Position paper: Digitization and the scholarly publishing market in the context of EU competition policy

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1. Introduction

Scholarly (or academic) publishing is a global market whose core products are journals and books, provided in print and digital forms. Scholarly journals, in particular, are the principal mode through which scientists communicate their discoveries and advancements to each other, to research and innovation (R&I)-based industries, and to citizens. **Scholarly publishing is therefore the essential pipeline that fuels the science-based societies and economies of Europe.** Globally around 2.5 million scholarly articles are published annually by ~35,000 journals.[1]

Frontiers is an award-winning Open Science platform on a mission to make research results openly available to the world, thereby accelerating scientific and technical innovation, social progress and economic growth.

Frontiers welcomes the DG Competition call for contributions on '*Shaping competition policy in the era of digitisation*', initiated by Commissioner Vestager. Frontiers offers this Position Paper to help explain: how the non-open-access, subscription publishing model which currently dominates scholarly publishing is using its position to slow down the adoption of open-access publishing; how business models that provide full and immediate open access (OA) to high-quality scientific articles and data are better for research and innovation (R&I) and economic growth and are also more competitive and transparent; and hence how competition policy could support existing policy initiatives to improve competition in scholarly publishing to the benefit of Europe.

2. Current subscription-based business models are withholding taxpayer-funded research results from full dissemination

Subscription-based models prevent harnessing the full benefits of digitization

Digitization has disrupted many industries and improved competition, but its full natural consequences and benefits have not yet reached scholarly publishing – an ironic situation considering that the internet was conceived as a channel to disseminate scientific information.

The dominant infrastructure for the registration, validation and dissemination of scientific knowledge remains an artificially restricted subscription-based system in which universities pay subscriptions to scholarly publishers to access their scientific journals. This business model, a legacy of the print-based era, imposes "paywalls" that perpetuate the limitations of hard copy dissemination and copyright control into the digital domain – limiting digital access to those who can afford subscription fees. At present, around 80% of all scientific articles are access-protected behind paywalls, and subscription models account for around 95% of the global $10.6 billion revenue from scholarly journals.[2]

This closed, **subscription-based system is a bad deal for society on many levels**:

- It restricts access to the results of publicly-funded research, a public good, to only a small number of academics working at those institutions that can pay for access via journal subscription, to the detriment of all others, including poorer institutions, start-ups and citizen scientists – thereby largely **eliminating the possibility for a level playing field** in the dissemination of scientific knowledge.

- By limiting knowledge dissemination, **it hampers technological innovation**. It therefore offers **European taxpayers very poor value for money**, by curtailing the substantial return on investment that publicly-funded research should yield through innovation.[3]

- It impedes powerful, digitally-enabled research methods such as text and data mining (TDM: the automated computational analysis of content), which have the potential to transform scholarly research by allowing researchers to exploit the vast and exponentially growing datasets that exist internationally.

- It underpins a universally criticized researcher evaluation system – for both researchers and their institutions – that is based on the prestige of the journal in which an article is published, rather than the impact of specific articles and authors.

- Its commercial model limits the range of services that libraries can provide to scholars by locking libraries into a limited number of "Big deal" subscription packages (that bundle high and low value journals) that tie up substantial portions of library budgets for multi-year periods to the frustration of librarians and limit the funds available for paying for open-access publication.

Subscription-based models are bad for pricing and competition

In addition to these detrimental effects, the subscription-based model is also problematic for competition within the scholarly publishing market.

This system does entail some degree of competition. Authors are free to choose to submit their manuscripts to any of hundreds of journals and to read these, if they are subscribed. University libraries (the main purchasers of subscriptions) can negotiate "Big Deal" contracts agreements that can – for that institution – broaden access and reduce unit costs of accessing journals or articles compared with regular subscriptions.

