



Waiving article processing charges for least developed countries: a keystone of a large-scale open access transformation

This article investigates whether it is economically feasible for a large publishing house to waive article processing charges for the group of 47 so-called least developed countries (LDC). As an example, Springer Nature is selected. The analysis is based on the Web of Science, OpenAPC and the Jisc Collections' Springer Compact journal list. As a result, it estimates an average yearly publication output of 520 publications (or 0.26% of the worldwide publication output in Springer Nature journals) for the LDC country group. The loss of revenues for Springer Nature would be US\$1.1 million if a waiver was applied for all of these countries. Given that the subject categories of these publications indicate the output is of high societal relevance for LDC, and given that money is indispensable for development in these countries (e.g. life expectancy, health, education), it is not only desirable but also possible in economic terms for a publisher like Springer Nature to waive APCs for these countries without much loss in revenues.

Keywords

open access; article processing charges; open access large-scale transformation; APC waiver; least developed countries



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Introduction

In recent years a number of funding organizations and research councils have started to support a large-scale transformation towards gold open access (GOA) that is based on article processing charges (APCs). National open access (OA) contracts have been negotiated in Austria, Finland, Hungary, Germany, the Netherlands, Norway, Poland, Qatar, Sweden and the UK, whereby institutions combine their spend on subscriptions and OA to shift the balance towards OA publication as standard.¹ The transformation of the publication environment, from a subscription-based financial model towards APC-based, is undoubtedly complex and bears some risks for all parties involved. In the context of a publication market based on subscriptions, the APCs model comes with some challenges that protagonists

2 must respond to. A major problem of the subscription model has been the limited access to scientific information, especially at locations where funds are scarce and perpetually increasing prices result in a library or serials crisis. In an APC-based environment, different challenges such as questionable publication practices,² double-dipping (publishers receiving both subscriptions and OA revenues on an article)³ and a redistribution of financial burdens of the publication system⁴ arose and were solved, at least in part.

One aspect that recurrently comes up in the political discussion about open access is the question of how to deal with APCs in the case of countries in the so-called Global South.⁵ It is likely that many do not have enough public funds for research to cover the costs for APCs or have other priorities than establishing structures and workflows for the organization of payments for APCs. If a large-scale transformation towards APC-based OA occurred globally, the risk is that the patterns of exclusion might change. In a subscription-based publication environment, readers in countries of the Global South tend to be excluded from access to published research because of paywalls and lack of public funds for subscriptions (Note 1). In a GOA environment based on APCs, authors from countries of the Global South might be excluded because of a lack of funds for publishing. Some publishers have already responded to that challenge by waiving APCs in some of their journals for corresponding authors coming from such countries (Note 2). Given that waivers are usually applied to full OA journals and given that hybrid OA journals are excluded, current models do not provide a comprehensive solution for countries of the Global South.

'how to deal with APCs in the case of countries in the so-called Global South'

This article analyses the possibility of instituting a standard practice of waiving APCs for authors from countries of the Global South from an empirical perspective, focusing on one of the large publishing houses: Springer Nature. It estimates how many publications would be affected if Springer Nature decided to waive APCs on articles from the Global South in all of their journals, as well as the loss of revenues that would result from such a step.

Literature Review

Besides its relevance in a political and bargaining context, this article contributes to a growing field of studies that aim to analyse the current transformation process towards GOA publishing based on APCs (Note 3). Their goal is to understand both the dynamics of the market and the economics of the publishing model.

'two thirds of the journals included in the DOAJ apply publication fees'

By no means all journals providing immediate OA charge an APC. OA journals that do not charge publication fees are sometimes called platinum⁶ or diamond OA.⁷ Firstly, at the global level, Morrison et al.⁸ find that more than two thirds of the journals included in the Directory of Open Access Journals (DOAJ)⁹ apply publication fees. The application of APCs seems to differ by field.¹⁰ For example, for medicine two thirds of the journals do not impose APCs.¹¹ In addition, the take-up of APCs also varies by region. A large share of OA journals not charging APCs can be found in Latin America, the Middle East and Eastern Europe.¹² They are financed by other means, such as subsidies from the state as in the case of Brazil,¹³ grants and support from learned societies, or they are driven by the voluntary and unpaid work of dedicated scientists.

Secondly, a number of studies are interested in the dynamics of the transformation to OA and address to what extent the publication output of an entity of a research system (e.g. institutions, countries, disciplines) is freely available online via the formal communication channel.¹⁴ Studies differ with regard to the databases and the sources of OA information being used as well as the definition of OA types,¹⁵ but, nevertheless, there is some evidence that can be found across all contributions: the share of publications that are freely available online in the formal communication channel has reached a level that can hardly be overlooked and that today contributes to the supply of information within many fields of the sciences, the social sciences and the humanities. In addition, the dynamics of growth of the GOA share is still significant.

