

The use of Gold Open Access in four European countries: An analysis at the level of articles

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Abstract

We assess the use and potential of Gold Open Access (OA) in Finland, Flanders (Belgium), Norway, and Poland by comparing data at the level of articles from full-coverage databases in each country. The inclusion of the journals in the Directory of Open Access Journals (DOAJ) is used as a reference to determine Gold Open Access. Gold OA is on the rise in all four countries and across fields, but some countries, especially Norway, and some fields have a substantially larger proportion of OA publications than others, with the overall share of Gold OA ranging from 5.7% to 17.3%. Especially in the SSH, a mixture of local and international journals can be found, many of which are not indexed in databases like Web of Science. As such, our results indicate that an overview of the state of Gold OA is preferably obtained by comparing DOAJ to a full-coverage database.

Introduction

Open Access (OA) to research has been one of the major topics of discussion in the area of scholarly communication for over a decade. Traditionally, a distinction is made between author self-archiving – Green OA – and publishing in an OA journal – Gold OA. A more refined model has been proposed by Martín-Martín et al. (2018). Using the terminology of these authors, we focus on *libre*, *immediate* and *permanent* access to the *accepted peer-reviewed* text of journal articles. For the sake of brevity, we will use the ‘Gold OA’ terminology.

The Directory of Open Access Journals (DOAJ) has emerged as one of the major sources of information on OA journals (Piwowar et al., 2018), although it does not cover all Gold OA (Björk, 2019). Basic requirements for inclusion in the DOAJ include immediate access (no embargo) to all content in the journal; having a registered ISSN; and displaying clear information on editor, editorial board, author guidelines, and article processing charges (APCs). In March 2014, DOAJ launched a new and more stringent set of criteria for inclusion (Van Noorden, 2014), leading to rejection of many journals that were previously included. In January 2019, the DOAJ covers 12,420 OA journals.

In this paper, we examine and compare to what extent researchers in four European countries/regions – Finland, Flanders (Belgium), Norway, and Poland – make use of journals that are in the DOAJ. These countries have been chosen because each maintains a full-coverage database (Sīle et al., 2018). also covers journals that are not indexed in international databases like Web of Science (WoS) as well as journals that do not register DOIs. This sets our study apart from most other studies, which rely on WoS or Scopus (Archambault et al., 2014; Bosman & Kramer, 2018; European Commission, 2019), and is especially relevant for the social sciences and humanities. As such, the study provides a complete picture of how widespread Gold OA is among peer-reviewed journal articles in these countries.

Data and methods

For each country, we take into account all peer-reviewed journal articles published between 2011 and 2017 by authors at the country's research institutions. However, the temporal and/or disciplinary scope of the Flemish and Polish data is smaller due to limitations of the data sources in these countries. Table 1 provides an overview.

The metadata of journal, conference and book publications from fourteen Finnish universities is stored in the VIRT A Publication Information Service for the period 2011-2017 (Pölönen, 2018). In case of scientific publications, it is indicated if they are peer-reviewed or not. For this study we selected peer-reviewed journal articles published in 2011-2017. For the year 2017, the data collection is not complete. Each publication is also assigned a cognitive field classification according to OECD Fields Of Science (FOS; OECD, 2015). Finnish universities' co-publications appear as duplicates, and they may have different field classification. We use deduplicated publication counts but one article can be counted in several fields. A small number of publications is assigned to category 'Other', and so can be counted toward the total for all fields but is excluded from the field-specific analyses.

Table 1. Overview of data per country

Country	Time period	Fields	Number of articles	Number of journals
Finland	2011-2017	All fields	169,231	15,434
Flanders	2011-2016	All fields	114,134	12,214
Norway	2011-2017	All fields	123,865	14,173
Poland	2013-2016	SSH	120,111	8,577

The Flemish PRFS (Engels & Guns, 2018) consists of multiple parameters, two of which count scientific publications in, respectively, the WoS and the VABB-SHW. The VABB-SHW is a database that was constructed to alleviate the shortcomings of WoS in covering the social sciences and humanities. We consider all journal articles published in 2011-2016 that are counted in the Flemish PRFS, both in WoS (n=81,936) and in VABB-SHW (n=12,635). The analysis at disciplinary level is carried out using a cognitive classification (Guns et al., 2018) based on OECD FOS; 4 publications that could not be assigned to a discipline were discarded.

