towards a universal OA regime, with very different conclusions being drawn regarding the impact of OA from a social welfare perspective (Scheufen, 2015; Shavell, 2010).

2.2.2 | OA journals

The growing relevance of academic OA publishing warrants a closer look at the development of pure OA journals as the gold road towards OA. Figure 5 shows the number of newly launched OA journals from 2002 to 2020. Following relatively slow growth from 2002 to 2014, with fewer than 500 new OA journals per year (except 2013), the number has exceeded 1,000 in every year since, peaking in 2017, when more than 2,000 new OA journals were added to the DOAJ database. Today, the DOAJ database counts more than 16,000 OA journals in many different fields of research, published in 80 languages by publishers from 126 countries.[18]

Notwithstanding this impressive development, the relevance of OA journals varies substantially across academic disciplines (Figure 6).[19] The research field with the largest attributed number of OA journals is Social Sciences (3,817), followed by Health Sciences (2,785), Technology and Engineering (1,416), and Language and Literature (1,153). By contrast, the natural science fields of Mathematics & Statistics (341), Physics & Astronomy (274), and Chemistry (181) feature only few OA journals.[20]

Remarkable differences also exist regarding a variety of OA journal characteristics (Table 1).[21] Most (52%) OA journals leave the copyright of published works with the author, whereas the traditional CA regime demands that the exploitation rights are transferred to the publisher. Moreover, only around 28% of all OA journals charge APCs—a remarkable finding, as the OA regime implies the transition from a "reader pays" to an "author pays" model. Other fees (e.g., a submission fee to cover the review process) are charged by only around 2% of all OA journals. Nevertheless, author fees may constitute a significant obstacle for authors to publish in an OA venue,

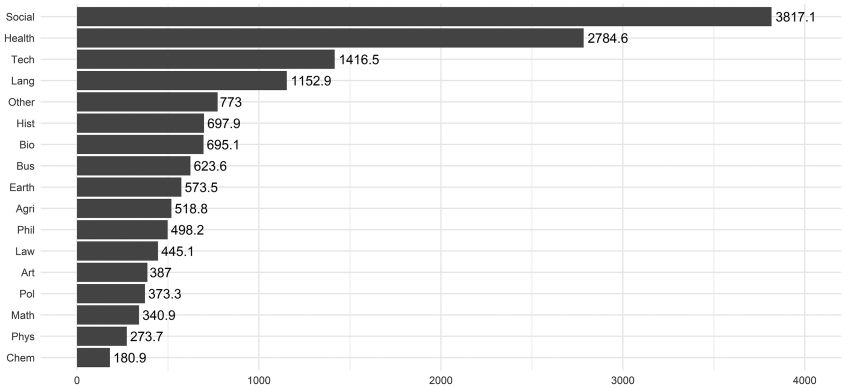


FIGURE 6 Number of OA journals by research field. *Source*: Author's calculations based on data from DOAJ (2021)

TABLE 1 Characteristics of OA journals

	Copyright remains with the author	APC charged	Other fees charged	Waiver available
Yes	8,010 (52.4%)	4,255 (27.8%)	342 (2.2%)	2,764 (18.1%)
No	7,270 (47.6%)	11,025 (72.2%)	14,938 (97.9%)	12,516 (81.9%)

Source: Author's calculations based on data from DOAJ (2021).

especially for non-tenured researchers seeking to publish in highly ranked journals, which are most likely to charge APCs (Budzinski et al., 2020). This obstacle also applies in particular to many researchers from developing countries, whose institutions rarely cover such costs. Yet 18% of OA journals provide for the possibility to waive such author fees.

OA publishing may indeed be considered a form of development aid, for two reasons: First, few institutions in the developing world have so far been able to subscribe to academic journals. The OA regime can thus promote scientific participation and thereby foster the global evolution of science as a "trial and error" process. Free or cheaper access to literature for researchers in the developing world tends to increase both their output (number of publications) and input (number of references) (Mueller-Langer et al., 2020). Second, an OA regime grants access to the latest results in science for groups who were previously excluded because they are not "club" members of a university library. This includes, e.g., corporate researchers, physicians, or farmers.

