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Article

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European scholarly journals from small- and mid-size publishers: mapping journals and public funding mechanisms

Mikael Laakso [1,*] **and Anna-Maija Multas** [2]

[1]Information Systems Science, Hanken School of Economics, Arkadiankatu 22, Helsinki 00100, Finland and [2]Information Studies, Faculty of Humanities, University of Oulu, P. O. Box 1000, Oulu 90014, Finland

*Corresponding author. E-mail: mikael.laakso@hanken.fi

Abstract

This study investigates the relationship between scholarly journal publishing and public funding, specifically concerning the context of small- and mid-sized journal publishers in European countries. As part of the movement towards open science, an increasing number of journals globally are free to both read and publish in, which increases the need for journals to seek other resources instead of subscription income. The study includes two separate components, collecting data separately for each European country (including transcontinental states): (1) the volume and key bibliometric characteristics of small- and mid-sized journal publishers and (2) information about country-level public funding mechanisms for scholarly journals. The study found that there are 16,387 journals from small- and mid-sized publishers being published in European countries, of which 36 per cent are already publishing open access. There is a large diversity in how countries reserve and distribute funds to journals, ranging from continuous inclusive subsidies to competitive grant funding or nothing at all.

Key words: journals; funding; national; science policy.

1. Introduction

The scholarly journal publishing sector has faced three intertwined and impactful changes during the last three decades. The first one of these is proliferation of digitisation and digital content delivery, which in the beginning posed challenges as individual journals and smaller publishers were not able to invest in and fully exploit it. The second change is related to the pattern of large publishers becoming even larger by acquiring smaller publishers and individual titles into their portfolios (Larivière et al. 2015). Publisher oligopolisation together with digitisation fuelled the 'big-deal' business model. The third change is the growth of open access (OA) that has disrupted the sector in many ways as access can be provided through journals directly as well as authors indirectly. In the late 1980s and the early 1990s, OA started to gain momentum as a largely community-driven bottom-up movement but has since been shaped strongly by commercial interests and science policy (Moore 2020; Schöpfel 2015).

When compared with paywalled subscription-based access, OA fundamentally changes the operating circumstances for journals as subscription income significantly decreases or disappears and journals are required to acquire other forms of funding or support to continue their activities. The largest international publishers have adjusted their offerings and business models to accommodate the growing demand for OA. This has often been done by introducing, e.g., transformative agreements in which case the customer institutions buy pre-paid quotas for affiliated authors to publish OA in the publishers' journals (ESAC-initiative.org 2021). Overall, OA has not posed an immediate financial threat to large publishers who, on the contrary, have been able to monetise the science policy pressure placed on its growth. For small and mid-sized publishers, which act outside the realm of institutional agreements with substantial leverage in contract negotiations, operational circumstances can appear very different.

Regardless of the publication model, scholarly journals need resources to run and persist. Such resources can come from many different directions and in many different forms (e.g. monetary, volunteer work, and shared infrastructures). However, without sufficient resources, a scholarly journal cannot continue to exist in the long run. Insufficiently resourced journals can also pose a risk to the integrity of the scholarly record if technical precautions for preservation are not adequately taken care of (Laakso et al. 2021). Based on the size of the primary audience, the potential for gathering resources is higher for English language, internationally-oriented journals than non-English journals that have a narrower geographical focus. It is here where journals' national-level funding instruments often offer the key resources to support non-profit publication outlets, which could otherwise fail to survive. The existence of financial support for journals brings with it the need to deliberate on both how such instruments should be designed and how such mechanisms should evolve over time as the scholarly journal and scholarly communication landscape changes.

While a purely commercial market shapes itself through market forces, involvement of public funds necessitates that decisions are also influenced by other factors. National-level funding for journals, their existence and making potential adjustments to them, is within the domain of science policy and as such cannot be purely driven by a simplistic economic analysis. This analysis has to include more than just the end-customer perspective (e.g. university library), such as other stakeholders that benefit from the journal's existence and output and an overall notion of public value and impact, which is challenging to quantify (Brewer 2013; Lauronen 2020).

Freedom and autonomy are widely held values in academic research, such as in selecting which topics to be researched and considering how findings related to them should be communicated. However, at the same time, in many countries, the funding originating from public sources is an essential component of funding academic research and institutions. It is also often the underlying funding source for national-level financial support for journals. Depending on the design of the funding instrument and distribution mechanism, government involvement in shaping which outlets are eligible for funding can be very direct. This, in the long run, could be something that is detrimental to freedom and autonomy of research. There are examples where countries have deliberately cut down on journal funding to reduce the number of active journals in the country (Tatalovic 2012). An intimate connection to government steering can also be fatal to the journal's existence. This may happen in the case of political agendas like in the extreme example of Hungary banning gender studies in its universities and restructuring the country's government funding on the university sector (CNN 2018).

According to previous research, it is known that European scholarly societies are often involved in publishing their own journal (Delicado et al. 2014; Hewitt et al. 2017; Late et al. 2020). The financial relationship between a scholarly society and a journal can vary a lot: for some societies, the journal is profitable and also covers society expenses outside the journal production activities, whereas some of the society journals require external financial assistance to break even. In both extremes, the move towards OA poses challenges in different nature. For example, in Finland, there has been a long tradition of public funding for scholarly journals that can be applied by journals to contribute towards their income (in cases of a deficit). Commonly, it has been sufficient for journals wishing to complement their subscription income, but when the viability of subscription income vanishes, in times of OA publishing, new funding mechanisms have been explored. A proposed consortia-based funding model has had difficulty in gaining sufficient support from all key stakeholder groups (Ilva 2018). The key question is how to manage such funding instruments both during transition to OA publishing and in the long term when the publishing model is universal. The lack of subscription income usually means that more money has to come in from somewhere else. In Finland, where both OA policy and practice are already relatively advanced, a new funding mechanism based on the circumstances of OA publishing has been worked on and discussed at least since 2015, however, so far without tangible progress in reaching a consensus over cost distribution among involved stakeholder groups (Ilva 2018). It is partly due to this drawn-out process that sparked the question of 'how have other countries approached this issue?' To our surprise, there was very little collected information about this, with no major studies or reports on the topic, so we decided to conduct our own investigation.