However, overall the subscription-dominated market is reportedly characterized by **low levels of competition**[4] and high **market concentration**.[5] According to the economist Bo-Christer Björk, the sector shows a relative **lack of competitive pressure** owing to weak rivalry between major (subscription-based) publishers, **weak bargaining power** of suppliers (i.e. scholars acting as authors, reviewers and editors) and subscription buyers, and **high barriers to entry** (i.e. low threats from new market entrants and substitutions).[4]

Although major subscription-based publishers have invested in digital publishing infrastructures and tools,[6] this has not improved competition, lowered prices or widened access to scientific results overall. Rather, upon the transition to internet-based systems, these publishers have **used technological, contractual and commercial tactics** (see Table below) **to limit the diffusion of scientific knowledge while increasing their market dominance and**

retaining high levels of profitability – twin phenomena tending to indicate that competition in a given market is not working properly.

In 2006 a report commissioned by the European Commission DG-Research detailed the competitiveness problems in the scholarly publishing industry and made recommendations, including measures aiming 'at a level playing field in terms of business models for publishing'.[7] This report identified **pricing policies, especially the 'lock-in' effect of 'Big deals', as the key market access problem** and issued recommendations (not implemented) to lessen their negative effects on market entry and competition.

Indeed, these "Big Deal" contracts can amount to **exclusivity or quasi-exclusivity deals.** They appear to have the intention, and certainly have the effect, of capturing the whole or almost the whole of library budgets and thereby foreclosing market entry or development by new entrants and other business models. According to a recent survey, most major Big Deal contracts extend over 3 years or more.[8] These deals also **lack transparency as they are typically subject to non-disclosure agreements**. According to a 2017 report published by OPENAIRE 2020 on behalf of the European Commission, the lack of transparency in the subscription market 'results in a dysfunctional market which serves neither researchers, institutions nor the public interest effectively'.[9]

3. Open-access publishing business models work

Open access fully leverages digitization

If the benefits of digitization were fully applied in scholarly publishing:

- Every published article would be immediately and fully accessible free of charge to all interested parties, from professional colleagues to citizen scientists and industrial innovators. Every actor in science and R&I would (subject to patent rights for non-academic use) be free to use, reuse and forward the work to colleagues through any channel without fear of infringing legal rights.

- Every published article would be database-compatible and would enter a corpus of work in which all articles and data were prepared according to a standard structured format that allows TDM to fully benefit R&I.

- Every article would be full-text indexed for optimal discovery and access via Google and other search engines.

- The chain of accountability and quality guarantees of the publication's peer-review validation and production would be certified in a transparent manner.

A new generation of high-quality digital OA publishers, operating with a business model different to that of traditional publishers, has demonstrated that these natural benefits of digitization are easily within our reach. **As a group these publishers (including Frontiers) have been at the vanguard of innovation, fully leveraging the benefits of the digitization revolution to deliver high-quality OA publishing services at scale, to facilitate data sharing and TDM, and to measure the impact of scholarly publishing through novel – and more relevant – metrics.**

According to the predominant OA business model, the publisher or platform charges an article processing charge (APC) for the immediate OA publication of a final peer-reviewed article published on the journal or platform website. The OA article (and, increasingly, its data) is then available free-of-charge for anyone to read, copy, share and reuse for scholarly purposes. The guiding principle is that OA publications should be FAIR – i.e. findable, accessible, interoperable and reusable, as is explicitly declared in the founding document of the OA movement, the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.[10] In most cases, APCs are paid by the research funder or the researcher's institution. OA publishers who employ the APC business model typically offer a range of waivers and fee reductions that ensure that scholars with limited economic means are able publish their accepted articles. Many OA publishers, including Frontiers, publish their APC policy and rates for complete transparency.

OA journals now rival subscription-based journals in terms of their quality and scholarly impact. Indeed, in many cases, OA journals now outperform many traditional journals in terms of citation rates, the most common metric for journal benchmarking. For example, according to recent data from SCImago, Frontiers – a fully OA publisher – is currently the fourth-most cited publisher of the world's 20 largest STM publishers, and *the* most cited multidisciplinary publisher within this cohort, based on the average number of citations received by the articles in its platform between 2015 and 2017.[11] Also within the top-10 most-cited publishers in this group are PLOS (number 6) and MDPI (number 8), underlining the breadth of quality and impact in OA publishing. Further data from the analysts, Deltathink, show that an increasing number of fully OA journals are attaining higher impact factors at faster rates than their subscription-based and hybrid counterparts.[12]

These data clearly demonstrate that OA models can protect, and even enhance, the quality and integrity of the scholarly publishing process while exploiting the full potential of digitization.