3 A third set of studies is interested in the price for publishing in an APC environment. Because of the lack of other data, early studies referred to list prices on publishers' websites¹⁶ or to prices as recorded by the DOAJ.¹⁷ Given that the amount of money that is actually paid for APCs can differ from list prices, and given that payments for articles published in the same journal may also vary, more recent studies are based on collections of actual payments.¹⁸ Five results of the APC prices/payment studies seem to be worth highlighting: the average price/payment reported in different studies varies at a similar scale between €905¹⁹ and €1,479.²⁰ All studies report a large standard deviation, indicating that there is much variance in the pricing of APCs. In addition, there is some evidence that APCs are higher for hybrid journals (subscription journals in which some of the articles are OA) than for full open access journals²¹ and that APCs vary by discipline,²² type of publisher,²³ quality²⁴ and language of the journal.²⁵

A fourth tier of studies investigates the financial effects of an ongoing OA transformation on the level of institutions showing that the transformation towards an APC model might overburden the library budget of research-intensive universities (Note 4).

Research Question

The aim of this analysis is to investigate the financial consequences for publishers of waiving APCs for authors from the Global South. Without any doubt, such a move would help the publisher's reputation as being a responsible partner of the scientific community and might be an option worth considering. However, costs in terms of loss of revenue must be clear to the publisher from the outset.

This article answers this question for Springer Nature journals covered by the UK Springer Compact Agreement. Springer Nature was chosen as it is one of the largest publishing houses worldwide with a strong engagement in OA publishing. The UK Agreement was selected as the agreement covers all hybrid journals that are subject to the current transformation efforts. It collects the majority of Springer's journals that apply a hybrid OA model and are of strategic importance for a transformation towards APC-based OA. The Springer Compact Agreement 2016–2018 includes 1,997 Springer Nature journals, covering all fields in the sciences, social sciences and humanities and allows all members of participating institutions to publish their articles OA.

Methods

Selection of countries

The identification of countries as 'poor' and notions like 'Global South' bear normative implications and the act of attributing such classifications may be contested, undesired and may ill reflect the self-image of these states. An analysis like this can hardly escape this problem as it necessarily must draw on some kind of classification to identify countries where a waiver of APCs would be reasonable. For the purpose of this study the country classification of 'least developed countries' (LDC) seems to be suitable. LDC is a country classification applied by the Committee for Development Policy (CDP) of the United Nations (UN). Unlike the World Bank classification of countries into low, lower-middle, upper-middle and high income countries, that is an obvious alternative, the LDC classification is not based on one (economic) criterion only but on a combination of three: income, human assets index and economic vulnerability index. A recommendation for inclusion takes place if a country does not meet a certain threshold in one of the three criteria, a graduation takes place if a country falls below a higher threshold of two of the three criteria. Income is defined as gross national income (GNI) per capita and an inclusion in the LDC requires a three-year average lower than US\$1,025 (Note 5). The Human Assets Index (HAI) is a composite index including the health indicators 'under-five mortality rate', 'percentage of population undernourished', 'maternal mortality ratio' and the two education indicators 'gross secondary school enrolment ratio' and 'adult literacy rate'. The economic vulnerability index is also a composite index that intends to measure structural vulnerability to economic and environmental shocks and is composed of eight indicators (Note 6). In 2013, 0.7% of global researchers were located in

4 LDC and were involved in 0.6% of the worldwide publication output.²⁶ The most recent LDC list with 47 countries, published in 2018, is used for this study (Note 7).

Data Sources

The analysis makes use of three data sources:

Jisc Collections Springer Compact 2016–2018

A list containing Springer Nature journals was used to identify the relevant set of publications for this study.

Publication database

Publication data and country information of the corresponding author were taken from the Web of Science (WoS). Raw data from WoS were provided by the Competence Centre for Bibliometrics.²⁷ The processed raw database in its version of February 26th 2020 was used in order to conduct an up-to-date analysis. WoS data allows the numbers of CA-publications to be determined for each country in the list of Springer Compact journals as far as they are covered by WoS.