3 | PROBLEMS AND CHALLENGES OF ACADEMIC PUBLISHING IN THE DIGITAL AGE

Notwithstanding all the changes discussed above, scholarly journals remain the most important medium of communication in many disciplines. For more than 300 years, they have been fulfilling the four key functions of *registration* (attribution), *certification* of articles (peer review), *dissemination* (distribution, access), and *preservation* (scholarly memory and permanent archiving). In recent decades, a fifth function must be added: the *evaluation* of researchers and their institutions.[22]

The increasing importance of OA articles in scholarly journals has triggered some controversial discussions, in particular regarding the questions as to whether OA negatively affects the quality of journal articles, whether OA improves the dissemination of research results, and how OA affects the competition between academic publishers as well as the distribution between academics and non-academics, between poor and rich universities, and between poor and rich countries. We shall discuss each of these questions and some related points in more detail below.

3.1 | Quality assurance of the research output

3.1.1 | Quality assurance in OA and non-OA journals

In times when "alternative facts" tend to trump sound research results, academia must provide the public with reliable information. The users of this information should be sufficiently certain that the results are based on proper methods, reflect the state of science in the specific field, and were obtained independently, e.g., of any political or commercial interests.[23] For that reason, strict and continuous quality control of research results is a "conditio sine qua non" for academic publishing.

Facilitating the communication of content from authors to readers, the academic journal market may be characterized as a two-sided market (Rochet & Tirole, 2003). While readers look for the most important research results in their fields by top authors, the latter are interested in the journal's reputation, in wide readership, and in citations. Thus, journals with high impact factors hold the greatest attraction to both sides.

With this in mind, the crucial question arises what effect, if any, OA is likely to have on the quality of academic articles. Jeffrey Beall, a librarian at the University of Colorado in Denver, is very skeptical regarding the quality of OA articles, especially those that are financed by APCs: "By adding a financial component to the front end of the scholarly publishing process, the open-access movement will ultimately corrupt scholarly publishing and hurt the communication and sharing of novel knowledge" (Beall, 2013, 590).

A weak form of "corruption" would refer to OA publishers' incentives to neglect rigorous peer review and to accept more submitted papers in order to increase revenues from APCs.[24] However, the commercial publishers' incentives to increase the number of articles to the detriment of the journal's quality vanishes at the point where the quality degradation actually reduces the APCs that the journal is able to charge, as well as publisher's profits (Shavell, 2010, 334).

A stronger form of "corruption" refers to the "new business model" of "predatory publishing," where some OA journal publishers have been known to exploit in particular young and inexperienced scholars who depend on publications for their careers, or to allow experienced authors to publish low-quality articles in OA journals, by accepting articles with little or no peer review, listing academics on editorial boards without their permission, mimicking the name or website style of reputable journals, and so on. In 2010, Beall established a list of predatory publishers, which was regularly updated until it went offline in January 2017 in response to heavy criticism not only from the publishers concerned but also from OA advocates who argued that Beall exaggerated the problem to suit his general ideological objection to OA. From today's perspective, this quality problem seems to be a transitory one which exists only in some disciplines (e.g., economics), whereas in other disciplines, such as biology, some OA journals are among the highest ranked journals and there is no evidence whatsoever of a systematic quality gap.[25] If senior researchers warn their younger colleagues and if academic institutions and research sponsors refuse to finance the APCs for articles accepted by predatory journals, this business model is bound to vanish.

A further concern voiced by *Beall* is that OA may discriminate against new and unpopular ideas: "Popular ideas will receive funding; new and unpopular ideas, regardless of their merit, will remain unfunded" (Beall, 2013, 590). However, this problem is a general consequence of the peer-review process, regardless of whether the paper was submitted to a traditional or an OA journal. Gans and Shephard (1994) list many prominent examples which suggest that mainstream articles are generally more likely to pass the review process than original and creative but heterodox ones. In their contribution to this special issue, Watt & Mueller-Langer show in a two-sided model that OA can be a feature of high-quality journals.

