

European scholarly journals from small- and mid-size publishers in times of Open Access: Mapping journals and public funding mechanisms

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Abstract

Open Access (OA) publishing omits reader-side fees, which requires that resources to sustain journals can not originate from the reader-side. Large international publishers have had capability to monetize OA publishing from national consortia and institutions, but small- and mid-sized publishers have not succeeded to the same degree. There is currently a lack of information concerning to what degree small- and mid-sized publishers are present in European countries, to what degree their journals are already OA, and how the countries are supporting these journals financially or technically to publish their materials OA.

The methods for this study include bibliometric analysis, document analysis of web information, inquiries to OA experts in European countries, and web-survey to a small sample of journals in each country. The study found that there are 16387 journals from small-and mid-sized publishers being published in European countries (incl. transcontinental states) of which 36% are already publishing OA. The vast majority of journals published in Europe are by single-publisher journals (77% of all publishers publish only one journal). Journals from small- and mid-sized publishers were found to be multilingual or non-English to a higher degree than journals from large publishers (44% and 43% vs 6% and 5%). According to our observations there is large diversity in how (and if) countries reserve and distribute funds to journals active in the countries, ranging from continuous inclusive subsidies to competitive grant funding or nothing at all. Funding information was often difficult to discover and efforts to make such information more easily available would likely facilitate policy development in this area.

We call out for additions and corrections to journal funding instrument information in order to make the data as comprehensive and accurate as possible.

Introduction

The scholarly journal publishing sector has faced three intertwined and impactful changes during the last three decades. The first one is digitization and digital content delivery becoming the norm, which in the beginning was challenging individual journals and smaller publishers to invest in and fully leverage. The second change is the pattern of large publishers becoming even larger by acquiring smaller publishers and individual titles into their portfolios (Larivière, Haustein, Mongeon 2015). Publisher oligopolization together with digitization fueled the 'big-deal' business model. The third change is the growth of open access (OA) which has disrupted the sector with its many ways through which access can be provided through journals directly as well as authors indirectly. In the late 1980s and early 1990s OA started to gain momentum as a largely a community-driven bottom-up movement, but has since been shaped strongly by commercial interests and science policy (Moore 2020; Schöpfel 2015).

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 for large publishers who, on the contrary, have been able to monetize the science policy pressure placed on its growth. For small and mid-sized publishers, that act outside the realm of institutional agreements with substantial leverage in contract negotiations, can often 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, shared infrastructures). However, without sufficient resources a scholarly journal can not 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, Matthias & Jahn 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 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 both on how such instruments should be designed, and how such mechanisms should change over time when the scholarly journal and scholarly communication landscape changes.

While a purely commercial market shapes itself through market forces, involvement of public funds necessitate that decisions are also influenced by other factors. National-level funding to journals, their existence and making potential adjustments to them, is within the domain of science policy and as such, can not 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 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 prior research it is known that European scholarly societies are often involved in publishing their own journal (Delicado, Rego, Conceição et al. 2014; Hewitt, Dingwall & Turkmendag 2017; Late, Korkeamäki, Pölönen 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 difficulties 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 as well as 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 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?

- What share of these journals are published by small- or mid-sized publishers, i.e. not by a major international publisher?
- What share of these journals are published OA? What share of OA journals utilize article processing charges (APCs) for funding?
- 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?

- What type of organisations are involved in distributing journal funding?
- Are there specific criteria for journals to be eligible for funding?
- Does this funding and technical support take into account circumstances related to OA publishing?
- 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.

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 contextualize the current state of OA journal publishing in Europe. The focus is placed on OA-related science policy, journal funding and bibliometric information characterizing the structure of the sector. It is warranted to mention that Europe is still a homogenous area when it comes to these issues, hence the need for this research endeavor 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, Rimmert & Taubert 2020; Kirkman 2018; Jahn & Tullney 2016) but there are less which concern the national systemic level funding for journals active in a country. This lack of information was the main motivator for this study, 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 which we know currently fairly little about (Ficarra & Johnson 2021).

European OA-related science policy

In Europe there has been a strong push toward OA through science policy for over a decade, largely facilitated by the European Union (European Commission 2012; Bjornsson, Tsoukala, Barbarossa & Keesenberg 2020). The Budapest Open Access Initiative, which celebrates 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 started and is coordinated from Europe (Schimmer 2016). This is the case also with the research funder cOAlition S (Schiltz 2018). According to a recent survey by the European Universities Association, over 89% of the institutions reported high or very high importance of OA to publications, with 64% reporting high or very high implementation as well (Morais, Saenen & Garbuglia et al 2021). According to a research on the impact of OA policies into OA practices of institutions, in 2017 Europe had an OA presence largely driven by green OA, i.e. self-archiving of article manuscripts (Huang, Neylon & Hosking 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 has 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 2021). 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.