APC cost information

In order to obtain the costs for APCs that were actually paid by institutions, the OpenAPC dataset was used. It is the largest collection of APC payment information from various countries (Note 8). OpenAPC was also used for an estimation of the number of publications not covered by WoS and the calculation of a correction factor. The empirical analysis is organized as follows: for each country (worldwide), the number of publications in Springer Nature journals are calculated by counting each corresponding author (CA-publication) from that particular country. This article makes the assumption that the corresponding author (or their institution) pays for a publication in an APC-based publication market. Therefore, it is key for the estimation of Springer Nature's worldwide distribution of revenues. This principle of cost attribution is, for example, currently applied in large transformative agreements. After an overview of the worldwide distributions, the number of CA-publications is calculated for the LDC country group, as well as for each individual country within that group. In addition, estimations of potential losses of revenues are reported in the case of a waiver for these countries.

Data analysis

As a first step, a table with all article-address-combinations was created for all citable items in journals on the Jisc Collections Springer Compact 2016–2018 list. 'Citable items' include the publication types 'article', 'review' and 'proceedings paper'²⁸ for which APCs are usually paid.²⁹ The time span covers publications from 2016 to 2018. Electronic and print ISSNs were used for matching the Springer Compact list with WoS.

The second step was to calculate the number of CA-publications for each country (the table was enriched with additional country information). In cases in which a publication had more than one corresponding author from different countries, the publication was counted for each country. The rationale behind the calculation method is not to under-estimate the number of publications for a possible waiver (see correction factors below) (Note 9). Finally, loss of revenue for Springer Nature as a consequence of waiving APCs was calculated for LDC as well as for each country in the categories.

Results

Overview

What would a publication market based on APCs look like and from which country would the bulk of revenues for Springer Nature come from? An overview of the worldwide distribution of CA-publications by country is given below. Figure 1 shows a scatter plot of the distribution of

5 all countries worldwide, ordered by the gross national income in million US\$ and the number of publications in the period 2016–2018 with a corresponding author from that country. The two countries with the largest publication output in Springer Nature journals, China and the United States with 88,278 and 65,376 CA-publications respectively, were excluded for better visualization. The distribution indicates that there is a strong correlation between GNI and volume of the CA-publication output and that there are a relatively small number of countries with a strong CA-publication record where the lion's share of Springer Nature's income would come from. For the plot, the GNI is used as an indicator as it is one of the three indicators for assigning countries to LDC. The group of LDC can hardly be detected in the lower left corner as their GNI and their number of CA-publications in 2018 are both small.

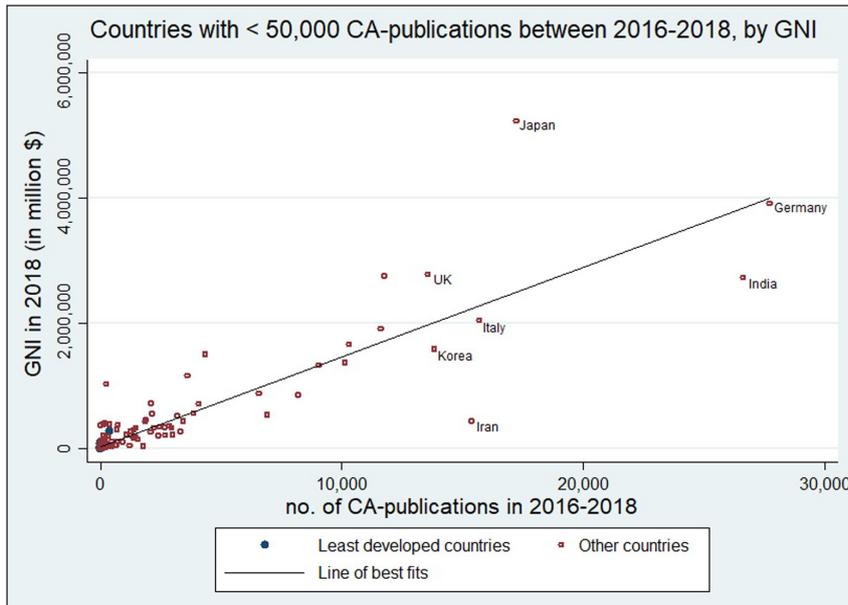


Figure 1. Countries with <50,000 CA-publications between 2016–2018, by GNI

Figure 2 zooms in and plots countries with a CA-publication output of less than 200, which makes the group of the LDC visible. With the exception of Bangladesh and Ethiopia, the number of CA-publications is smaller than 100, thus indicating that this group does not currently contribute much to the publication market. In addition, it is interesting to note that a considerable number of these countries have a CA-publication output of less than five publications.

