

1 Disclosing funding sources for open 2 access publication fees: the Open APC 3 initiative

4 Najko Jahn¹ and Marco Tullney²

5 ¹Bielefeld University Library, Bielefeld University, Bielefeld, Germany

6 ²Technische Informationsbibliothek (TIB) - German National Library of Science and
7 Technology, Hannover, Germany

8 ABSTRACT

9 Publication fees in open access publishing hold a prominent place on the agenda of researchers, policy-
10 makers, and academic publishers. This paper contributes to the evolving empirical basis on open access
11 funding. It describes the Open APC initiative, in which German universities and research organizations
12 share their expenditures for publication fees. As method, the initiative uses existing open data tools to
13 aggregate and disseminate institutional spending on open access publication fees. In total, 29 German
14 research organizations self-reported funding of 6,279 open access journal articles, which amounted to
15 8,039,339 €. The average payment for each article was 1,280 €, and the median payment 1,209 €. Our
16 data-set comprises only 53 articles in hybrid journals. With an indexing coverage of 99 %, the findings
17 reveal that the DOI agency CrossRef provides both comprehensive bibliographic coverage of the funded
18 open access journal literature and disambiguated names of journal titles and publishing houses. We
19 show that authority control of these bibliographic information is particularly relevant for the comparative
20 study of the economical effects of open access publishing.

21 Keywords: Open access, open access journal, scholarly publishing, publication fees, article processing
22 charges, science policy

23 INTRODUCTION

24 Publication fees, often paid by funders or universities, are a widely discussed open access business model.
25 Yet, how and to what extent these activities are effective in terms of the number of supported research
26 articles and associated costs remains under debate. This paper describes the Open APC initiative¹, in
27 which German universities and research organization share spendings on open access publication fees,
28 and how it is currently implemented. More specifically, it addresses three problem areas when studying
29 the economical effects of open access publishing: fragmentation of open access funding, variable pricing
30 schemes and the comparison across research institutions. Such an approach extends methods and improves
31 data collection activities for researchers and practitioners, as well as contribute to a better understanding
32 of factors affecting the analysis of publication fees in open access publishing.

33 The rise of open access journals matches the increasing relevance of publication fees in academic
34 publishing (Davis and Walters, 2011; Laakso and Björk, 2012; Pinfield, 2015). To cover these fees,
35 authors tend to make use of funding that grant agencies or academic institutions provide (Suber, 2012).
36 However, collecting information about what was funded is in most cases difficult. One reason why
37 payments made for open access journal publications are often hard to track is that, on the one hand,
38 they are fragmented across the budgets of funding agencies, research institutions, and libraries, and, on
39 the other hand, taken from personal budgets. Furthermore, open access funding mostly exists in higher
40 income countries, mainly to support research articles in the bio- and physical sciences (Solomon and
41 Björk, 2011). Personal budgets stand in contrast with those support structures and are likely used to cover
42 low price publication fees (Björk, 2015; Solomon and Björk, 2011). Along with the fragmentation of
43 payments, funding for open access publications lacks transparency because the parties involved - authors,

¹<https://github.com/openapc/openapc-de>

universities, funders, publishers - neither release information on who pays for what nor the costs of publishing (Björk and Solomon, 2014), a situation similar to the lack of transparency regarding journal subscriptions (Lawson and Meghreblian, 2015). It also remains unclear which factors contribute to price formation.² While fixed prices for individual articles are common, agreements between publishers and institutions often provide discounts and publishers sometimes waive publication fees for authors from low-income countries (Björk and Solomon, 2012; Lawson, 2015b). Other factors leading to a complex landscape of variable pricing schemes (Pinfield et al., 2015) include submission or page charges (Björk and Solomon, 2012). Hybrid journals substantially add to this complexity, because comprehensive offset systems to avoid paying for the same article twice, through subscription and publication fee, are rare, which, in turn, leads to the phenomena of “double dipping” in scholarly publishing (Pinfield et al., 2015).