Open access journals in Europe

The geographical existence of a journal can and has been operationalized 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 consider the share of journals published in a country that are included in national and international indexing services. Analysis could also be done 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 relates to the composition: Europe contains many small countries which many have their own national languages, something which 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 which the majority of EU member states implement in order to distribute public funds to higher education institutions (Zacharewicz, Lepori, Reale 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 subsidize journals in the country, as well as 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 enroll to these portals at low cost or free of 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, Kahn, Sokolovska 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%) 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%) (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% of the journals requesting authors for a fee are asking it in excess of 1400 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 (4211 journals) and Eastern European countries (2677 journals) which together account for 45,5% of all OA journals included in the DOAJ at the end of 2020.

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, Frantsvåg & Kramer 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 on their operations. This survey generated responses from 1619 journals. Some of the most relevant findings concerning the current study indicate that 22% of responding journals are being funded by national or government funding agencies and 5% by research funding organisations. In total, 72% 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 three 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, Solomon & Björk 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 & Estelle 2019). In the case of the 27 mechanisms identified by Wise & Estelle (2019) most models of substantial aid and with suitability to smaller actors would require more coordination on organizing 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 that journals switch back to being subscription-based after publishing OA for a while (Matthias, Jahn & Laakso 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, Pinter & Stern (2017) mapped the OA monograph landscape from the perspectives of policies, funding, and publishing, including 8 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 on the very early stages of development. Another Europe-focused study by Morka & Gatti (2021) included 14 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.

Methods

Bibliometric data

A fundamental aspect of scholarly journals is the constantly changing environments which challenge 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, 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 & Paul-Hus 2016). In order to establish the current landscape of the scholarly journals in European states, a bibliometric data collection and analysis was conducted. Ulrichsweb Global Serials Directory, an inclusive indexing source of published materials, was used to identify active journals. Between August 23rd and 3rd of 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 51 sovereign states in Europe, including transcontinental states partly in Europe, were queried individually. A total of 26 577 journals were identified. Some states did not have any eligible publication outlets so, in total, journal records for 47 states were obtained. In addition to ISSN, an E-ISSN number, publisher name and journal title information concerning publication languages were also extracted from Ulrichsweb. 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.

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, Lenke, Schmidt & Taubert 2020). 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 Directory of Open Access Journals (DOAJ) (accessed on the 14th of 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 7684 individual journal publishers of which several imprints were known to belong to larger publishers. These were merged and counted into the counts of said publisher. It was decided that the 12 largest publishers would be considered as the large publishers and treated separately in the analysis. The 12 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 is 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.

Number of journals published	Number of publishers
Small- and mid-sized publishers	
1	5912
2	755
3	295
4	170
5	112
6	61
7	60
8	46
9	44
10	31
11 to 50	165
51 to 100	17
101-150	4
Large publishers	
151-500	5
501-1000	3
> 1000	4

Table 1 - Publisher size distribution and categorization

Country-level funding information

We aimed to collect information about country-level public funding mechanisms for scholarly journals active in the 51 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 standardized 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 open access), whether the funding is guaranteed for all eligible applicants or are there some filtering, and does the funding explicitly only provide a share of journal 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 to the study. From our bibliometric dataset we identified journals from small and medium-sized publishers publishing open access, of which we randomly selected 30 journals for each country (or all such journals if there were less than 30 for a specific country). We then visited each journal website to find the main contact e-mail address, or alternatively the contact e-mail 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 10 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.

Results

This section is divided into two main parts: The first one focusing on the results of the bibliometric analysis of scholarly journals in Europe, and the second one presenting 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 categorized as part of the central and eastern Europe category.

Bibliometric analysis

Table 2 depicts a 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%) of all journals published in Europe are published by one of the 12 large publishers, while the rest (62%) 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% of journals could be established to be OA, while 36% of small- and mid-sized journals were OA. Three countries (Germany, Netherlands, UK) were noticed to have a large number of journals of which the majority belongs to one of the 12 large publishers identified in this study. On the other hand we identified 20 countries that had at least 1 published journal and of which none was published by one of the large publishers.