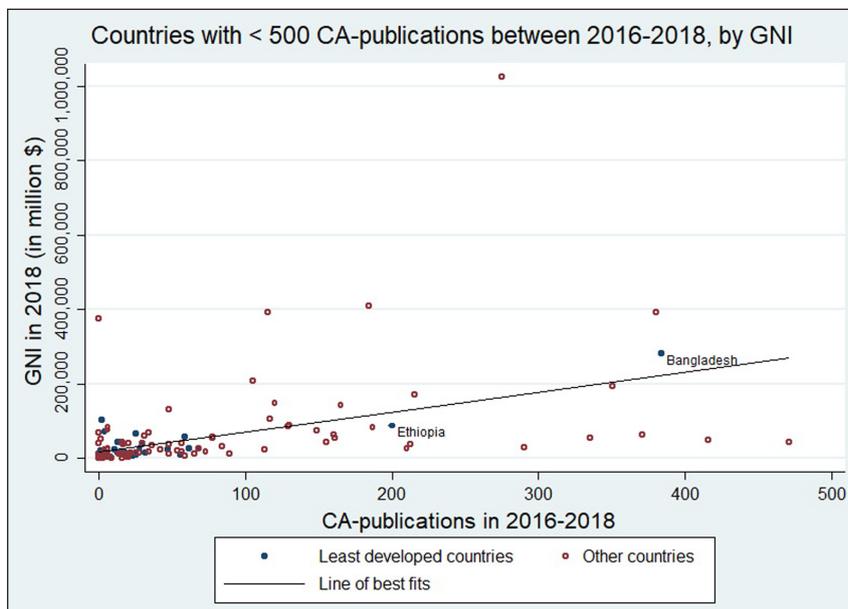


Figure 2. Countries with <500 CA-publications between 2016–2018, by GNI

6 Figure 3 orders countries again by number of CA-publications in the period 2016–2018 but now by GNI per capita. One aspect is worth noting: there are countries with a strong CA-publication record but with a relatively low GNI per capita. The most prominent example is India with a GNI per capita of US\$2,020 in 2018 but also Ethiopia should be mentioned here.

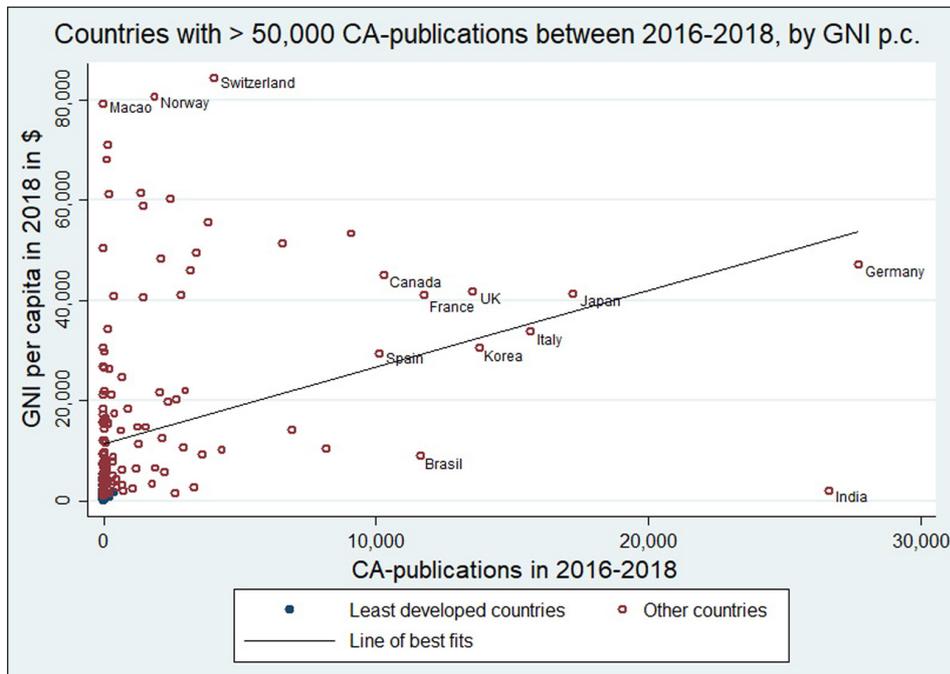


Figure 3. Countries with <50,000 CA-publications between 2016–2018, by GNI per capita

Again, the group of LDC can be hardly detected in the graph. The zoom (Figure 4) shows that the GNI per capita is far below US\$5,000 for most of the LDC group, with the exception of Tuvalu. The two countries with the strongest publication output in the LDC group both have a low GNI per capita (US\$1,750 in the case of Bangladesh and US\$750 in the case of Ethiopia).