The following research questions were formulated to guide the study:

(1) What is the number of peer-reviewed scholarly journals in each European state?
   (a) What shares of these journals are published by small- or mid-sized publishers?
   (b) What shares of these journals are published OA? What shares of OA journals utilise article processing charges (APCs) for funding?
   (c) How dominant is English among European journals? To what degree are journals non-English or multilingual?
(2) Do European states support publication of peer-reviewed scholarly journals with public funding, if so, how?
   (a) What types of organisations are involved in distributing journal funding?
   (b) Are there specific criteria for journals to be eligible for funding?
   (c) Do this funding and technical support take into account circumstances related to OA publishing?
   (d) To what degree are technical platforms for publishing made available for journals?

This study is limited to the domain of scholarly journals. While there are other types of key scholarly publications, e.g. books and conference proceedings, their funding circumstances are so different that they need dedicated inquiries for a proper investigation.

2. Background

Europe has been among the most progressive areas when it comes to policies, practices, and facilitation of OA publishing, as well as funding the journals' operations directly or by OA publishing agreements with major publishers. This section reviews the most relevant literature in order to contextualise the current state of OA journal publishing in Europe. The focus is placed on OA-related science policy, journal funding, and bibliometric information characterising the structure of the sector. It is warranted to mention that Europe is still a heterogeneous area when it comes to these issues and hence the need for this research endeavour in the first place. National-level ministries, scholarly societies, and research funders shape the circumstances for open science and OA (Brysbaert 2021). This creates divergences in how different countries have advanced in terms of such practices since the national conditions vary significantly.

Many studies and reports focus on the funding and pricing of individual OA journal articles from the perspective of higher education institutions, libraries, or research funders (see, e.g., Bruns et al. 2020b; Jahn and Tullney 2016; Kirkman 2018), but there are less that concern the national systemic level funding for journals active in a country. This lack of information was the main motivator for this study as there are not a lot of cohesive overviews on the sector at large, but there are indications that this question is becoming relevant as journals transition towards OA publishing. How funding is

currently distributed in the OA journal market internationally is a topic that we know currently fairly little about (Ficarra and Johnson 2021).

2.1 European OA–related science policy

In Europe, there has been a strong push towards OA through science policy for over a decade, largely facilitated by the European Union (EU) (Bjornsson et al. 2020; European Commission 2012). The Budapest Open Access Initiative, which celebrated its 20th anniversary in 2022, was signed in Europe (BOAI 2002). The EU's 7th Framework Programme Horizon 2020 has a very progressive OA publishing policy (European Commission 2017), and the OA2020 Initiative is started and coordinated from Europe (Schimmer 2016). This is also the case with the research funder cOAlition S (Schiltz 2018). According to a recent survey by the European Universities Association, over 89 per cent of the institutions reported high or very high importance of OA to publications, with 64 per cent reporting high or very high implementation as well (Morais et al. 2021). According to research on the impact of OA policies on OA practices of institutions, in 2017, Europe had an OA presence largely driven by green OA, i.e. self-archiving of article manuscripts (Huang et al. 2020). Since then, there have been many read-and-publish deals made with European national consortia, which have likely changed this picture by introducing more hybrid OA, i.e. individual articles in subscription-based journals made OA through payment. Overall, open science policy development and implementation in Europe have been intensive. As a reaction to this, some recent research has found indications of researchers experiencing alienation as the policies are seen to be in dissonance with the realities of doing efficient merit-acquiring research in the present (Lilja 2020). Reaching a balanced mix between top-down policies and bottom-up practices is something that concerns the funding of scholarly journals as the heavy-handed steering will likely lead to backlash from editors at journals.

2.2 OA journals in Europe

The geographical existence of a journal can and has been operationalised in many different ways in previous studies. The country of the journal's publisher is just one dimension to perceive this aspect. One could consider reviewing journal scope statements manually, publication languages, author or editorial board affiliation countries, or the share of journals published in a country that are included in national and international indexing services. Analysis could also be performed according to the citation level investigating both incoming and outgoing citations to papers of a certain journal. However, in this literature overview, we have based the journals' nationalities according to the country of the publisher.

There are a few characteristics that distinguish journal publishing in Europe from many other regions of the world. One key factor is related to the composition: Europe contains many small countries that many have their own national languages, something that introduces its own circumstances to the publication collaboration between countries and when targeting different audiences. In Europe, there are many multilingual and non-English journals, and for example, in the Nordic countries, it is quite common to have journals that accept materials in all Scandinavian languages (Laakso 2021). Another factor is the prevalence of performance-based research funding that the majority of EU member states implement in order to distribute public funds to higher education institutions (Zacharewicz et al. 2019). This can be argued to place pressure on the institutional and, by extension, individual level to perform well when it comes to publication output–related indicators. Public funds might, as part of such models, both subsidise journals in the country and fund institutions based on the quantity of published articles in these journals. A third factor is the growing presence of publicly-funded journal portals in Europe that provide a common infrastructure to support national OA journal publishing (Björk 2017). These types of services blur the line between journal funding and other types of journal support since journals can often enrol to these portals at low cost or free or charge and then get the entire technical infrastructure taken care of as a service. Open science infrastructures are still an emerging area in practice and research. Concerns are often raised about the stabilisation of funding for non-commercial services (Fecher et al. 2021). However, journal portals are some of the earliest and most successful examples of the centralised technical services providing so many benefits for involved stakeholders that their future operation does not seem threatened.