Countries	Total	Large publishers					Small and Mid-sized publishers				
	Journal count	Journal count	% of journals	Subscription journal count	OA journal count	% OA journals	Journal count	% of journals	Subscription journal count	OA journal count	% 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	7985	301	4 %	92	209	69 %	7684	96 %	5100	2584	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 & 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 %
Kosova	1	0	0 %	0	0	0 %	1	100 %	1	0	0 %
Moldova, Republic of	35	0	0 %	0	0	0 %	35	100 %	7	28	80 %
Montenegro	11	0	0 %	0	0	0 %	11	100 %	1	10	91 %
Poland	1337	207	15 %	73	134	65 %	1130	85 %	601	529	47 %
Romania	597	35	6 %	8	27	77 %	562	94 %	234	328	58 %
Russian Federation	2816	1	0 %	1	0	0 %	2815	100 %	2282	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	1321	0	0 %	0	0	0 %	1321	100 %	962	359	27 %
Southern Europe	3167	125	4 %	94	31	25 %	3042	96 %	1428	1614	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	1330	38	3 %	32	6	16 %	1292	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	14610	9717	67%	7696	2021	21 %	4893	33%	3585	1308	27 %
Austria	194	42	22 %	38	4	10 %	152	78 %	94	58	38 %
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	2296	1386	60 %	1131	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	1945	1529	79 %	1243	286	19 %	416	21 %	330	86	21 %
Switzerland	1300	896	69 %	600	296	15 %	404	31 %	224	180	64 %
United Kingdom	7616	5668	74 %	4494	1174	21 %	1948	26 %	1474	474	24 %
Total	26577	10190	38 %	7909	2281	22 %	16387	62 %	10493	5894	36 %

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

Use of APC 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 the majority 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 info. These journals may be OA and are included in the DOAJ where such information is available but simultaneously belong to the small- and mid-sized journals category.

	APC	No APC	OA but no APC info
Journals from large publishers	1705	441	135
Journals from small- and mid-sized publishers	957	3847	1090

Table 3. APC information comparison between publisher categories

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 journals articles/full-text content are 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%) and a considerably higher share of non-English journals (43% vs 5%). Multilingualism is strongly present among journals from small- and mid-sized publishers. In total 44% of the journals publish content in two or more languages, and 18% in three or more languages. The respective numbers for large publishers were 6% and 3%.

	Mean number of languages per journal	% English-only journals	% non-English journals	% two or more languages	% 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 %

Table 4 - Publication language comparison between publisher categories

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 in order to fund their journals

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. Focus was placed on finding sources of country-specific public funding for scholarly journal publishing. As was described in more detail in the methodology section we utilized an explorative approach to maximize the chances for identifying relevant funding mechanisms. These included web searches, literature review, reaching out to national OpenAIRE contact persons and a web survey sent to randomly selected journals in each country. According to our data gathering, the funding mechanisms of journals from small and mid-size publishers in Europe appear rather multifaceted. Of the 47 countries included into the study, we were able to identify only 15 of them having one or few national funding sources aimed for support of scientific journals in the country (see Table 5). 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. However, their discoverability through open web searches is limited.

	Type of funder	Funder name	URL	Evaluation-based funding	Open access criteria	Continuous/One-time	Indication of Scope	Comments	Technical platform(s)	Journals
Slovenia	National research funder	Slovenian Research Agency (ARRS)	http://www.arrs.si/sl/infra/tisk/razpisi/20/razp-zp-p-21-22.asp	Yes	Yes	Continuous (biennial)	Total funds for the grant 2 500 000 eur	Grants for 2 years. For co-financing of journals		
Ukraine										
Southern Europe										
Cyprus										
Greece									https://epublishing.ekt.gr/ and http://ejournals.lib.auth.gr/	54+30
Italy										
Malta										
Portugal										
Spain	Government agency	Ministry de Cultura y Deporte	https://www.culturaydeporte.gob.es/en/servicios-al-ciudadano/catalogo/becas-ayudas-y-subsidencias/libro-edicion-revistas-cultura.html	Yes	No		The maximum amount 700 000 euros in total for companies and 300,000 euros for non-profit institutions that publish magazines.			
	University	Universidad de Granada	https://investigacion.ugr.es/planes-propios/programas/p4	Yes	No	Continuous (annual)	Max. 3000-4000 eur / journal / year, for 1-3 years period			
	National research funder	Spanish Foundation for Science and Technology, FSP (FECYT)	https://www.convocatoria.fecyt.es/publico/bases/bases.aspx	Yes	?	?	Total budget 3 940 000 euros. Funding for 1 year period.	Large scope		