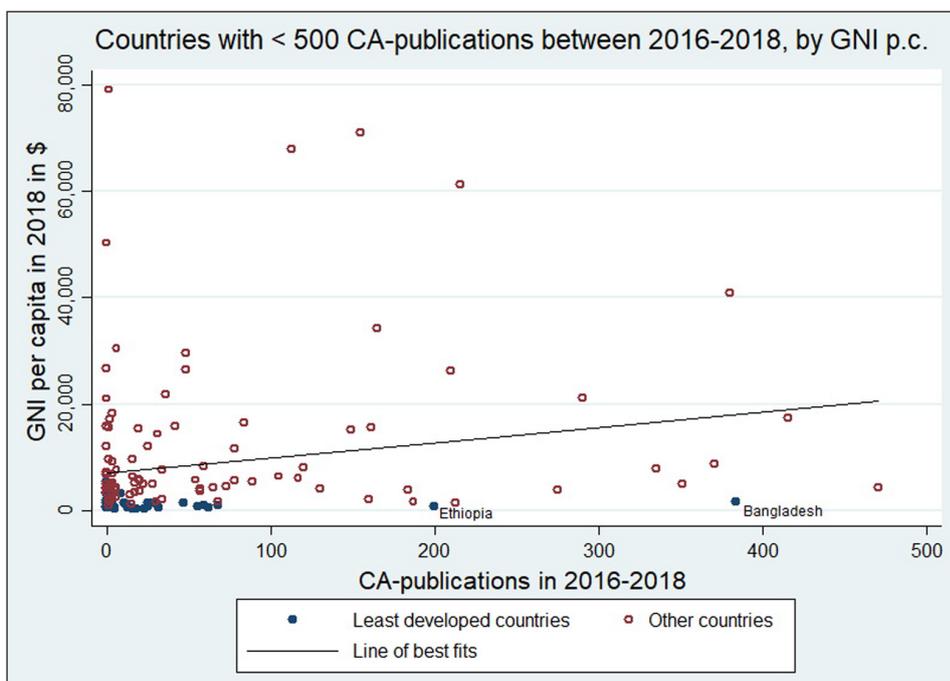


Figure 4. Countries with <500 CA-publications between 2016–2018, by GNI per capita

Correction Factors

The analysis of the number of CA-publications by country based on WoS provides a good overview of the relative share of all countries in a GOA publication market, when APCs are applied. When it comes to the calculation of the financial effects of a possible waiver for APCs, two shortcomings of the data should be considered: the incomplete coverage of Jisc Collections Springer Compact journals in WoS and the incompleteness of corresponding author information. In order to overcome both shortcomings and to come to a qualified estimation of possible financial effects, two correction factors are calculated.

Incomplete coverage of Jisc Collections Springer Compact list in WoS

WoS covers more than 24,000 journals but is not exhaustive. The matching of the Springer Compact list with WoS revealed that only 1,446 of the 1,997 journals were indexed in WoS. In other words, 551 journals (or a share of 28%) are not covered. Given that journals differ regarding the number of citable items published, the share of journals is not an adequate correction factor. Therefore, a different approach is undertaken. For UK institutions, the OpenAPC data set comprises all expenditures for APC, including those of the Springer agreement. For this set of publications, the period 2016–2018 was analysed in order to calculate to what extent they are covered by WoS. The correction factor (Table 1) is simply the ratio of all UK publications in journals of the Jisc Collections Springer Compact list and the number of them covered by WoS.

No. of CA-publications from UK in Springer Hybrid OA journals	No. of them covered by WoS	No. of them not covered by WoS	Correction factor
10,891	8,613	2,278	1.26448

Table 1. Number of UK publications in Springer Hybrid Journals in- and outside WoS (Source: OpenAPC, Pubyear 2018)

Corresponding author information in WoS

Corresponding author information for a publication can sometimes be problematic. On the one hand, there are a number of publications with more than one corresponding author address. In the analysis, a pragmatic solution was followed and all publications were fully counted for all countries involved. On the other hand, there are a number of publications where CA-information is missing. In order to consider these publications, the ratio between all publications and those without CA-information was calculated as a correction factor (Table 2).

No. of publications in Springer Hybrid OA journals	No. of them with CA-information	No. of them without CA-information	Correction factor
464,483	443,064	21,419	1.04834

Table 2. Number of publications in Springer Hybrid Open Choice Journals covered by WoS: All, with and without corresponding author information (period 2016–2018)

CA-publication output of least developed countries

The results of the analysis for the group of LDC are given in Table 3. The column 'CA-pub. all' reports the number of publications of corresponding authors from a particular country for the period 2016–2018 in WoS, followed by three columns that break down the number to individual years. Column 'CA-pub av.' contains the arithmetic mean of the three years and column 'CA-pub. av. corr.' multiplies the arithmetic mean with the two correction factors and can be regarded as a qualified estimation of the overall CA-publication output of a country or country group in Jisc Collections Springer Compact journals. The column 'Loss of rev.' calculates the losses of revenues for Springer Nature in the case that the publisher decides to waive APCs for the particular country. It is based on the 'CA-pub. av corr.' multiplied by the average amount of APCs paid by UK institutions for Springer hybrid journals in 2018. This amount is €2,200 (Note 10).