Based on a study of all 15,128 journals included in the Directory of Open Access Journals (DOAJ) at the end of 2020, over two-thirds (69 per cent) of the listed journals were free for authors to publish in. However, most of the ~1 million articles that these journals publish in total are published in journals that ask authors for a fee (65 per cent) (Crawford 2021). This suggests that journals that are free for authors, sometimes referred to as Diamond OA journals, have, on average, a smaller publication volume than journals with author fees. There is also a stark division between free and fee-based journals since 72 per cent of the journals requesting authors for a fee are asking it in excess of 1,400 USD. Crawford (2021) also provides a geographical analysis of journals based on the country of publication. In addition to individual country-level data, the European countries are also aggregated into Western European (4,211 journals) and Eastern European countries (2,677 journals), which together account for 46 per cent of all OA journals included in the DOAJ at the end of 2020.

2.3 Funding mechanisms of OA journals

Recently, a large investigation of Diamond OA journals placed a central focus on the aspects related to funding and journal resources (Bosman et al. 2021). The authors found that not all Diamond OA journals were listed in the DOAJ. Therefore, they requested that the journals respond to an extensive survey in order to obtain insight into their operations. This survey generated responses from 1,619 journals. Some of the most relevant findings concerning the current study indicate that 22 per cent of responding journals are being funded by national or government funding agencies and 5 per cent by research funding organisations. In total, 72 per cent of the journals had no intention of moving away from the Diamond OA model. Moreover, journals with the strongest concern for their financial security in the next 3 years were the university press journals followed by the journals owned by individuals or scholarly societies. The study calls out for more stable funding mechanisms for such journals in particular.

The issue on how journals that are reliant on subscription income should transition to OA publishing is a topic that has

been a central topic of discussion and research for a long time and lacks a simple answer (Laakso et al. 2016). Recently, a project focused on identifying alternative ways in which society journals can sustain themselves while enabling OA to their content. The study found that this can happen mainly through generating more income through alternative ways such as subscriptions or cutting costs (Wise and Estelle 2019). In the case of the twenty-seven mechanisms identified by Wise and Estelle (2019), most models of substantial aid and with suitability to smaller actors would require more coordination in organising publishing platforms. Brysbaert (2021) suggests practical solutions for the learned societies to cut costs. For example, societies could operate their OA journals at low cost by opting for an inexpensive submission portal and consider doing all editorial work in-house rather than using external aid. It is not unheard of that journals switch back to being subscription-based after publishing OA for a while (Matthias et al. 2019). This is something that could in many cases be prevented by providing more predictable and stable funding for journals.

While OA monograph publishing is outside of the scope of this study, it is worthwhile to point out that there have been notable studies within this domain that have focused specifically on European countries and have featured funding instruments as a prominent aspect of their investigation. Ferwerda et al. (2017) mapped the OA monograph landscape from the perspectives of policies, funding, and publishing, including eight European countries in its scope. Through desk research, a web survey, and interviews, the authors found that policies and funding practices for OA monographs are very uneven and often in the very early stages of development. Another Europe-focused study by Morka and Gatti (2021) included fourteen countries and examined the role of academic libraries in the context of OA books with in-depth desk research and workshop interviews. The study found that only a handful of countries had any form of national or institutional funding instruments for supporting publication of OA books.

3. Methods

3.1 Bibliometric data

A fundamental aspect of scholarly journals is the constantly changing environment, which challenges the observation of the landscape. For example, when collecting data, one only obtains the status of any described journals at exactly that point in time, based on the inclusion/exclusion criteria used to identify the journals to observe. New journals get started, existing ones merge or are discontinued, and publishers change and transition back and forth between publication models. No journal indexing service is exhaustive, but some of the widely-used ones have been found to skew the global representation in different ways, which is important to be aware of when designing bibliometric studies (Mongeon and Paul-Hus 2016). In order to establish the current landscape of the scholarly journals in European states, a bibliometric data collection and analysis were conducted. Ulrichsweb Global Serials Directory, an inclusive indexing source of published materials, was used to identify active journals. Between 23 August and 3 September 2021, we performed queries to the directory with the criteria of 'Status: Active, Serial type: Journal, Content type: Academic Scholarly, Key feature: Refereed/Peer-reviewed'. Each of the fifty-one sovereign states in Europe, including transcontinental states partly in Europe, were queried individually. When querying journals by country, Ulrichsweb uses the country information registered for the publisher of the journal, with each journal having one publisher and one country associated with it. The publishing organisation can be almost anything, with common examples being universities, commercial companies, or scholarly societies. In the scholarly publishing sector, there are large international organisations whose activities span country borders, which can lead to information concerning publisher country not being representative of the actual main country where the journal is active. While this mostly concerns journals by large publishers, which are not the main focus of this study, this facet is important to keep in mind when interpreting country-specific results.