This complex situation of fee-based open access publishing creates difficulties for researchers and practitioners alike. Because of fragmented payments, the extent of funding remains unclear. To increase transparency, some research funders have begun collecting and disclosing expenditures for open access journal articles as open data. As per definition, open data is data that “can be freely used, modified, and shared by anyone for any purpose” (Dietrich et al., 2016). Therefore, opening up information about the funding of open access journal articles promises to enhance the discussion about current and future business models in academic publishing. To our knowledge, the first research funders providing such data were the Wellcome Trust (Kiley, 2014) and the Austrian Science Fund FWF (Reckling and Kenzian, 2014), who both released data on publication fees they had funded. The British not-for-profit company Jisc followed by collecting data from higher-education institutions in the UK (Lawson, 2015a). Disclosed as publicly available spreadsheets, these data-sets self-report expenditures along with bibliographic information, including title, journal and publisher, persistent identifier to the publisher’s version, and a link to a deposit in a subject repository. Curatorial efforts focused on the disambiguation of publisher and journal titles as well as on detecting duplicates. In the case of the Wellcome Trust, crowd-sourcing data cleaning activities through a Google spreadsheet in combination with checks against bibliographic sources massively improved the spending data (see comments in Kiley (2014)).

The open access landscape in Germany, which is the focus of this paper, shares the general problems of in-transparency regarding funding schemes and costs as discussed above. The Deutsche Forschungsgemeinschaft (DFG), the largest research funder in Germany, has been encouraging open access publishing since years. It launched its “Open-Access Publishing” program in 2009 that has strongly influenced the support of open access publication fees through funds managed by university libraries.³ With this program, the DFG aims to help universities to establish support structures for publishing in open access journals where authors are requested to pay a publication fee. To reduce administrative burdens, grantees agree not only to reimburse the bills on behalf of the researchers they support, but also to look for ways to improve the handling of those financial transactions. Examples include central invoicing schemes and related agreements between university libraries and publishers. Grantees are also required to report the institutional publication output and their fees paid for open access journal articles to the DFG on a regular basis, and to present the university-wide strategy to sustain the funds when DFG’s initial support runs out lately in 2019. The DFG enforces a set of criteria grantees have to comply with, leading to similar implementations for supporting open access publishing across German universities: these criteria exclude sponsoring of articles in hybrid journals, and the funding of articles whose publication fee exceeds 2,000 € (excluding VAT) (Fournier and Weihberg, 2013). Research institutes organized in the Fraunhofer-Gesellschaft, Helmholtz-Gemeinschaft, Leibniz-Gemeinschaft, and Max-Planck-Gesellschaft are not eligible for this funding program, contributing to the diversity of schemes in Germany. In response, some organizations have adopted similar processes to support authors. The Max-Planck-Gesellschaft operates their long-lasting open access activities, including handling spending and publisher agreements centrally, through the Max Planck Digital Library (Schimmer et al., 2013; Sikora and Geschuhn, 2015), while the Leibniz-Gemeinschaft set up a dedicated open access fund in 2016.

The growing share of articles published in fee-based open access journals in recent years has led to calls for an unified approach towards funding of publication fees. The Allianz der Wissenschaftsorganisationen⁴, representing all major research organizations in Germany, thus marks transparency as a major means to

²These might include article processing, impact, rejection rates, management and investment, and profit margins. See Noorden (2013) for a general discussion and Gumpenberger et al. (2012) and Björk and Solomon (2015) for discussions of journal impact and quality.

³Guidelines for the funding program can be found here: http://www.dfg.de/formulare/12_20/

⁴http://www.dfg.de/en/dfg_profile/alliance/index.html

sustain an “adequate open access publication system” (Bruch et al., 2015). However, there are various ways to achieve this goal. The existing approaches in Austria and the United Kingdom have one institution in charge to collect and analyze the data. The history of the Open APC initiative is rather bottom-up: In May 2014, Bielefeld University Library began to share its expenditures for publication fees. The library put its approach to the working group “Electronic Publishing” of the Deutsche Initiative für Netzwerkinformation (DINI)⁵ as a basis for discussion, and invited others to participate. Reflecting the increasing demand for publicly available data, contributions from Universität Regensburg and Universität Hannover followed soon after. As of writing, 29 universities and research institutes voluntarily reported their data to the Open APC initiative to be included into a unified data-set of all expenditures.

Drawing on self-reported cost data, we asked to what extent German universities and research institutions covered publication fees for open access journal articles over the last years. More specifically, we addressed three questions that arose while studying fee-based open access publishing: how to gather bibliographic metadata about sponsored open access journal articles, how is institutional publication fee spending distributed over publishers and journal titles, what is the share of sponsored articles in open access journals versus hybrid journals.