Country	ISO3 code	GNI p.c 2018	CA-pub. all	CA-pub. 2018	CA-pub. 2017	CA-pub. 2016	CA-pub. av.	CA-pub. av.corr.	Loss of rev.
Bangladesh	BGD	1,750	384	145	138	101	128.0	169.7	373,290
Ethiopia	ETH	790	200	90	69	41	66.7	88.4	194,422
Nepal	NPL	970	68	20	28	20	22.7	30.0	66,104
Uganda	UGA	620	62	29	15	18	20.7	27.4	60,271
Tanzania	TZA	1,020	59	16	24	19	19.7	26.1	57,355
Benin	BEN	870	56	18	21	17	18.7	24.7	54,438
Senegal	SEN	1,410	47	14	12	21	15.7	20.8	45,689
Burkina Faso	BFA	670	32	13	12	7	10.7	14.1	31,108
Yemen, Rep.	YEM	NA	30	13	8	9	10.0	13.3	29,163
Zambia	ZMB	1,430	28	10	10	8	9.3	12.4	27,219
Rwanda	RWA	780	25	10	5	10	8.3	11.0	24,303
Sudan	SDN	1,560	25	8	9	8	8.3	11.0	24,303
Malawi	MWI	360	23	8	8	7	7.7	10.2	22,359
Mozambique	MOZ	460	18	8	6	4	6.0	8.0	17,498
Madagascar	MDG	510	16	4	8	4	5.3	7.1	15,554
Niger	NER	390	16	10	2	4	5.3	7.1	15,554
Congo, Dem.	COD	490	13	4	3	6	4.3	5.7	12,637
Mali	MLI	840	13	5	4	4	4.3	5.7	12,637
Cambodia	KHM	1,390	11	4	4	3	3.7	4.9	10,693
Vanuatu	VUT	3,130	9	2	4	3	3.0	4.0	8,749
Togo	TGO	660	5	3	2	0	1.7	2.2	4,861
Burundi	BDI	280	5	5	0	0	1.7	2.2	4,861
Lao PDR	LAO	2,450	4	0	2	2	1.3	1.8	3,888
Myanmar	MMR	1,310	4	3	0	1	1.3	1.8	3,888
Guinea	GIN	850	3	1	2	0	1.0	1.3	2,916
Bhutan	BTN	2,970	2	1	0	1	0.7	0.9	1,944
Angola	AGO	3,370	2	1	0	1	0.7	0.9	1,944
Mauritania	MRT	1,160	2	0	0	2	0.7	0.9	1,944
Lesotho	LSO	1,390	2	1	0	1	0.7	0.9	1,944
Gambia, The	GMB	710	2	1	1	0	0.7	0.9	1,944
Guinea-Bissau	GNB	750	2	0	2	0	0.7	0.9	1,944
Sierra Leone	SLE	490	2	0	1	1	0.7	0.9	1,944
Solomon Isl.	SLB	2,020	1	0	0	1	0.3	0.4	972
Eritrea	ERI	NA	1	1	0	0	0.3	0.4	972
Afghanistan	AFG	550	1	0	1	0	0.3	0.4	972
Somalia	SOM	NA	1	1	0	0	0.3	0.4	972
Liberia	LBR	610	1	1	0	0	0.3	0.4	972
Chad	TCD	670	1	0	0	1	0.3	0.4	972
Djibouti	DJI	3,190	0	0	0	0	0.0	0.0	0
Tuvalu	TUV	5,430	0	0	0	0	0.0	0.0	0
Cent. Afric. Rep.	CAF	490	0	0	0	0	0.0	0.0	0
Timor-Leste	TLS	1,820	0	0	0	0	0.0	0.0	0
South Sudan	SSD	NA	0	0	0	0	0.0	0.0	0
Sao Tome	STP	1,890	0	0	0	0	0.0	0.0	0
Kiribati	KIR	3,140	0	0	0	0	0.0	0.0	0
Comoros	COM	1,380	0	0	0	0	0.0	0.0	0
Haiti	HTI	800	0	0	0	0	0.0	0.0	0
SUM			1,176	450	401	325	392.0	519.6	1,143,202

Table 3. Least developed countries, number of CA-publications (2016–2018)

9 An important question regarding the publication output is whether there are typical subjects and fields in which corresponding authors from the LDC group publish. The WoS provides a subject classification that attributes each journal and all of their publications to one (or more) of 256 subjects.