A total of 26,577 journals were identified. Some states did not have any eligible publication outlets, so, in total, journal records for forty-seven states were obtained. In addition to the International Standard Serial Number/Electronic International Standard Serial Number (ISSN/E-ISSN), publisher name, and journal title, information concerning publication languages was also extracted from Ulrichsweb. The focus was placed on languages with which the journals publish full-text content. Although Ulrichsweb is the most comprehensive international bibliometric database of peer-reviewed journals, it is not universally complete as there are journals that are not indexed in the service. Ulrichsweb does not contain any information about the article output volume of the journals. These can vary substantially between journals, which means that the analysis is limited to the journal and publisher level of the landscape. If one would want to utilise a data source that would include article counts comprehensively (e.g. Scopus and Web of Science), the trade-off is a considerably more limited set of journals as such databases focus primarily on international publication venues and omit a large part of journals targeted at national audiences (Mongeon and Paul-Hus 2016; Sanz-Casado et al. 2021).

To identify which journals were published OA, the journal records extracted from Ulrichsweb were cross-matched with journal records contained in the ISSN Gold v4 dataset. ISSN Gold is an openly available aggregate dataset composed of OA status information from multiple bibliometric sources on the web (Bruns et al. 2020a). The journal information from Ulrichsweb was cross-matched with this dataset (ISSN, E-ISSN, or journal title) in order to establish journal OA status. Further information concerning potential APC charges of the OA journals was extracted from the open dataset provided by the DOAJ (accessed on the 14 September 2021). For OA journals with matches in the DOAJ dataset, information concerning journal use of APCs for funding was extracted.

The focus of this study is on small- and mid-sized publishers, and therefore, some way of filtering between such publishers and large international publishers was required. The dataset consisted of 7,684 individual journal publishers, of which several imprints were known to belong to larger publishers. In addition to merging entries that had minor spelling differences or parts of the name of the owning organisation present in the imprint name, the following merges were made: Sciendo into Walter de Gruyter GmbH; Nature Publishing Group, BioMed Central, and Palgrave Macmillan into Springer Nature; Cell Press and The Lancet into Elsevier; Hindawi into Wiley; Taylor & Francis, Routledge, Co-Action

Table 1. Publisher size distribution and categorisation.

Number of journals published	Number of publishers
Small- and mid-sized publishers	
1	5,912
2	755
3	295
4	170
5	112
6	61
7	60
8	46
9	44
10	31
11–50	165
51–100	17
101–150	4
Large publishers	
151–500	5
501–1,000	3
>1,000	4

Publishing, Dove Medical Press, and F1000 Research into Informa; and Lippincott Williams & Wilkins into Wolters Kluwer. These were merged and counted into the counts of the said publisher. It was decided that the twelve largest publishers would be considered as the large publishers and treated separately in the analysis. The twelve largest publishers in the dataset were all international in scope, and the 13th publisher had less than half of the journals of the 12th position after which the counts were more even. Identifying and clustering journals into publishers are not trivial (see, e.g., Pacher (2021) for a study focused solely on this issue), but we believe that the approach we have used here produces a result that is good at separating large international publishers as well as inclusively identifying scholarly journals of various languages, disciplines, and regions.

The breakdown of publisher size in the data is presented in Table 1. Publisher-type categories are something that are missing in the Ulrichsweb dataset and could not be included in the present study. However, Crawford (2021) presents a comprehensive and recent analysis of all journals included in the DOAJ. The study found that 60 per cent of all OA journals were published by university publishers, which often operate at a small scale relative to professional publisher organisations and likely make up a large share of the journals placed in the span of one to ten journals each. In an attempt to unravel what kind of publishers the substantial category of single-journal publisher contains, we performed a search for word parts referring to universities and higher education organisations. Through this, we could establish that at least 46 per cent of the journals in the category of single-journal publishers were published by a university organisation.

3.2 Country-level funding information

We aimed to collect information about country-level public funding mechanisms for scholarly journals active in the fifty-one sovereign states in Europe including transcontinental states partly in Europe. There are currently no central information sources nor comprehensive studies or listings of such funding sources. Therefore, manual data collection was required to gather as much information as possible.

One part of the data collection was handled by querying the open web through search engines, which could identify web pages and documents offering information about major funding instruments in each individual country. Collecting such heterogeneous information in a standardised way often requires some simplification of the data. This is why we mainly focused on collecting information on the name of the organisation providing funding, URL, criteria of eligibility (e.g. related to OA), whether the funding is guaranteed for all eligible applicants or if there is some filtering, and does the funding explicitly only provide a share of journal's total costs. This search on the open web also included scholarly and grey literature. Relevant publications were added to the dataset to contribute to the overall picture of journal publishing and funding in the country.

We found that information about journal funding instruments is often difficult to find due to such information often being spread out on various web pages in national languages. Therefore, we also opted to implement a survey component in the study. From our bibliometric dataset, we identified journals from small- and medium-sized publishers publishing OA, of which we randomly selected thirty journals for each country (or all such journals if there were less than thirty for a specific country). We then visited each journal website to find the main contact email address or alternatively the contact email for the editor-in-chief to which we sent an invite for the survey. In total, 977 survey invites were sent out, of which 111 valid responses were received. The short ten-question survey inquiring the funding sources of European journals was not intended to give any quantitative or aggregate results, but rather serve as a lead into identifying major funding sources in the respective countries that our search process in the first step might have missed.

For countries for which we did not discover any funding mechanism through the earlier described methods, we further reached out to the designated OpenAIRE contact person named on the OpenAIRE website to inquire potential further information.

A preprint version of this manuscript and collected data was also made publicly available on 27 January 2022 in order to solicit additional missing information from the general public (Laakso and Multas, 2022a). The link and invitation to complete missing data were circulated through Twitter by the authors, which up until April 2022 had received over 9,000 impressions. The preprint has been viewed over 900 times by 6 April.