METHODS AND MATERIALS

The study examined cost information provided by the Open APC initiative. Under this umbrella, German universities and research institutions shared details of how much open access journals charged authors as open data. We analysed the data-set that was released on 13 May 2016 and is stored as version v2.4.2 in the corresponding GitHub repository. At the time of our study, the data-set reported the amount institutions paid for each article including value added tax, and the year an article was invoiced. Bibliographic metadata consisted of the Digital Object Identifier (DOI) to uniquely identify an article, the publisher, and information about the journal titles. The Open APC initiative automatically retrieved this publisher and journal information from CrossRef, a DOI minting agency for scholarly literature. Furthermore, the data-set differentiated whether an open access article was published in a subscription based journal (“hybrid journal”).

For gathering normalized publisher and journal titles, we re-aggregated the bibliographic metadata from CrossRef using the DOI on 19 May 2016 because of two reasons: First, CrossRef provides incremental metadata updates to reflect the dynamic landscape of academic publishing including ongoing mergers of publishing houses or name changes. A prominent example in this regard is the merger of the two large publishing houses Springer Business + Media and Nature Publishing that now operate under “Springer Nature”. In contrast to this, the Open APC initiative normalized publisher and journal titles based on CrossRef shortly after the institution had provided its cost data. Therefore, re-aggregating the data-set ensures unique reference to currently existing publishers and journals at the expense of information about to which publisher a journal belonged while a sponsored article was published.

Secondly, CrossRef is not the only registration agency for DOI’s, but also DataCite and Medra mint DOIs for scholarly work. While obtaining bibliographic information from CrossRef, we also examined the number of publications for which each of the DOI registration agency provided metadata during our study. As a client, we used the R package `rcrossref` (Chamberlain et al., 2016) developed and maintained by the rOpenSci initiative.⁶ With the function `cr_cn`, we requested the linking resource `application/vnd.crossref.unixsd+xml`, which main function is to support text mining activities.⁷ The advantage of this XML format was that it distinguishes full and abbreviated journal titles as well as the media types of ISSN’s, the International Standard Serial Number used to identify journals. It also contained license information and disambiguated publisher information, thus avoiding confusion about licensing and naming of publisher houses other studies were faced with when working with self-reported data (Woodward and Henderson, 2014). In cases where no bibliographic information could be obtained, we used the Open APC values.

After summarizing publication fee spending per institution, publisher and journal, we compared the share of hybrid journal articles in the Open APC data-set with those of Wellcome Trust, FWF and Jisc. For this aim, we systematically reviewed the proportions for each year from the accompanying literature.

⁵<http://dini.de/english/ag0/e-pub0/>

⁶rOpenSci: <https://ropensci.org/>

⁷CrossRed: Text and Data Mining for Researchers: <http://tdmsupport.crossref.org/researchers/>

RESULTS

Cost Data

On May 13, 2016,⁸ the Open APC initiative covered 7,417 articles whose publication fees were centrally paid by 30 German universities and research institutions until 2015. The number of supported open access journal articles grew over the years (see Figure 1). While one institution disclosed 5 payments made in 2005, the majority shared their expenditures from 2013 onwards. With 1,999 articles, the year 2015 was best represented in our data-set. However, 27 institutions contributed their cost data for 2015 at the time of this analysis, suggesting that there exists a time lag between payments made and reporting these spending to the Open APC initiative.