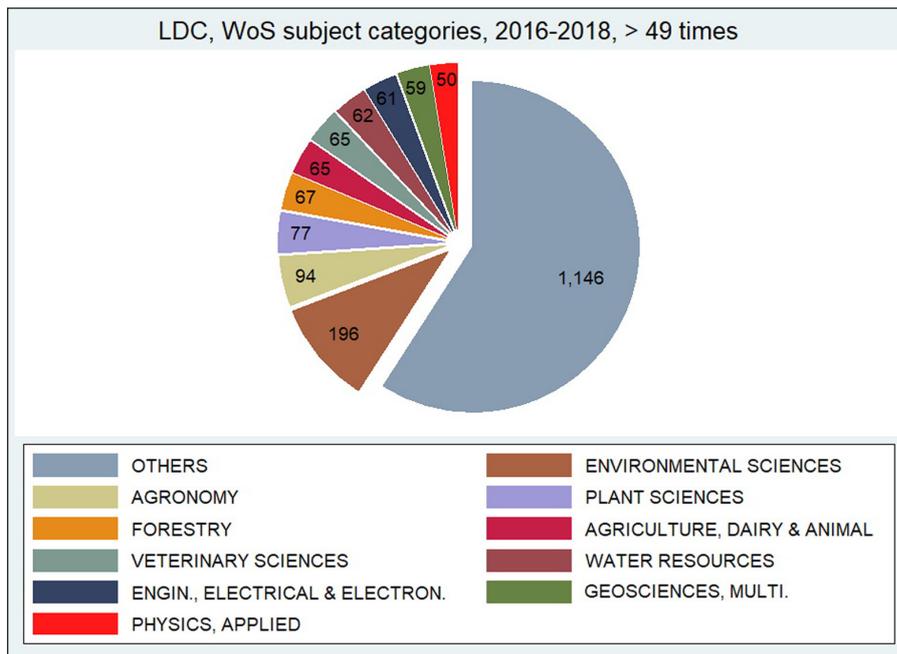


Figure 5. LDC, WoS subject categories, 2016–2018, >49 times

Before the main characteristics of the distribution are described, two methodical remarks should be made. First, corresponding authors from LDC publish in a large variety of different WoS categories. Therefore, subject categories with an output below a threshold of 50 publications were summarized in the category 'other'. Second, journals can be assigned to more than one of the WoS categories. Therefore, the cumulated number of all subject categories is larger than the number of publications reported in the previous sections.

A look into the distribution (Figure 5) reveals that large fractions of the publication output appear to refer to societal conditions, problems and challenges of LDC. For example, in the subjects 'agriculture', 'agronomy', 'plant science', 'water resources' and 'veterinary science' that are relevant for the production and supply of food, and also for 'environmental science', 'geoscience' and 'forestry' that may study environmental conditions (and changes of these). This distribution indicates that large parts of the research of authors from LDC address major societal conditions and provide knowledge of high practical relevance.

Discussion

This article provides an analysis for the CA-publication output of the period 2016–2018 in Springer Nature journals for the LDC group and for all individual countries within these groups. Given that, on the one hand, the worldwide differences in terms of income are striking and, on the other hand, research and academic publishing are extremely costly activities, the empirical results and the comparisons suggested by this study tend to be absurd. In particular, two empirical results of the study are worth highlighting:

First, it turned out that both the CA-publication output in WoS and the estimated overall publication output (in journals in WoS and not in WoS) are low for LDC, when compared with the worldwide publication output (Note 11).

Country group	Av. GNI p. c.p per country	CA-pub. av.	CA-pub. av. corr	Share of worldwide CA-pub.
LDC	\$1,345	392.0	519.6	0,26%

Table 4. LDC, GNI and CA-publications

In addition, a skewed publication output is not only found when comparing countries on a worldwide level but also within the LDC group as Ethiopia’s and Bangladesh’s shares sum up to 50% of the overall publication output of LDC.

Second, the relation of the average costs that are actually paid for a publication in a journal of the Springer Compact list and the average GNI per capita is remarkable. An APC for a single article is much higher than the average income per year of a citizen in one of the LDC.

Regarding the request for a waiver for APCs, the following conclusions can be drawn: the share of CA-publications of LDC is low in journals of the Jisc Collections Springer Compact list. It would therefore be possible in economic terms for a publisher like Springer Nature to waive APCs for these countries without much loss in revenue (Table 4). Given that money is indispensable for development in the case of LDC (e.g. life expectancy, health, education), it is also desirable that public funds in these countries should not be spent on APCs. This particularly applies against the background of the analysis of the subject categories, suggesting that large parts of the publication output are of high societal relevance for LDC.