3.1.2 | Access to data and the replication crisis

The last decades have seen an increasing availability both of data on virtually any subject and of software that serves to process that data almost instantaneously. Consequently, there has been a surge of empirical articles in practically every discipline. For such articles, besides the well-established pre-publication peer review, another option for quality assurance becomes available: post-publication replication studies.[26] A distinction can be made between *pure replication*, where the same data and the same methods are used as in the original study, and *scientific replication*, which uses either (1) different data but the same method, (2) the same data but new methods, or (3) new data and new methods. A researcher's incentive to conduct a replication study depends on (1) the probability of detecting an error or fraud in previously published findings, (2) the impact of the article under scrutiny, (3) the cost of replication, and (4) the willingness of editors to publish replication studies. Whereas some 50 years ago, when data were saved on punch cards, the cost of replication consisted mainly of technical barriers, today copyright protection and data disclosure policies are the main determinants of replication cost.[27] Regarding point (4), the first journals specializing in replication studies have already been established, including *Experimental Results*, an OA journal by Cambridge University Press with a focus on Science, Technology and Medicine, and the *International Journal for Re-Views in Empirical Economics* by Springer Nature.

Over the last 15 years or so, a number of replication studies in several disciplines have revealed that the results of many original studies, even when published in highly ranked journals, could not be replicated, prompting many academics to speak of a "replication crisis."[28] The challenge is to improve the quality of empirical research by easier access to data so as to be able to correct wrongful results of empirical studies ex post and deter fraud or simply carelessness ex ante, without destroying the incentives to conduct the original study in the first place.

3.2 | Assessing the quality of academic scholars and their institutions

Another important question is whether digitization and the internet have facilitated the quality assessment of academics, of their scholarly and societal impact, and of their institutions. Currently, the quality assessment of academic researchers and of entire universities is largely based on JIFs, which were "originally designed to provide a metric for journals competing with each other" (European Commission, 2019, 52), being a measure of the average citations to all articles in a journal volume but not of the citations to the individual articles. In practice, a few articles are cited frequently, and many articles are not cited at all.[29] Moreover, an article may also attract many citations for being inadequate, and citations are easily manipulated (Anderson, 2018, 183–191). For example, some journals encourage the authors of submitted papers to cite related papers that were previously published in the same journal (*self-citations*). Others have extended this practice by coordinating the effort of several journals (*citation cartels*).[30] Overall, this focus on JIFs induces scholars and their universities to adapt their performance and the allocation of

resources to these output-oriented measures and leads to distortions with detrimental consequences for the quality of research (Osterloh & Frey, 2014). Quite in line with *Goodhart's Law*—"when a measure becomes a target, it ceases to be a good measure" (STM, 2018, 67)—scholars are induced to "hit the target but miss the point."

The deficiencies of the JIF as the primary measure to compare the scientific output of individual researchers and their institutions gave rise to several initiatives that aim to improve the evaluation of scientific output by the researchers' employers, by funding agencies, and by the scientists themselves.[31] The San Francisco Declaration on Research Assessment (*DORA*), developed by a group of editors and publishers of scholarly journals who met during the Annual Meeting of the American Society for Cell Biology in December 2012, has become a worldwide initiative covering all disciplines and has issued a number of recommendations regarding the following general themes[32]:

- "the need to eliminate the use of journal-based metrics, such as JIFs, in funding, appointment, and promotion considerations;
- the need to assess research on its own merits rather than on the basis of the journal in which the research is published; and
- the need to capitalize on the opportunities provided by online publication (such as relaxing unnecessary limits on the number of words, figures, and references in articles, and exploring new indicators of significance and impact)."

The *Leiden Manifesto on research metrics*, which originated from the Leiden International Conference on Science and Technology Indicators in September 2014, is likewise critical of the existing metrics to assess research output and instead formulates 10 principles to guide research evaluation in the future (Hicks et al., 2015).These discussions raise the question whether the new technologies (digitization and the internet) and business models (OA) of academic publishing enable superior methods to assess scholars and their institutions. Some authors see the future in OA publishing with a broader base of readers and open post-publication evaluation. For example, *Randy Schekman* of UC Berkeley, the 2013 Nobel laureate in biology, criticizes the focus on a small number of highly ranked luxury journals, arguing instead for a system where all articles that meet a journal's editorial criteria should be published and made freely available, financed by APCs or other revenues. This is essentially the strategy of mega-journals such as *PLOS One* (Schekman, 2013). From a similar perspective, James Heckman, who shared the 2000 Nobel Prize in Economics, and Siddarth Moktan (Heckman & Moktan, 2020) examined the relationship between placement of publications in the top five journals in economics and receipt of tenure in economics departments. They detect a "tyranny of the top five journals", which favors careerism over creativity. From the readers' perspective, the crucial question is how to find relevant high-quality articles at low search costs, especially in a situation where OA vastly expands the set of freely available articles to choose from. Discipline-specific journal rankings of course reduce search costs to some extent. However, the inadequacy of the JIF as a measure of article quality has been duly noted. Thus, an important challenge to academic publishing is to provide reliable signals on the quality of journal articles that are independent of the journal that published the article.