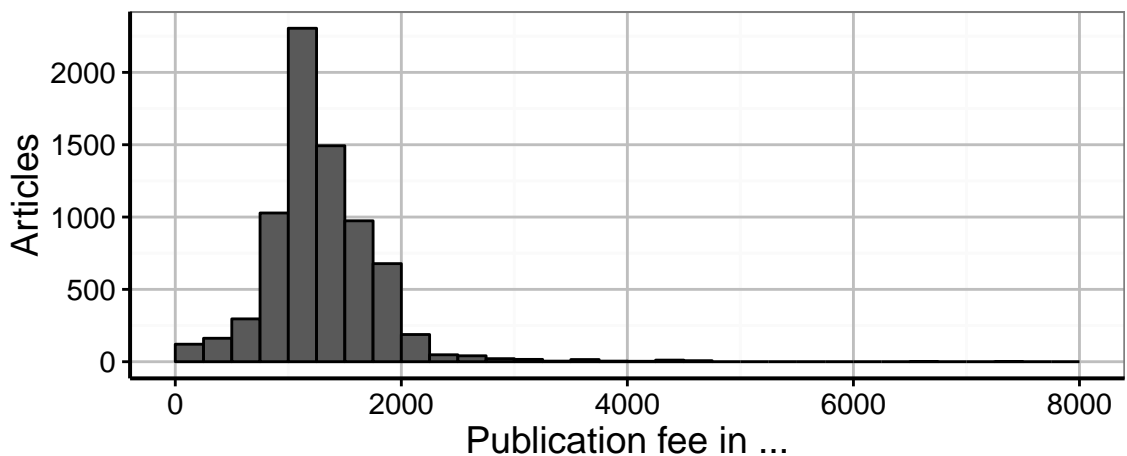


Figure 1. Histogram APC

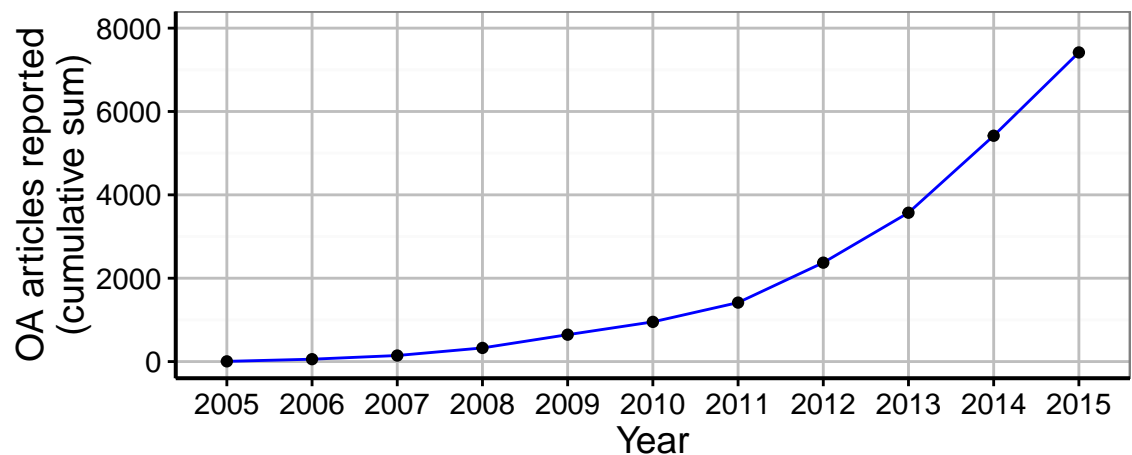


Figure 2. Growth of Open APC Initiative

Among all articles, fees amounted to 9,627,537 € including VAT, the average payment was 1,298 € and the median value 1,231 €. Figure 2 shows the large price variation among the articles. The disclosed publication fees ranged from 40 € to 7,419 €. However, the average price paid varied somewhat during the period 2011 and 2014 (1239 - 1289 €). We also observe that 6,996 (94%) of the publication fees were paid in accordance with the DFG price cap of 2,000 €. Whereas related open data initiatives in Austria and the United Kingdom reported a large share of spending for hybrid journal articles, the situation in Germany is different: only 60 articles in hybrid journals were reported by 3 out of 30 research institutions, accounting for 0.81 % of the overall payments.

⁸The data is openly available on GitHub. The following analysis is based on version 2.1.13 of the dataset, available at <https://github.com/OpenAPC/openapc-de/tree/v2.1.13>.