Open access benefits competition

In addition to its benefits on scientific knowledge dissemination, a fully OA market will help improve competition within digital scholarly publishing.[4,9,13] This is because **the APC OA model is more transparent, more price sensitive and more innovative towards improved efficiency and competition** than the subscription-based model (see Table below).

As the UK expert body and digital services provider, Jisc, has acknowledged, 'the success of diverse new publishers in the OA market is evidence that this market features high levels of innovation, new technologies and business models that enable new entrants to operate at scale and to compete with incumbents.[13] This is evidenced by the collective scholarly publishing market shares of PLOS (7%), MDPI (5%), Hindawi (5%) and Frontiers (4%) – all of which have been in existence for less than 25 years.[2] **Pure OA publishers have captured approximately 15% of the market by volume, at a revenue share of only 5%,[2] an indication of the superior value of these high-quality digital-based services.**

Some subscription-based publishers have responded to the OA movement by publishing some fully OA journals or by offering 'hybrid' OA journals. Hybrid journals are subscription journals that offer authors the option to make their articles OA upon payment of an APC. APCs in hybrid journals are generally higher than APCs charged by fully OA journals published by subscription-based publishers, which are in turn higher than APCs charged by purely OA publishers such as Frontiers,[14,15] presumably to seek to maintain revenue as close as possible as that of the subscription model.

Moreover, while the **APCs of full OA journals are influenced by the impact of the journal, hybrid journal APCs bear little relationship to journal impact**.[16] The hybrid APC model is widely considered to be likely to reinforce the existing subscription-dominated market[9,14] and is not supported by the European Commission or the recently formed cOAlition S, comprising 11 European research funders including the European Research Council (see below).

The competition frameworks of the subscription and OA (APC) publishing business models are contrasted in the following table:

Parameter	Subscription electronic	Open-access electronic
Legal context	**Closed and restricted** Authors required to surrender intellectual property rights of their article and data, limiting access, re-use, sharing and TDM. Copyright restriction not only offers a competitive advantage to large portfolio publishers[7] but also hinders full exploitation of scientific data and knowledge. Traditional publishers thus retain full control over their copyrighted content.	**Licensed for optimal digital reuse** Authors retain copyright and allow publication (typically) via a Creative Commons CY-BY license that allows open access, reuse, sharing and TDM, thereby promoting innovation. (Note: Frontiers and other OA stakeholders previously called for European legislators to support the rights provisions of a copyright exception for TDM that is: mandatory and that cannot be overridden contractually, valid for any commercial or non-commercial scientific research purposes; and valid for all those with lawful access (including both public interest research organizations and businesses).[17]
Technical context	**Technical measures to protect the subscription business model** Paywalls prevent access to all but those with access rights at paying institutions. Non-subscribers pay in the order of $35 per article. Implementation of TDM technologies inhibited.	**Content is immediately reusable and interoperable** Technology enables full OA and interoperability (according to the FAIR principles) to facilitate data sharing and reuse, including for TDM of very large collections of articles. Technical innovation to support this, to deliver high-quality OA publication at scale, and to measure and publish the impact of scholarly publishing (transparency thus aiding competition) has been led by digital-born OA scholarly publishers, such as Frontiers.
Commercial context	**Libraries locked in to commercially inflexible Big Deal packages (bundling)** Strategic 'big deal' contracts tie the purchase of high-demand journals to low-demand journals that a library might not otherwise buy, if given a real choice. These widen reader access and may reduce unit costs within subscriber institutions, but exert a lock-in or foreclosure effect, with limited flexibility or control. They typically run over multiple years, include annual price increases,[8] and reduce libraries' spend on other offerings in the market – thereby effectively impeding market entry or penetration by others, including OA.	**APCs provide a granular marketplace for editorial services** APCs are transparent, as shown by regular public reporting of APC expenditure at institutional (e.g. via OpenAPC) and national levels (e.g. Jisc). Many OA publishers, including Frontiers, publish their APC policy and rates for complete transparency. There is potential for fully transparent publisher-payer agreements, such as Frontiers' landmark national agreements with Austrian Research Performing and Research Funding Institutions (in full here) and the National Library of Sweden. These offer full digital services with discounted APCs; centralized, simplified APC invoicing; and comprehensive monthly and annual