3.3 | Fast and targeted dissemination of research results

Digitization, the internet and alternative metrics for research evaluation also affect how research results are disseminated. Regarding *scholarly impact*, i.e., reception by other researchers, there is an ongoing discussion as to whether OA articles receive more or fewer citations than those with a paywall. Evidence to that effect is presented in the contributions by McCabe & Snyder and by Eger et al. to this special issue. Regarding *societal impact*, i.e., reception by the broader public, the classical, mainly citation-based bibliometrics is increasingly being complemented with *altmetrics*, which relies on tweets, likes, mentions, or downloads in the social media, online reference managers such as Zotero and Mendeley, scholarly blogs, and online repositories.[33]

3.4 | Promotion of OA and competition among publishers

In the gradual transition from traditional subscription journals to OA, the crucial question is how to manage the tightrope walk between two evils: On the one hand, high subscription fees may simply be replaced with high APCs.[34] Powerful journal publishers merely have to adapt their business model to continue exploiting the universities or research sponsors. On the other hand, low APCs may not suffice for publishers to cover their cost and to earn a reasonable profit, giving them no incentive to publish high-cost journals. The challenge is to establish sufficient competition to induce journal publishers to process articles of certified quality at minimal cost and disseminate them fast and cheaply to the interested public.

The level of competition depends not least on the economic and legal environment of OA publishing. If there were only pure OA journals, publishers would compete for good submissions. If all authors had to cover the APCs from their personal funds, the APCs would tend towards a level that enables the publishers to earn normal profits. However, in the real world, publishers of pure OA journals, hybrid OA journals and CA journals co-exist with OA repositories, and APCs may be subsidized by universities or research sponsors. Under these conditions, different regulatory strategies to foster OA will have specific effects on the level of APCs. Here are some examples: (1) If green OA is promoted via mandates or an inalienable right to secondary publication, as has been the case in Germany since January 2014, publishers of subscription journals find it difficult to increase their fees. This could also deter the publishers of OA journals from increasing their APCs. In any event, a discipline-specific embargo period must be set: If it is too short, it will undermine the publishers'

incentive to publish the journal in the first place; if it is too long, the effect on subscription fees will be minimal. A mandate for gold OA by research funders could even strengthen the bargaining position of the publishers of OA journals and thereby increase APCs.[35] (2) If excellent scholars support the establishment of new OA journals, this could foster competition among publishers of OA journals for good authors. Yet this strategy faces the problem that it takes many years to establish a good reputation and to attract excellent authors. Until then, the new journal will have little effect on the APCs/subscription fees of the incumbent journals. (3) Consortia of academic libraries can constitute a countervailing power to the big journal publishers, potentially restricting the level of APCs. One example is the DEAL project in Germany, which so far comprises two "transformational agreements" between a consortium of most academic libraries in Germany on the one hand and Wiley and Springer as big publishers of scholarly journals in all disciplines on the other hand. There is a controversial discussion whether such agreements impede competition on the journal market to the detriment of small publishers or indeed strengthen competition. In any event, such agreements seem to promote the transformation of traditional CA journals into hybrid OA journals.[36]

3.5 | Distributional consequences of OA

OA publishing may entail several distributional effects: First and foremost, the shift from "reader pays" to "author pays" can create obstacles for poorly funded researchers, for example, in developing countries. As we have seen, 18% of OA journals offer APC waivers for such researchers. Second, unilateral or country-specific steps to foster OA, such as the DEAL project mentioned above, may lead to the overrepresentation of researchers who enjoy support to the detriment of those who do not. Moreover, publishers may be reluctant to accept papers from researchers from countries that put author fees under specific pressure, e.g., by awarding authors an inalienable right of secondary publication. Third, mandatory gold and/or green OA may create distributional effects due to path dependencies that originate from discipline-specific incentives mechanisms, such as the reward structure in science or cultural features. Accordingly, especially for non-tenured researchers, mandatory gold OA may harm their careers in fields where OA cannot yet compete with well-established and esteemed CA journals.[37] An example for distortion effects due to cultural features may be the Ingelfinger rule, e.g., in the field of Biology. In this regard, a (forced) green OA publication may conflict with a publication of a work in a journal since the Ingelfinger rule prevents that a journal publishes works that have been published elsewhere.