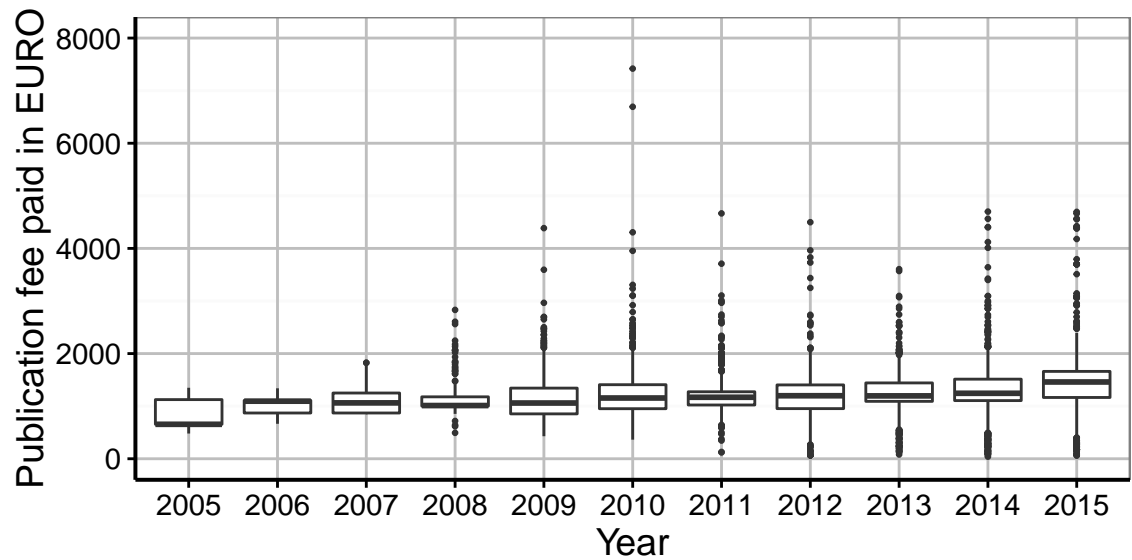


Figure 3. Payments per year

162 The number of APC payments per institutions varied considerably (see Table 3). With 2,856 reported
 163 articles, the Max Planck Society contributed 39 % of the overall submissions. In contrast, the two
 164 universities of technology, TU Clausthal and TU Ilmenau, who recently begun to set up support structures
 165 for fee-based open access journal articles, shared payments made for four articles each.

Table 1. Institutions self-reporting expenditures for open access publications (in €)

Institutions	Articles funded	Total	Mean	Median	Minimum	Maximum
MPG	2,856	3,661,120	1,282	1,168	69	7,419
Goettingen U	650	883,918	1,360	1,354	180	4,695
KIT	426	523,166	1,228	1,243	69	3,731
Regensburg U	399	503,205	1,261	1,207	77	4,403
Muenchen LMU	365	463,491	1,270	1,299	496	2,023
TU Muenchen	308	390,086	1,267	1,386	131	2,122
Bielefeld U	262	322,815	1,232	1,234	142	2,103
Giessen U	243	326,082	1,342	1,247	81	4,498
Konstanz U	221	302,659	1,369	1,380	40	2,072
Heidelberg U	215	308,348	1,434	1,500	60	2,042
Wuerzburg U	207	286,543	1,384	1,447	105	2,514
Leipzig U	173	243,873	1,410	1,471	341	2,055
FZJ - ZB	158	196,869	1,246	1,177	370	3,700
TU Dresden	130	175,723	1,352	1,415	200	2,193
Duisburg-Essen U	114	136,911	1,201	1,214	238	1,982
FU Berlin	106	142,671	1,346	1,292	220	2,000
GFZ-Potsdam	106	126,520	1,194	1,065	223	4,403
Bayreuth U	92	105,725	1,149	1,200	82	2,059
Bochum U	71	93,546	1,318	1,438	100	2,042
Hannover U	69	90,259	1,308	1,241	149	2,159
MDC	69	145,256	2,105	1,800	491	4,700
TU Chemnitz	36	37,826	1,051	1,142	78	2,123
Kassel U	35	35,550	1,016	1,142	150	1,861
Hamburg TUHH	24	32,789	1,366	1,466	300	2,027
Potsdam U	24	32,128	1,339	1,386	916	2,116

Institutions	Articles funded	Total	Mean	Median	Minimum	Maximum
Bamberg U	22	23,663	1,076	1,009	90	2,010
TU Ilmenau	13	13,053	1,004	986	178	2,077
Dortmund TU	9	8,238	915	900	155	1,738
TU Clausthal	8	6,999	875	918	181	1,724
INM - Leibniz-Institut für Neue Materialien	6	8,505	1,418	1,492	237	2,454

CrossRef indexing

Along with the price information, participating institutions were required to identify funded articles by their DOI. They were reported for 7,373 out of 7,417 articles. Of those, `my_apc %>% filter(indexed.in.crossref == TRUE) %>% nrow()` were indexed in CrossRef, representing `my_apc %>% filter(indexed.in.crossref == TRUE) %>% nrow() / my_apc %>% nrow() * 100 %` of all funded publications. The reasons why articles identified by a DOI were not registered with CrossRef differed. Some journals were not indexed by CrossRef at the time of our study but by the DOI agencies DataCite (Journal of new frontiers in spatial concepts published by KIT Scientific Publishing) and Medra (DIE ERDE: Journal of the Geographical Society of Berlin). In other cases, either the DOI did not refer to the full text despite the fact that the journal was indexed on a regular basis (compare <http://doi.org/10.1186/1471-2105-13-S19-S7> with <http://bmcbioinformatics.biomedcentral.com/articles/10.1186/1471-2105-13-S19-S7>) or the resource type could not be retrieved, although the DOI resolves (<http://doi.org/10.1186/s12885-015-1795-7>).