A limitation of our/this data collection process was its weak ability to capture decentralised and/or indirect funding streams supporting OA journal publishing activities. Funding streams going into decentralised funding models is something that our methods have limited capacity to capture, since they often span country borders and are made up of small contributions, often paid by a large number of individual institutions rather than as through one funding stream at the national level. Examples of such decentralised funding models are Subscribe to Open, Open Library of the Humanities, and other types of consortia arrangements to support OA journal publishing without APCs (Wise and Estelle 2019). It is also known that some countries provide strong infrastructural support

Table 2. Country breakdown of journal counts and OA status per publisher category.

	Total	Large publishers					Small and mid-sized publishers				
Countries	Journal count	Journal count	Percentage of journals	Subscription journal count	OA journal count	Percentage of OA journals	Journal count	Percentage of journals	Subscription journal count	OA journal count	Percentage of OA journals
Northern Europe	815	47	6	27	20	43	768	94	380	388	51
Denmark	128	4	3	4	0	0	124	97	94	30	24
Estonia	39	3	8	2	1	33	36	92	7	29	81
Finland	127	2	2	1	1	50	125	98	74	51	41
Iceland	15	0	0	0	0	0	15	100	8	7	47
Latvia	45	8	18	3	5	63	37	82	17	20	54
Lithuania	144	5	3	1	4	0	139	97	50	89	64
Norway	172	13	8	11	2	15	159	92	58	101	64
Sweden	145	12	8	5	7	58	133	92	72	61	46
Eastern and Central Europe	7,985	301	4	92	209	69	7,684	96	5,100	2,584	34
Albania	12	0	0	0	0	0	12	100	7	5	42
Armenia	7	0	0	0	0	0	7	100	4	3	43
Azerbaijan	14	0	0	0	0	0	14	100	10	4	29
Belarus	144	0	0	0	0	0	144	100	125	19	13
Bosnia and Herzegovina	63	0	0	0	0	0	63	100	22	41	65
Bulgaria	162	4	2	0	4	100	158	98	76	82	52
Czech Republic	504	13	3	3	10	77	491	97	328	163	33
Croatia	185	7	4	0	7	100	178	96	56	122	69
Georgia	12	0	0	0	0	0	12	100	7	5	42
Hungary	169	4	2	2	2	50	165	98	112	53	32
Kazakhstan	14	0	0	0	0	0	14	100	7	7	50
Kosovo	1	0	0	0	0	0	1	100	1	0	0
Republic of Moldova	35	0	0	0	0	0	35	100	7	28	80
Montenegro	11	0	0	0	0	0	11	100	1	10	91
Poland	1,337	207	15	73	134	65	1,130	85	601	529	47
Romania	597	35	6	8	27	77	562	94	234	328	58
Russian Federation	2,816	1	0	1	0	0	2,815	100	2,282	533	19
Serbia	236	3	1	1	2	67	233	99	69	164	70
Slovakia	218	24	11	3	21	88	194	89	122	72	37
Slovenia	127	3	2	1	2	67	124	98	67	57	46
Ukraine	1,321	0	0	0	0	0	1,321	100	962	359	27
Southern Europe	3,167	125	4	94	31	25	3,042	96	1,428	1,614	53
Cyprus	8	0	0	0	0	0	8	100	6	2	25
Greece	102	1	1	0	1	100	101	99	64	37	37
Italy	1,330	38	3	32	6	16	1,292	97	811	481	37
Malta	10	0	0	0	0	0	10	100	7	3	30
Portugal	142	5	4	2	3	60	137	96	51	86	63
Spain	918	80	9	60	20	25	838	91	238	600	72
Turkey	655	1	0	0	1	100	654	100	249	405	62
Vatican City State (Holy See)	2	0	0	0	0	0	2	100	2	0	0
Western Europe	14,610	9,717	67	7,696	2,021	21	4,893	33	3,585	1,308	27
Austria	194	42	22	38	4	10	152	78	94	58	38

(continued)

Table 2. (Continued)

Countries	Total	Large publishers					Small and mid-sized publishers				
	Journal count	Journal count	Percentage of journals	Subscription journal count	OA journal count	Percentage of OA journals	Journal count	Percentage of journals	Subscription journal count	OA journal count	Percentage of OA journals
Belgium	205	1	0	1	0	0	204	100	159	45	22
France	943	152	16	148	4	3	791	84	572	219	28
Germany	2,296	1,386	60	1,131	255	18	910	40	683	227	25
Ireland	107	43	40	41	2	5	64	60	46	18	28
Luxembourg	2	0	0	0	0	0	2	100	1	1	50
Monaco	2	0	0	0	0	0	2	100	2	0	0
Netherlands	1,945	1,529	79	1,243	286	19	416	21	330	86	21
Switzerland	1,300	896	69	600	296	15	404	31	224	180	64
UK	7,616	5,668	74	4,494	1,174	21	1,948	26	1,474	474	24
Total	26,577	10,190	38	7,909	2,281	22	16,387	62	10,493	5,894	36

Table 3. APC information comparison between publisher categories.

	APC	No APC	OA but no APC information
Journals from large publishers	1,705	441	135
Journals from small- and mid-sized publishers	957	3847	1,090

through universities, but such indirect funding streams are hard to transparently observe and quantify.

4. Results

This section is divided into two main parts: the first one focuses on the results of the bibliometric analysis of scholarly journals in Europe and the second one presents the results of journal funding sources per country. We present the main results according to each European subregion as defined by the EU thesaurus EuroVoc (EUR-Lex 2021). Two included states were not part of EuroVoc, Kazakhstan and Kosovo, but were categorised as part of the Central and Eastern Europe category.