In general, the transition to OA journals implies that authors or their sponsors pay for the ability of readers from all over the world to freely access the articles. This outcome may be undesirable whenever predominantly poor authors write for predominantly rich readers. Then, the global budget that is available to finance academic articles is allocated inefficiently, in which case the transition to OA may reduce the number of articles published. The problem is exacerbated when many of the readers are employed outside of academia.[38] Generally, however, we can assume that universities whose faculty publish many articles also account for a large share of the readership, in which case any redistribution between authors and readers (or their sponsors) as a consequence of the transition to OA should be limited.

4 | OUTLOOK

A number of technological, economic and legal developments since the second half of the 20th century have dramatically changed the academic publishing market and triggered discussions about the very future of academic publishing. Academic journals, which in most disciplines continue to be the most important medium of academic communication, are increasingly owned by commercial publishers, with the top five publishers currently selling more than 50% of all journals. Digitization and the advent of the internet have allowed these publishers to engage in "big deals" with academic libraries, selling bundles of licenses which entitle the libraries to access a wide range of journals at a fixed price per year. As a result, journal subscription prices and academic libraries' expenditure on academic journals have been dramatically increasing to the detriment of smaller publishers and expenditure on books ("serials crisis").

To cope with these problems, a number of national and international initiatives triggered the development towards OA, a new business model of academic publishing. Today, a rapidly growing number of pure and hybrid OA journals are no longer financed by subscription fees but instead by publication fees paid by the authors or their sponsors (gold road). Moreover, institutional and disciplinary OA repositories have been established (green road), and the traditional channels of academic communication have been supplemented with social media, blogs, etc. Another consequence of digitization and the internet has been the strongly facilitated collection and processing of data, boosting empirical research in many disciplines. The downside of this development is an increasing number of cases where the results of quantitative studies cannot be replicated ("replication crisis"). Solving this problem would require coping with copyright and data-protection issues and motivating academic authors to engage in replication studies.

The discussion continues as to how these developments affect the quality control of academic journal articles, the evaluation of scholars and their institutions, and the size and allocation of financial means for academic publishing. This special issue adds to the discussion a set of articles dealing with some of its central aspects, including the evaluation of scholars by scientometric indices (Ramello & Migheli), welfare effects of mandatory open access (Watt & Müller-Langer), the citation impact of OA (McCabe & Snyder; Eger, Mertens, & Scheufen), access to research data (Handke, Guibault, & Vallbé), "Plan S" to support OA in Europe (Armstrong), and the DEAL Project to support OA in Germany (Haucap, Moshgbar, & Schmal).

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ENDNOTES

[1] See, for example, Regazzi (2015, 22–26), Csiszar (2018, 23–37), Anderson (2018, 13–15).

[2] Regazzi (2015, 48–50) also includes textbooks.

[3] See McCabe (2002), Edlin and Rubinfeld (2004), Nicita and Ramello (2007), and Ramello (2010).

[4] Moed (2017, 194); STM (2018, 26).

[5] For a more general view on the impact of technological change on the development of copyright law, see Eger and Scheufen (2012) and Elkin-Koren and Salzberger (2013). See also Armstrong (2015).

[6] For some reasons, see Anderson (2018, 19–23, 231–34).

[7] For an overview, see Eger and Scheufen (2018, 6–9, 29–55).

[8] Harnad et al. (2004).

[9] APCs vary enormously across journals. Budzinski et al. (2020) found that market power is an important driver of APCs, through market concentration, publisher size and, in particular, the choice of hybrid publishing model. On market concentration among OA journals, see also Schwarz Rodrigues et al. (2020).

[10] While Björk (2017) estimated that the number of hybrid OA journals increased from approximately 2,000 in 2009 to nearly 10,000 in 2016 and the number of hybrid articles increased from 8,000 to 45,000 over the same period, Pinowar et al. (2018, table 3) found that among a sample of 100,000 articles published between 2009 and 2015 in hybrid journals and indexed in the Web of Science, only 4.3% were open access. See also STM (2018, 107f.).