Cost data by publisher and journal

We used the DOI to automatically fetch publisher and journal names for each article from the CrossRef REST API. Table 4 shows the top ten publishers in terms of payments made that represent 92 % of the spending for publication fees. In total, payments were made to 139 publishing houses. In comparison with data from the UK, full open access publishers have a greater share on total spending. Pinfield et al. (2015), for instance, reported remarkably lower numbers for the open access publishers MPDI AG, Copernicus GmbH, and Hindawi Publishing.

Table 2. Publication fees paid per publisher (in €)

Journal	Articles funded	Total	Mean	SD	Median	Range
Springer Nature	2,167	2,948,697	1,361	387	1,385	80.92 – 4403
Public Library of Science (PLOS)	1,680	2,243,128	1,335	321	1,207	555.66 – 2790.27
Frontiers Media SA	906	1,186,283	1,309	424	1,142	77.35 – 4179
Copernicus GmbH	841	1,160,450	1,380	658	1,277	69.12 – 7418.88
IOP Publishing	677	699,137	1,033	228	953	374.77 – 1950
MDPI AG	208	236,729	1,138	453	1,177	154.43 – 2054.68
Hindawi Publishing Corporation	120	125,495	1,046	538	947	174.99 – 2225.22
The Optical Society	111	176,665	1,592	392	1,626	498.62 – 3731.09
Wiley-Blackwell	78	126,148	1,617	467	1,601	490.58 – 3065

Journal	Articles funded	Total	Mean	SD	Median	Range
Oxford University Press (OUP)	64	118,225	1,847	793	1,741	297.5 – 4498.2
Other	565	606,578	1,074	840	922	40 – 4699.61

Most of the funding of publication fees in Germany went to the publisher Springer Science + Business Media, especially profiting from the merge with the former full open access publisher BioMed Central. In contrast, other established publishing houses such as Elsevier and Wiley-Blackwell rank lower, presumably because they mostly publish hybrid journals, which were not well represented in our data-set at the time of the study. Table 4 also illustrates the variation across and within publishers, which confirms earlier findings (Pinfield et al., 2015).

Table 3. Publication fees paid per journal (in €)

Journal	Articles funded	Total	Mean	SD	Median	Range
PLOS ONE	1,433	1,745,513	1,218	130	1,198	748.71 – 1808.8
New Journal of Physics	673	693,322	1,030	225	953	374.77 – 1856.4
Atmospheric Chemistry and Physics Discussions	281	437,903	1,558	776	1,403	233.86 – 7418.88
Frontiers in Psychology	271	363,794	1,342	429	1,142	77.35 – 2122.81
BMC Genomics	135	179,592	1,330	205	1,276	920 – 1926
Biogeosciences Discussions	127	187,716	1,478	548	1,313	663.55 – 3641.47
BMC Bioinformatics	113	142,680	1,263	217	1,244	655 – 1661.24
Frontiers in Plant Science	107	126,763	1,185	408	1,106	551.04 – 2380
Atmospheric Measurement Techniques Discussions	107	143,782	1,344	585	1,203	428.4 – 3709.44
Frontiers in Human Neuroscience	106	140,065	1,321	415	1,106	575 – 2000
Other	4,064	5,466,407	1,345	557	1,350	40 – 4699.61

Prices also varied within single journals. Based on the number of articles paid for, Table 5 illustrates the top ten out of 732 journals. Payments to these ten journals represent 45 % of all payments. In the case of Atmospheric Chemistry and Physics Discussions, the price range can be explained by the fact that this journal charges per page and also takes the submission's file format into consideration.

The data-set finally confirms the leading role of “mega-journals” in open access publishing, including the multidisciplinary PLOS ONE and the journals New Journal of Physics, Atmospheric Chemistry and Physics Discussions and Frontiers in Psychology, all of which publish contributions from all branches of their respective discipline. In general, an estimated 14 out of more than 10,000 journals registered in

DOAJ in 2015 accounted for up to 15–20 % of all articles published in full open access journals (Björk, 2015).

DISCUSSION

The Open APC initiative extends existing methods to disclose spending on open access publication fees. Our workflow benefits from openly available tools and the social coding platforms GitHub, both of which are well established and suited to increase transparency in research (Peng, 2011; Ram, 2013). For 99 % of the articles, CrossRef provided bibliographic information, which substantially contributed to a uniform data-set about formerly fragmented payments made for open access articles.