4.1 Bibliometric analysis

Table 2 shows the per-country breakdown of journals per publisher size and access model. Considering the high-level distribution of journals in the entire dataset, it is possible to discern that over a third (38 per cent) of all journals published in Europe are published by one of the twelve large publishers, while the rest (62 per cent) are by small- and mid-sized publishers. When comparing these two publisher groups, a notable difference in the proportion of OA journals could be observed. For large publishers, only 22 per cent of journals could be established to be OA, while 36 per cent of small- and mid-sized journals were OA. Three countries (Germany, the Netherlands, and the UK) were noticed to have a large number of journals, of which the majority belongs to one of the twelve large publishers identified in this study. On the other hand, we identified twenty countries that had at least one published journal, of which none was published by one of the large publishers.

The use of APCs as a means of funding journals was explored to the degree possible by using the information about journals contained in the DOAJ. For comparison, Table 3 presents the results separated into the two publisher categories. The difference between publisher categories is stark. The large publishers clearly implement APC funding for most of their journals, while the inverse holds journals from small- and mid-sized publishers. Worth noting is also the higher proportion of journals with missing APC information. These journals may be OA and are included in the DOAJ where such information is available but simultaneously belongs to the small- and mid-sized journal category.

The final step in comparing journal characteristics between the two publisher groups included an analysis of the publication languages. Here, the focus was placed on only those languages by which the journal articles/full-text content is published according to the Ulrichsweb data. Table 4 presents the results, where again, a stark difference can be identified between the two publisher categories. The journals from small- and mid-sized publishers have, on average, a higher number of languages allowed per journal (1.45 vs 1.09), a lower share of English-only journals (32 vs 89 per cent), and a considerably higher share of non-English journals (43 vs 5 per cent). Multilingualism is strongly present among journals from small- and mid-sized publishers. In total, 44 per cent of the journals publish content in two or more languages, and 18 per cent in three or more languages. The respective numbers for large publishers were 6 and 3 per cent.

Overall, it can be concluded that many European countries have a strong publishing presence of journals by small- and mid-sized publishers and, on average, a higher share of multilingual and OA journals compared to journals from large publishers in the same region. It is also evident that, to a considerably lower degree, OA journals from small- and mid-sized publishers rely on APCs to fund their journals.

4.2 Journal funding sources

Here, we present the results of the data collection, which aimed to identify the major public funding mechanisms available for small- and mid-sized journals in each country. The focus was placed on finding sources of country-specific public funding for scholarly journal publishing. As was described in more detail in Section 3, we utilised an explorative approach to maximise the chances of identifying relevant funding mechanisms. These included web searches, literature review, reaching out to national OpenAIRE contact persons, a web survey sent to randomly-selected journals in each country, and open request solicitation for additional data through social media. According to our data gathering, the funding mechanisms of journals from small- and mid-size publishers in Europe appear rather multifaceted. Of the forty-seven countries included in the study, we were able to identify only fifteen of them having one or a few national funding sources aimed for support of scholarly journals in the country (Supplementary data 1). Most of these sources were government agencies such as ministries and research councils or major national research funders. In the case of a few countries, we were able to identify grant calls on the university level usually aimed for funding the journals working underneath or part of the university. However, we presume that these types of university funding calls are much more common than our findings suggest due to their limited discoverability through open web searches.

4.3 Central and Eastern Europe

The bibliometric results show (see Table 2) that most scholarly journals in Central and Eastern European countries are published by small- and mid-size publishers and in languages other than English. As expected, the journal counts in this publisher size segment vary significantly between countries, from only a few journals in Kosovo and Montenegro to the Russian count of 2,815. The largest journal counts after Russia are in Ukraine (1,321 journals), Poland (1,130 journals), and the Czech Republic (491 journals). The percentage of OA journals within this section range between 13 per cent of Belarusian journals and 70 per cent of Serbian journals. Although the Russian journal count published by small- or mid-size publishers is vast, only 19 per cent of these journals could be established as being OA.

Of the Central and Eastern European countries, we were able to identify that Bulgaria, Croatia, Poland, Serbia, Slovenia, and Romania had some sort of established national

Table 4. Publication language comparison between publisher categories.

	Mean number of languages per journal	Percentage of English-only journals	Percentage of non-English journals	Percentage of two or more languages	Percentage of three or more languages
Journals from large publishers	1.09	89	5	6	3
Journals from small- and mid-sized publishers	1.45	32	43	44	18

funders providing annual calls for funding scientific journal publishing. Within these countries, the small- and mid-size publishers' journal count is the largest in Poland (1,130 journals), followed by Romania (562 journals) and the rest of the countries (127–236 journals). The national funders in these countries are mainly government agencies, such as Ministries of Science and Education (Bulgaria, Croatia, Poland, and Serbia) and the Ministry of Research, Innovation and Digitation (Romania). In Poland, university-level funding was also identified from the University of Silesia in Katowice and Priorytetowy Obszar Badawczy Heritage, an association of the Jagellonian University. In Slovenia, the funding is offered by the Slovenian Research Agency (ARRS). Of these, the Croatian and Slovenian funding organisations and Polish universities require OA for the funded journals. The Croatian Ministry of Science and Education (MSE) expects immediate publishing in their national OA platform. The Croatian MSE also has a large total grant amount, offering approximately 1.6 million euros for funding national scientific journals annually. ARRS does not express the level of OA expected from the funded journals and only describes that they should follow the agency's OA strategy.