Data for Norway are derived from the Norwegian Science Index (NSI), a subset of the Current Research Information System in Norway (Cristin), with complete coverage since 2011 of all peer-reviewed scientific and scholarly publications from most research organizations in the country. The bibliographic data in NSI represent books, journal articles, articles in edited volumes, and articles in peer-reviewed conference series (Sivertsen, 2016). Only journal articles are included in this study, and they are counted only once even if several institutions have contributed to them. Field classifications are mapped against OECD FOS.

The data from Poland are limited to the years 2013–2016 and to the social sciences and humanities (SSH). In these years, Polish SSH scholars published 120,111 articles (deduplicated at the national level). Disciplines or fields are assigned according to a qualification-based classification (typically based on the author's PhD). 9,147 co-authored articles involve authors from both social sciences and humanities and are assigned to both fields.

An overview of DOAJ-covered journals, obtained from the DOAJ website, is matched against each national database by comparing the ISSN(s) recorded per publication to the print and online ISSNs registered in DOAJ. Our analysis includes all journals in DOAJ, whether or not they have been accepted after March 2014. If a journal has only started providing OA content in a given year, only publications from that year or later are considered to be OA. In addition

to a general overview, we also present the results for four broad fields: Natural sciences & technology, Medical & health sciences, Social sciences, and Humanities.

Results

The overall share of Gold OA articles varies considerably by country and by field, ranging from 5.7% (Social sciences, Flanders) to 17.3% (Medical & health sciences, Norway). In each of the four fields, Norway has the largest share of Gold OA articles (Figure 1). North- and West-European countries tend to exhibit similar publication patterns, while Eastern European countries sometimes behave somewhat differently (Kulczycki et al., 2018). This does not appear to carry over to Gold OA publishing, at least not in the SSH: the share of Flemish OA publications is lower in both social sciences and humanities than any of the other three countries. This suggests that national context and incentives may play an important role.

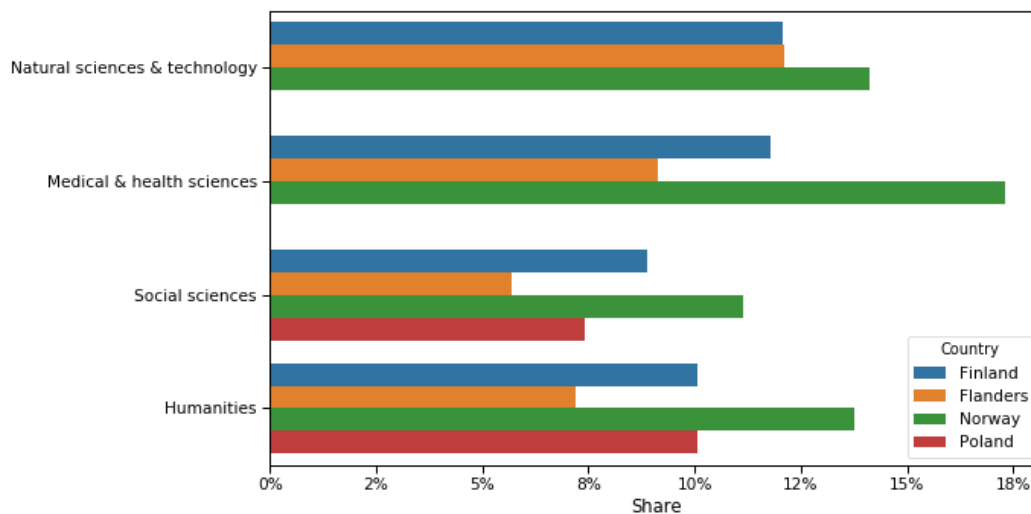


Figure 1. Share of Gold OA articles per field and country

The differences between countries and fields notwithstanding, the overall trend is clear: the share of Gold OA articles is linearly increasing (Figure 2). This increase may be due to multiple factors: the establishment of new Gold OA journals, changes to the business models of existing journals, and changes in journal choice of researchers. Figure 2 suggests that the ratios between the four countries are mostly stable, with Norway having the largest share of OA, followed by Finland and Poland, and finally by Flanders. The recent steep increase for Norway in the SSH is partly due to the establishment of a national OA platform for the most central journals published in the Norwegian language in SSH disciplines (Sivertsen, 2018).