Although CrossRef disambiguates journal titles and publisher names and is therefore an authority-controlled source for open access journal literature, derivations from CrossRef metadata curation as well as the context of aggregation must be made clear. In particular, problems persist on how to deal with name changes and ongoing mergers. For example, the publisher Public Library of Science (PLOS) has changed its acronym from “PLOS” to “PLOS”, which CrossRef metadata reflects from 2015 onward. We therefore normalized all PLOS journal titles in order to secure unique reference to these journals. Another publisher affected is “The Optical Society,” formerly “Optical Society of America”. Because the ownership of publishing houses can become combined, dealing with mergers is also essential to make cost data comparable. Jisc data, for instance, differentiate between the full open access publisher BioMed Central and the traditional publisher Springer, concluding that “traditional publishing houses” lean on the hybrid model (Pinfield et al., 2015). This stands in stark contrast to our approach, in which CrossRef metadata reflects the merger of BioMed Central and Springer, resulting in Springer Science + Business Media to be the best represented publisher for articles in full open access journals in the Open APC data-set. Another approach for ensuring unique reference, but that we have not evaluated yet, is to use CrossRef’s identifiers for journals and publishers instead.⁹

Because of the dynamic landscape of academic publishing and its representation in CrossRef’s data curation efforts, it is important to consider the time-frame of metadata aggregation. In our case, we re-used metadata shortly after the data submission. However, for some cost analysis – for instance to prepare negotiations with publishers on future schemes to fund open access journal articles – it could be more feasible to re-normalize the complete data. The CrossRef API provides incremental metadata updates that can be used to assess the current potential of future funding. While licensing information is incompletely covered in the CrossRef index so far, and therefore not analyzed in our study, the growing importance of facilitating text mining may result in more and more publishers sharing this information with CrossRef in the future.

Participation is voluntary. Therefore, not all institutions in Germany that provide central funding of publication fees contribute cost data to this initiative. In a qualitative survey that also asked why German institutions are reluctant to share their cost data through the Open APC initiative one institution feared that increase in transparency would allow publishers to adjust prices in their favor. Others pointed out that the workload to produce such a data-set could be too extensive (Deppe, 2015).

While there may still be institutions that have no overview of their APC spending, we would like to emphasize that reporting data that is already available within an institution to the Open APC initiative should not lead to much additional work. The central incentive of this initiative is to make it as easy as possible to submit data to it. Being able to combine that data into one standardized data-set increases transparency and comparability, and gives institutions a better understanding of the overall development of open access publishing. In particular, we cannot see the harm of increased transparency; in fact, not knowing how much is spent is undoubtedly a disadvantage in dealing with publishers.

Extending the data template to include information about funders or whether special agreements with publishers applied as suggested by Pinfield et al. (2015), would even increase the efforts needed to participate. However, with the growing demand for action in areas like the large-scale transition of toll-access journals to open access (Schimmer et al., 2015), an updated data template could help institutions to better comply with these policy developments in the future. From our experience, another barrier to participate is the lack of skills in version control: the data submission itself is not always made directly by the institutions. Instead, they sent files to Bielefeld University Library with the request to make them available on GitHub on their behalf.

⁹We would like to thank Martin Fenner for pointing this out to us. See also the CrossRef API documentation https://github.com/CrossRef/rest-api-doc/blob/master/rest_api.md

252 Future work needs to focus on analyzing the cost data. Of particular interest are questions concerning
 253 the coverage of central funding schemes in comparison with open access publication output in general,
 254 and the use of other means to cover publication fees in particular. The Open APC initiative does not cover
 255 personal budgets or make price reductions explicit, but studies suggest that there is a possible gray area
 256 (Björk, 2015; Björk and Solomon, 2012; Lawson, 2015b). Existing study designs could be re-applied
 257 to examine the relationship between price on the one hand, and indexing coverage, journal prestige or
 258 management costs on the other (Björk and Solomon, 2015, Pinfield et al. (2015); Walters and Linvill,
 259 2011). This, in turn, helps to address the central question of future business models in scholarly publishing
 260 from an international perspective (Pinfield et al., 2015).

261 ACKNOWLEDGMENT

262 We thank Andrea Hacker and Ada-Charlotte Regelman for valuable comments on the first draft of this
 263 paper. We also thank Christoph Broschinski, Vitali Peil, and Dirk Pieper, the members of the DINI
 264 working group “Electronic publishing”, and all data contributors¹⁰ of the Open APC initiative.