We were not able to identify any national funding sources for Russian scholarly journals. This is surprising considering the great amount of journals published in the country. However, there is an open platform for Russian scientific journals called eLibrary.ru, which provides full-text content of over 4,800 journal titles. Other identified technical platforms for OA journals were the Croatian OA platform Hrčak, which is a prime example of a national journal portal currently containing over 500 journals, and the doiSerbia portal covering full-text content of sixty-six Serbian scientific journals.

4.4 Northern Europe

In addition to the geographic location and similar sociopolitical environment, the Nordic countries share similarities in their journal publishing profile. The vast majority of journals are published by small- and mid-sized publishers (92–100 per cent of journals in each country). Norway, Sweden, Denmark, and Finland also have similar journal counts for this publisher size segment (124–159 journals), with Iceland having less (fifteen journals).

When it comes to funding mechanisms, we could establish that Finland provides inclusive journal subsidies for non-profit journals with funds provided by the Ministry of Education and Culture and administered by the Federation of Learned Societies. In Finland, there is a national technical platform provided for OA journals (both immediate and delayed) called journal.fi, which can be utilised for a nominal fee regardless of public funding status. Norway mainly funds journals within a curated journal consortium, and there is no national-level portal for journal publication. However, there is a strong presence of university-hosted Open Journal Systems platforms that often serve many journals. In Sweden, the national research funders Vetenskapsrådet and FORTE provide regular competitive grant opportunities. On a national level, mechanisms for technical and financial support of journals are being developed as part of the national strategy to further OA publishing. In Denmark, the national funder Independent Research Denmark provides regular competitive grant opportunities for journals to apply for. The national-level journal portal https://tidsskrift.dk/ is maintained by the Danish National Library and is open to (both immediate and delayed) OA journals.

4.5 Western Europe

Germany, the UK, and the Netherlands have very high numbers and relative shares of large publisher journals. Common for these three countries was the lack of any dedicated public funding source for supporting journals. The Netherlands has recently opened a national portal for Diamond OA journals, https://openjournals.nl/, but the other two countries do not have anything similar. Germany has had competitive funding rounds through its national research funder, the German Research Foundation. It has not been intended for sustained funding and it is not suitable for journals that are already OA, but rather aimed for journals undergoing transitioning to OA publishing. It is well known that commercial scholarly journal publishing is often very profitable, and public financial support that is used to support such actors directly is understandably something that is not provided. However, the exact reasons that these countries do not have public support for non-commercial journals remain unknown although such journals also have a notable presence in these countries.

The journals in Austria, Belgium, and France are published in large parts by small- and mid-size publishers. There are 204 journals in Belgium, 152 in Austria, and 791 in France. Of these, 22–38 per cent are published OA. In France, the main national journal platform is OpenEdition Journals, which hosts 592 journals, with another innovative development being Episciences that hosts overlay journals from the national repository, Hyper Articles en Ligne. According to our searches, all these countries have a national research funding agency offering evaluation-based funding for scientific journals. In Belgium, the Fund for Scientific Research offers annual calls for journal publishers granting subsidies for up to 3-year periods. The Austrian Science Fund (FWF) offers eligible applicants 50,000 euros to cover a 3-year period of funding. In France, the foundation of the Centre national de la recherche scientifique (CNRS) offers support for eligible scientific journals for a 2-year period at a time. All these agencies expect the funded journals to offer OA for all their content, with

the CNRS expecting it fully and immediately according to the French law of digital affairs (République numérique de 2016). The FWF offers their grants also for journals transitioning into OA. To our knowledge, there are not any national technical platforms available for scientific journals in these countries.

4.6 Southern Europe

According to our data, the status of scientific journal funding mechanisms in Southern European countries remains unclear as we were able to identify public funding sources only for Spanish journals. Fortunately, the OpenAIRE contacts of some of these countries shed some light on their countries' situations. For example, in Greece, there are no public resources allocated to scientific journal funding although subsidies are available for monographs. However, there are two nationally available technical platforms for open publishing of Greek scholarly journals. The ePublishing platform contains full-text content of fifty-six Greek journals, nine proceedings, and ten book publishers. Prothiki is an OA journal platform for journals of the Aristotle University of Thessaloniki currently containing full-text content of thirty university journals. The majority of Maltan scholarly journals are published by the University of Malta, and therefore, the publishing costs are covered by the university. According to our findings, there are 654 Turkish scientific journals published by small- and mid-size publishers, of which 62 per cent are published OA. However, the Turkish OpenAIRE contact person was able to confirm that the majority of Turkish scholarly journals are published by universities and other public institutions, and there is no national funding source for journals. Although Italy has a large total journal count in this publisher size segment (1,292 journals, of which 37 per cent are OA), we were not able to identify any confirmed public funding mechanisms offered for Italian journals.

In Spain, most of the scholarly journals are published by small- and mid-size publishers (838 journals), of which a noticeable amount of 72 per cent are OA. We were able to identify three different funding sources for supporting Spanish scientific journal publishing. The Spanish Ministry of Culture and Sport offers funding for 50 per cent of the journal's total costs within the fields of social sciences and humanities. The University of Granada supports newly-established journals with a 3,000–4,000 euro grant for a 1–3-year period at a time. This annual grant call is aimed only for journals within the University of Granada. A national research funder, The Spanish Foundation for Science and Technology, offers a grant call for support of scientific efforts with a total budget of 3.9 million euros. This grant may, to our understanding, be partly applicable to scientific journals as well, but no more specific breakdown of the budget distribution or funding decisions could be located.