Table 2 displays the 5 most used OA journals in Finland, Flanders and Norway. The top-5 tends to be dominated by international journals that are mostly multidisciplinary or from the natural sciences. Only the large multidisciplinary journals *PLOS One* and *Scientific reports*, as well as *Journal of High Energy Physics*, figure among the most used OA journals in all three countries. Because the Polish data is limited to the SSH, the Polish top-5 is completely different and does not contain any WoS-indexed journals.

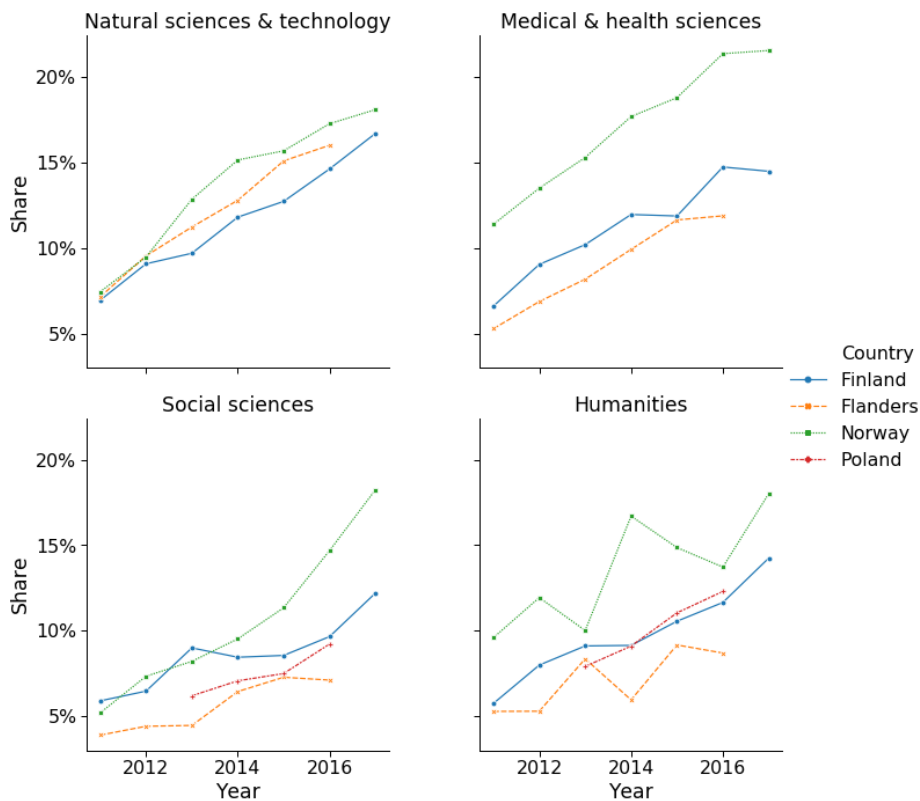


Figure 2. Evolution of share of Gold OA articles per field and country

Table 2. Top-5 most used OA journals per country

Finland	Flanders	Norway
PLoS ONE	PLoS ONE	PLoS ONE
Scientific reports	Scientific Reports	Scientific Reports
Atmospheric chemistry and physics	Optics Express	BMC Public Health
Nature communications	Journal of High Energy Physics	BMJ open
PLoS genetics	BMC Public Health	Atmospheric chemistry and physics

For each of the four fields, we investigate one discipline in more detail: Biological sciences (Natural sciences & technology), Clinical medicine (Medical & health sciences), Educational sciences (Social sciences), and Languages and literature (Humanities). As can be seen from Table 3, the variability between disciplines and countries is, again, substantial. First, some disciplines are an order of magnitude larger than others in terms of number of articles. These size differences are not similar across countries, e.g., Educational sciences appears to be much larger (relatively speaking in terms of the number of articles) in Finland than in Flanders and Poland. Second, the share of OA publications of a discipline seems to be dependent on local circumstances.