[11] https://v2.sherpa.ac.uk/opendoar.

[12] Anderson (2018, 111f) and Eger and Scheufen (2018, 15).

[13] See https://www.doabooks.org.

[14] Note that the WoS database only lists journals with an impact factor, that is, ones that exceed a certain quality threshold.

[15] Since academic journals are not perfect substitutes but differ by their JIF, every journal actually constitutes a kind of mini-monopoly (Suber, 2012, 39; Armstrong, 2015, F 11). Thus, the market power of commercial academic publishers largely depends on their number of highly ranked journals, and not on their market shares in academic journals in general.

[16] The impact factor is the average number of times that the articles published by the journal over the past 2 years were cited in the reporting year.

[17] See the contributions by McCabe and Snyder and Eger at al. to this issue.

[18] See http://www.doaj.org [22 July, 2021].

[19] We follow the definition of the fields of research in DOAJ. To better understand the decisions of academic authors in various disciplines and countries regarding OA publication, Eger and Scheufen (2018) conducted a survey covering more than 10,000 scholars from all disciplines and from 25 countries. For a more detailed survey of authors from Germany or some Mediterranean countries, see Eger et al. (2015, 2016).

[20] If a (multidisciplinary) journal is associated with more than one research field, we assign an equal share of 1 to each field concerned. The resulting totals per journal are rounded.

[21] Due to missing information, our sample is reduced to 15,280 OA journals listed in DOAJ.

[22] EU Commission (2019, 24); STM (2018, 14); Regazzi (2015, 37–39).

[23] On the latter point, see the interesting book by Oreskes and Convay (2010).

[24] For a discussion, see McCabe and Snyder (2005).

[25] See also Eger and Scheufen (2018, 102–106, 109–112) and the contribution by Eger et al. to this special issue.

[26] For the following, see Mueller-Langer et al. (2019, 64–65).

[27] See also the contribution by Handke et al. to this issue.

[28] See, e.g., Anderson (2018, 70–72) and Ritchie (2020, 25–43). For an overview of replication problems in economics, see Mueller-Langer et al. (2019, 63).

[29] See also the empirical contributions by Ramello and Migheli and by Eger et al. to this special issue.

[30] "Thomson Reuter (TR) has attempted to tackle this issue by deploying an algorithm that flags pairs of journals in which at least one of the two journals cites the other at an excessively high rate… As of 2019, TR has suspended from its annual journal ranking 46 pairs of journals—featuring 55 journals in total—due to excessive pairwise citations" (Kojaku et al., 2021, 1). Kojaku et al. (2021) propose an alternative algorithm that avoids the problem of false positives by distinguishing between healthy and malicious citation behavior.

[31] In May 2021, Clarivate announced a new metric for comparing the relative citation performance of journals across different disciplines, the so-called *Journal Citation Indicator*. See https://clarivate.com/wp-content/uploads/dlm_uploads/2021/05/Journal-Citation-Indicator-discussion-paper.pdf.

[32] file:///C:/Users/thoma/Documents/Academic%20Publishing/Einleitung/Read%20the%20Declaration%20DORA.html.

[33] See Priem et al. (2010) and Moed (2017, chapters 11 and 17).

[34] On the drivers of APCs, see, e.g., Budzinski et al. (2020).

[35] Plan S, an agreement between originally 11 and now 18 national research funders, requires the recipients of funds to publish their results OA. For more details, see the contribution by Armstrong to this special issue.

[36] See also the contribution by Haucap et al. to this special issue. Similar examples exist in other parts of the world. Recently, the UC Berkeley concluded a deal with Elsevier; see https://news.berkeley.edu/2021/

03/16/ucs-deal-with-elsevier-what-it-took-what-it-means-why-it-matters/. For transformative agreements in the United Kingdom, see www.researchinformation.info/feature/transformational-oa-agreements-help-or-hindrance.

[37] On the effects of OA versus CA in the publishing game, see Fees and Scheufen (2016).

[38] This particular problem likely applies to academic books more than to journals. We therefore expect that any negative effects of open access on authors' and publishers' incentives to write and publish will concern books.

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