5. Discussion

A central finding from the study was that the vast majority of journal publishers in Europe were single-journal publishers (77 per cent of all publishers), i.e. by actors/organisations that only output one journal, a finding that provides a better understanding of the circumstances that many journals are likely dealing with. We could already observe that many countries had set up a national journal platform to support such OA journals from a technical dimension, something that is crucial to ensuring that they are running on continuously updated modern web technologies that facilitate smooth editorial workflows, indexing, and content preservation. While the technical solutions offered for journals in such situations are largely similar, the results suggest that there is a broad diversity in approaches on how public funds are channelled to support journal publishing at national levels. However, in addition to diversity, one could argue that a lot of this type of information also has elements of obscurity as it is rare that information about funding of journals is easily located and retrievable. Information about strategic goals or agreements for publishing in international journals could often be easily located on pages of national consortia or universities in a country, but detailed information on how journals in a said country are financially supported, be it based on an OA publishing model or not, was much harder to come by.

Common for the identified government agencies and national research funders providing funding for scholarly journals across Europe were that most of them used evaluation-based application processes and usually required OA of the eligible journals. Exceptions to this were the Finnish and Serbian subsidy mechanisms that provide subsidies for all applicants that fulfil prespecified fundamental scholarly journal criteria. Of these, Serbia offers progressively higher funding for journals that have been ranked high enough on international metrics. Most of the identified funding sources provided annual calls for journals and/or funding for more than a 1-year period. However, according to the questionnaire responses, journals utilising this type of funding were rather uncertain of its continuity in the future since the evaluation-based assessment processes cannot be counted on to be favourable for the journal every time. Noticeable is that according to the survey answers, some of the journals did not consider requiring any external funding for their journal. In many cases, we could not detect any dedicated funding mechanism for channelling earmarked funds towards supporting journal publishing from public funds. Rather, the responsibility is laid on local institutions to host and facilitate journal publication as part of their budgets, operation, and volunteer effort. In comparison to, e.g., direct governmental subsidies, there are benefits and drawbacks to consider when this kind of additional institutional layer is introduced, but these cannot at length be explored here.

The bibliometric results reaffirmed that there are a broad variety of national languages used for scholarly communication in Europe, and support for dissemination of research-related information can be part of the explicit national strategy (see, e.g., VN (2021) for the example of Finland). The Helsinki Initiative on Multilingualism in Scholarly Communication (Helsinki-initiative.org 2021) was created to raise awareness and promote scholarly communication equally in all languages, a function that nationally-oriented journals contribute to very strongly. Although automatic machine translation is developing and provides increased readability of scholarly texts across languages (Steigerwald et al. 2022), relying on such functions to a high degree has many pitfalls unless a human expert is used to verify the accuracy of the translation. Even if the direct translation would be accurate, be it automatic or human created, it does not compensate for the utility of locally-grounded research publications, something

that many globally-oriented journals might not publish. In cases where communication in local languages is a high priority, it makes sense to have dedicated funds directed at outlets that take this aim further rather than mixing such funds into institutional funding schemes with the assumption that some of the resources would go towards publication-related practices.

The financial and contractual knowledge base for international publishers is well developed through advances made as part of the collaborative Efficiency and Standards for Article Charges initiative in which the consortia and libraries share the terms of their contracts often together with cost breakdowns (ESAC-initiative.org 2021). However, the same cannot be said of information concerning public funding directed to local journals. This happens even though such information is theoretically easier to make public as commercial non-disclosure agreements do not hinder what can be made public information, and there is an ideological ground to make use of public funds as transparent as possible for citizens. Hence, one of our practical recommendations would be for national actors to collaborate internationally on designing and implementing practices through which non-profit journals can most efficiently be supported with public funds. This would enable learning from each other and making the endeavours compatible with the circumstances of OA publishing. Such actions would also likely lower the threshold for collaboration on other fronts, such as on common investments into further development of open-source publishing platforms.

For future research, it could prove interesting to take this initial charting of the landscape and paint a fuller picture by zooming in on various aspects of interest. One suggestion would be to take a closer look at the publishing organisations that are responsible for one or a handful of journals and to examine how are they working and what steps could be taken to facilitate their activities. Another study could enhance the level of analysis to also include article counts for journals, an element that was now missing due to the lack of such data in the Ulrichsweb database. By aggregating data from multiple sources and conducting manual data collection where needed, one could get an enhanced perspective that would consider the size differences among journals. Other research could conduct an evaluation of the strengths and weaknesses of the different funding models available by consulting journals that have experience in utilising them. This would likely provide valuable input into future policy-making.

6. Conclusions

We consider that, as the push towards more OA publishing increases, the aspect of public funding for journals is something that would warrant more systemic global attention. Due to the reduction and eventual cease of subscription income, journals must find alternative funding streams to cover costs or alternatively seek a publishing agreement with an international commercial publisher to gain financial stability and predictability. The problem with such arrangements is that multilingualism is often compromised in favour of English. This may lead to the journals' scopes becoming broader to attract a global audience of both readers and authors, something that undesirably reduces the local relevance of the journal. Ultimately, in a such scenario, it is likely that public-sector funds are still used to a high degree, just funnelling through large international companies that require their own share of the transaction. This makes it more expensive compared to direct public subsidies to the journal. A well-designed public funding instrument is likely to enable the existence and diversity of scholarly publication outlets, which are of high relevance to more specific audiences than just the generic universal global target audience.

Supplementary material

Supplementary material is available at *Science and Public Policy* online.

Data availability

The data concerning the identified funding mechanisms are made openly available as supplementary data to this article. The bibliometric journal data as been made available as open data (Laakso and Multas, 2022b).

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