Table 3. Number of publications and OA share per discipline and country

		Biological sciences	Clinical medicine	Educational sciences	Languages and literature
Finland	Total	12,375	32,291	4,086	2,656

	OA	2,075	3,088	583	275
	Share of OA	16.8%	9.6%	14.3%	10.4%
Flanders	Total	12,608	18,021	1,444	2,608
	OA	1,450	1,139	104	276
	Share of OA	11.5%	6.3%	7.2%	10.6%
Norway	Total	14,148	32,755	4,899	3,575
	OA	1,544	5,545	808	646
	Share of OA	10.9%	16.9%	16.5%	18.1%
Poland	Total	-	-	6,985	17,917
	OA	-	-	617	1,280
	Share of OA	-	-	8.8%	7.1%

We also investigate the most used OA journals per discipline per country. The distribution of papers per OA journal tends to be highly skewed, with the top-10 journals typically accounting for 50% or more of all OA publications in a given discipline. It is noteworthy that the two most important OA journals in Finland for both Biological and Medical & health sciences are the large multidisciplinary journals *PLoS ONE* and *Scientific reports*. Since disciplines in Flanders are currently assigned at the journal level, publications from either journal are treated as multidisciplinary, even if they may be about, e.g., biology.

Table 4. Number of non-English or multilingual journals among 10 most used OA journals

	Educational sciences	Languages and literature
Finland	4/10	6/10
Flanders	3/10	4/10
Norway	9/10	5/10
Poland	9/10	6/10

All top-10 journals for Biological sciences and Clinical medicine are English language, mostly published in the UK, US, Switzerland (Frontiers) and the Netherlands (Elsevier). Exceptions include Bulgaria (*ZooKeys*), Sweden (*Acta dermato-venereologica*), and Italy (*Haematologica*). The situation is rather different in the SSH, where we also find journals published in other languages (Table 4). These may target a local audience through use of the local language, but there are also examples of non-English journals that reach a broad international audience (e.g., *Zeitschrift für interkulturellen Fremdsprachenunterricht* or *Teoría de la Educación*; cf. Sivertsen, 2018). In addition, there are several instances of multilingual journals, which accept articles written in two or more different languages. As for country of publication, we observe that in some cases the top-10 is largely international, albeit with greater geographical variation than for the natural and medical sciences (e.g., Educational sciences in Finland and Flanders). Other cases exhibit much more concentration in one or a few countries. In Poland, the ten most used journals of both SSH disciplines are all published in one of three Central and Eastern European countries (Poland, Lithuania, Ukraine), including the multilingual and English-language journals.

Discussion and conclusions

By comparing the contents of full-coverage databases to DOAJ, we are able to make an accurate assessment of the current state of Gold OA to peer-reviewed articles in four European countries. The same type of analysis can be used to monitor the further development towards Gold OA.

The overall share of Gold OA differs substantially between countries as well as between fields, and ranges from 5.7 to 17.3%. This finding suggests that the share of Gold OA depends not only on the number of possible OA publishing outlets in a given discipline, but also on more local and contextual factors, such as incentives and perceived quality level. Gold OA is on the rise in Finland, Flanders, Norway and Poland.

A closer investigation into four specific disciplines shows that the most important journals in Biological sciences and Clinical medicine tend to be English-language journals, mostly published by large international publishers. Note, however, that the results from Flanders for these two disciplines may be biased in favour of English-language journals, since the data for Natural sciences & technology and Medical & health sciences derive from WoS. In the SSH disciplines, we find both local and international journals. The latter group can be published in English or another international language, or in multiple languages. All in all, the results demonstrate that, especially for the SSH, the state of Gold OA can only be fully assessed by comparing to a full-coverage database.

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