‘An APC for a single article is much higher than the average income per year of a citizen in one of the LDC’

However, the possibility of instituting a standard practice of waiving APCs for authors from countries of the Global South only works as long as the publishers voluntarily agree on it. A disadvantage of this option is, without doubt, that it is not self-sustaining in the long term.

Not all publishers’ portfolios are identical and those that specialize in some of the disciplines listed above might see a disproportionate revenue loss. In this case there are various alternative strategies that could be employed based on the particular data set. For example, possible strategies could include the exclusion of certain countries from the waiver, exclusion of certain disciplines, a possible APC discount instead of a full waiver or the number of CA-publications, beginning with the country with the highest number. A further model could be for high income countries to cover some of the costs of waivers or reductions. However, it is recognized that some, if not all, of these scenarios may not be welcomed by the countries in question and this view needs to be balanced against the desire to transition to a fairer open access model.

‘waivers and reductions should apply as an automatic procedure and should not require any kind of application by the author’

Whatever the model adopted, waivers and reductions should apply as an automatic procedure and should not require any kind of application by the author. The number of CA-publications would need to be monitored to establish trustful relations between the country and the publisher and to avoid free-riding of authors from other countries. OpenAPC is well placed to collate this data on an annual basis and to make it openly available for scrutiny and further analysis. Ultimately, an APCs fee waiver for an LDC country would be a temporary solution for as long as a particular country met the conditions outlined above.

Conclusion

Waiving APCs for LDC might be a means for publishers to improve their reputation within the scientific community and might help them to be attributed as a socially responsible partner of science. In the past, there have been examples of responsible actions by publishers. Besides a waiver for low income countries in a set of full OA journals, one may recall the provision of open access to relevant publications in response to the outbreak of swine flu (H1N1) and the current Covid-19 pandemic, as well as temporary access to relevant publications in the crisis and other catastrophic events (e.g. Ebola, HIV, Hurricane Katrina). The number of publications concerned was at a similar level to that of the annual publication of LDC in Springer Nature Compact journals.

The authors of this article would strongly encourage further empirical research in this area in order to ensure a fair and equitable transition to open access for all countries.

Abbreviations and Acronyms

A list of the abbreviations and acronyms used in this and other *Insights* articles can be accessed here – click on the URL below and then select the ‘full list of industry A&As’ link: <http://www.uksg.org/publications#aa>

Competing Interests

Graham Stone is a member of the *Insights* editorial board. All other authors have declared no competing interests.

Notes

1. Initiatives such as Research4Life, <https://www.research4life.org/> (accessed 11 November 2020) address the problem of the exclusion of researchers and professionals from low and low-middle income countries within the subscription model by offering free or low-cost access.
2. Wiley, for example, applies a pricing model with waivers and discounts for some countries and some journals <https://authorservices.wiley.com/open-research/open-access/for-authors/waivers-and-discounts.html> (accessed 11 November 2020), Springer Nature and BioMed Central waives APCs for low income countries and offers discounts for lower middle income countries <https://www.springernature.com/de/open-research/policies/journal-policies/apc-waiver-countries> (accessed 18 November 2020) <https://www.biomedcentral.com/getpublished/article-processing-charges/open-access-waiver-fund> (accessed 18 November 2020) but only for full OA and not for hybrid journals.
3. Early prominent examples are BioMed Central and the Public Library of Science which adopted publication fees already around 2000. See Bo-Christer Björk and David Solomon, “Article Processing Charges in OA Journals: Relationship between Price and Quality,” *Scientometrics* 103, no. 2 (May 2015): 373–85, <https://doi.org/10.1007/s11192-015-1556-z> (accessed 11 November 2020) and David Solomon and Bo-Christer Björk, “A Study of Open Access Journals Using Article Processing Charges,” *Journal of the American Society for Information Science and Technology* 63, no. 8 (2012): 1485–95, <https://doi.org/10.1002/asi.22673> (accessed 11 November 2020).
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6. The LDC identification criteria and indicators are published on the website of the UN: <https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-criteria.html> (accessed 11 November 2020).
7. The list of countries used in this report was retrieved from the website of the UN: <https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-data-retrieval.html> (accessed 11 November 2020).
8. On March 31st 2020 it contained cost information for 104,661 OA articles in full OA and hybrid journals, amounting to €207,687,858 and contributed by 262 institutions <https://www.intact-project.org/openapc/> (accessed 11 November 2020).
9. However, the consideration of costs for APCs for both countries are only of minor consequence in the case of the LDC country group. Only three publications in the period 2016–2018 with corresponding authors from an LDC have another corresponding author from a second country.
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