Central and Eastern Europe

The bibliometric results show (see Table 2) that the majority of 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 2815. The largest journal counts after Russia are in Ukraine (1321 journals), Poland (1130 journals) and Czech Republic (491 journals). The percentage of OA journals within this section range between 13 % of Belarusian journals to 70 % of Serbian journals. Although the Russian journal count published by small or mid-size publishers is vast, only 19 % 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 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 (1130 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, also university-level funding was identified from the University of Silesia in Katowice and POB 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 organizations and Polish universities require OA for the funded journals. The Croatian MSE expects an 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. The Slovenian Research Agency does not express the level of OA expected from the funded journals and only describes that they should follow the agency's open access 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 4800 journal titles. Other identified technical platforms for OA journals were the Croatian OA platform Hrčak, another prime example of a national journal portal currently containing over 500 journals, and the doiSerbia covering full-texts of 66 Serbian scientific journals.

Northern Europe

In addition to geographic location and similar socio-political 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% 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 (15 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 could be utilized 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 OJS 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 Tidsskrift.dk is maintained by the Danish National Library and is open to (both immediate and delayed) OA journals.

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, openjournals.nl, but the other two countries do not have anything similar. Germany has had competitive funding rounds through its national research funder DFG. 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 which is used to support such actors directly is understandably something that is not provided. However, the exact reasons these countries do not have public support for non-commercial journals remains unknown, although such journals also have a notable presence in these countries.

The national scientific 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% to 38 % are published OA. 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 (FNRS) offers annual calls for journal publishers granting subsidies for up to three year periods. The Austrian Science Fund (FWF) offers eligible applicants 50 000 euros to cover a three years period of funding. In France, the CNRS Foundation offers support for eligible scientific journals for two year period at a time. All these agencies expect the funded journals to offer OA for all their content, 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.

Southern Europe

According to our data gathering, 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 into their countries' situations. For example, in Greece, there are not 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-texts of 56 Greek journals, nine proceedings and 10 book publishers. Prothiki is an open access journal platform for journals of the Aristotle University of Thessaloniki currently containing full-texts of 30 university journals. The majority of the Maltese 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 % 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 (1292 journals, of which 37 % OA), we were not able to identify any confirmed public funding mechanisms offered for Italian journals.

The majority of Spanish scholarly journals are published by small and mid-size publishers (838 journals) of which a noticeable amount of 72 % 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 % of the journal's total costs within the fields of social sciences and humanities. University of Granada supports newly established journals with a 3000-4000 euro grant for one to three 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 (FECYT) 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 for scientific journals as well, but no more specific breakdown of the budget distribution or funding decisions could be located.

Conclusions

From the results it is possible to derive that there is a broad diversity in approaches on how public funds are channeled to support journal publishing at national levels. However, in addition to diversity one could also 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 found to a much lesser degree.

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 fulfill prespecified fundamental scholarly journal criteria. Of these, Serbia offers progressively higher funding for journals that have rank high enough on international metrics. Most of the identified funding sources provided annual calls for journals and/or funding for more than one year period. However, according to the questionnaire responses, journals utilizing this type of funding were rather uncertain of its continuity in the future since the evaluation-based assessment processes can not be counted on to be favorable for the journal every time. Noticable is that according to the survey answers, some of the journals did not consider needing any external funding for their journal.

According to our findings, in many cases there was no dedicated funding mechanism for channeling 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 which can not at length be explored here. The bibliometric results re-affirmed that there is a broad variety of national languages in Europe, and support for dissemination of research-related information can be part of 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 which nationally-oriented journals contribute to very strongly. 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 fairly well developed through advances made as part of the collaborative ESAC 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 can not be said of information concerning public funding directed to local journals. This happens despite the fact that 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 endeavors 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.

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 have to find alternative funding streams to cover costs, or alternatively seek a publishing agreement with an international commercial publisher for gaining financial stability and predictability. The problem with such arrangements is that multilingualism is often compromised in favor of English. This may lead to the journals' scopes becoming broader to attract a global audience of both readers and authors, something which, undesirably reduces the local relevance of the journal. Ultimately it is likely that public sector funds are still used to a high degree in the future, just funneled 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.

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Data availability statement

The data concerning the identified funding mechanisms and information related to them are made openly available. We encourage readers to inform the authors of any potential additions or corrections to the dataset.