	"Big deals" are usually covered by **non-disclosure agreements**. The resulting **lack of transparency** masks the extent of price increases, prevents benchmarking and collaborative action by buyers, and **hinders price competition** by other providers.	reporting on expenditures and research outputs. There is no bundling and no volume requirement in Frontiers' national agreements.
Market feedback / price sensitivity	**Librarians pay but scholars decide** Journal subscriptions are usually paid by university libraries, not journal users (i.e. scholars). The demand-supply relationship is therefore inelastic: user demand is unaffected by rises or falls in subscription pricing. Subscription publishers tend not to compete on price, since almost all universities are forced to buy from all of them.[4] Subscription prices have increased at above-inflation rates for many years.	**Full price transparency to authors and institutions** APCs better connect publishing activities and cost. Authors can see APCs and judge value for the cost of services. The APC market shows price and quality/impact sensitivity[14,16,18] and competition in this part of the market functions effectively[9]
Price and cost	**Technology has not slowed price increases** Investments in digital publishing infrastructures and tools have not improved competition, lowered prices or widened access overall.	**APCs already operate at one-third cost per article** The APC-based model brings substantial savings versus the subscription model.[19]

Abbreviations: APC, article processing charge; FAIR, findable, accessible, interoperable, reusable; IP, intellectual property; TDM, text and data mining.

4. Recent developments in scholarly publishing

In 2016, European Union Member States sitting in the Competitiveness Council committed to a target **for full and immediate OA for scientific peer-reviewed publications to be the default by 2020** based on its potential to increase the quality, impact and benefits of science and ultimately contribute to growth and competitiveness of Europe.[20]

The European Commission DG Research & Innovation has declared **Open Science the 'modus operandi'** of the proposed Horizon Europe R&I program.[21] Furthermore, the coalition of 11 EU research funders, including the European Research Council (cOAlition S), has also recently mandated that from 1 January 2020 grantees must publish in compliant OA journals or platforms providing full and immediate OA.[22] Hybrid APCs will not be eligible for reimbursement under the proposed EC Horizon Europe framework program,[21] while cOAlition S funders have called for the hybrid system to be 'terminated', along with the subscription-based model.[22]

Despite the policy initiatives by the European Commission to date, the transition to OA is very slow. At present, only 20% of newly published articles are OA, and at this pace of change the EC target of full and immediate OA is very unlikely to be reached by 2020. The coOAlition S announcement is an important step in the right direction. **However, broader, concerted and holistic policy efforts are likely to be needed. Competition policy is as important for this as R&I policy.**

5. The way forward

An optimized scholarly publishing market is vital to the science-based economies of Europe. Europe will not benefit fully either from the results of scientific research, or from digitization, while most scientific articles are access-protected behind paywalls as at present. **It is an appropriate moment, therefore, to consider whether competition is working optimally in these markets.**

OA publishing models are less costly overall to payers than subscription models, yet they leverage the benefits of digitization better and can offer equal or superior quality. Given these benefits, the slowness of the transition to OA models may indicate a **market in which competition is not working as it should**, in particular owing to subscription Big Deals.

Competition policy should ensure that there is a level playing field to allow different business models to compete on their respective merits and for the market to decide between them. In scholarly publishing, the process of levelling the playing field should be guided by two main principles:

- Ensuring that transparent information is available to customers and
- Allowing customers a genuinely free choice between publishers and publishing models, for instance by prohibiting deals which tie up a significant portion of an institution's relevant budget.

A level playing field would encourage the adoption of innovative models to reduce the cost of publishing while maintaining or improving quality and impact. The establishment of a market in which competition can be truly effective would also provide a significant boost to efforts to fully harness the digital dissemination of research and knowledge.

Current policy initiatives, including those by DG Research and Innovation, to aid the transition toward the agreed target of full and immediate OA will help improve competition by allowing all publishers and platform providers to compete openly on this digitally enabled, level and transparent playing field. We suggest that competition policies that better enable market forces to apply (and thus allowing researchers a real choice as to where to submit their research papers) could be helpful to reinforce these existing policy initiatives.

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