265 REFERENCES

- 266 Björk, B.-C. (2015). Have the ‘mega-journals’ reached the limits to growth? *PeerJ* 3, e981. <http://doi.org/10.7717/peerj.981>.
- 267 Björk, B.-C., and Solomon, D. (2012). Pricing principles used by scholarly open access publishers.
 268 *Learned Publishing* 25, 132–137. <http://doi.org/10.1087/20120207>.
- 269 Björk, B.-C., and Solomon, D. (2014). How research funders can finance APCs in full OA and hybrid
 270 journals. *Learned Publishing* 27, 93–103. <http://doi.org/10.1087/20140203>.
- 271 Björk, B.-C., and Solomon, D. (2015). Article processing charges in OA journals: relationship
 272 between price and quality. *Scientometrics* 103, 373–385. [http://doi.org/10.1007/s11192-](http://doi.org/10.1007/s11192-015-1556-z)
 273 [015-1556-z](http://doi.org/10.1007/s11192-015-1556-z).
- 274 Bruch, C., Deinzer, G., Geschuhn, K., Haetscher, P., Hillenkoetter, K., Kress, U., et al. (2015).
 275 Positions on creating an Open Access publication market which is scholarly adequate : Positions of the Ad
 276 Hoc Working Group Open Access Gold in the priority initiative “Digital Information” of the Alliance of
 277 Science Organisations in Germany. Ad-hoc-Arbeitsgruppe Open-Access-Gold der Schwerpunktinitiative
 278 “Digitale Information” der Allianz der deutschen Wissenschaftsorganisationen. [http://doi.org/10.](http://doi.org/10.2312/allianzoa.009)
 279 [2312/allianzoa.009](http://doi.org/10.2312/allianzoa.009).
- 280 Chamberlain, S., Boettiger, C., Hart, T., and Ram, K. (2016). *rcrossref: Client for Various ‘CrossRef’*
 281 *APIs*. Available at: <https://CRAN.R-project.org/package=rcrossref>.
- 282 Davis, P. M., and Walters, W. H. (2011). The impact of free access to the scientific literature: a review
 283 of recent research. *Journal of the Medical Library Association* 99, 208–217. [http://doi.org/10.](http://doi.org/10.3163/1536-5050.99.3.008)
 284 [3163/1536-5050.99.3.008](http://doi.org/10.3163/1536-5050.99.3.008).
- 285 Deppe, A. (2015). *Ansätze zur Verstetigung von Open-Access-Publikationsfonds.*, ed. K. Umlauf
 286 Institut für Bibliotheks- und Informationswissenschaft. Available at: [http://nbn-resolving.de/](http://nbn-resolving.de/urn:nbn:de:kobv:11-100234262)
 287 [urn:nbn:de:kobv:11-100234262](http://nbn-resolving.de/urn:nbn:de:kobv:11-100234262).
- 288 Dietrich, D., Gray, J., McNamara, T., Poikola, A., Pollock, R., Tait, J., et al. (2016). *Open Data Guide*.
 289 Available at: <http://opendatahandbook.org/guide/en/>.
- 290 Fournier, J., and Weihberg, R. (2013). Das Förderprogramm “Open Access Publizieren” der Deutschen
 291 Forschungsgemeinschaft. Zum Aufbau von Publikationsfonds an wissenschaftlichen Hochschulen in
 292 Deutschland. *Zeitschrift für Bibliothekswesen und Bibliographie* 60, 236–243. [http://doi.org/10.](http://doi.org/10.3196/186429501360528)
 293 [3196/186429501360528](http://doi.org/10.3196/186429501360528).
- 294 Gumpenberger, C., Ovalle-Perandones, M.-A., and Gorraiz, J. (2012). On the impact of Gold Open
 295 Access journals. *Scientometrics* 96, 221–238. [http://doi.org/10.1007/s11192-012-0902-](http://doi.org/10.1007/s11192-012-0902-7)
 296 [7](http://doi.org/10.1007/s11192-012-0902-7).
- 297 Kiley, R. (2014). *Wellcome Trust APC spend 2012-13: data file*. Figshare. [http://doi.org/10.](http://doi.org/10.6084/m9.figshare.963054.v1)
 298 [6084/m9.figshare.963054.v1](http://doi.org/10.6084/m9.figshare.963054.v1).
- 299 Laakso, M., and Björk, B.-C. (2012). Anatomy of open access publishing: a study of longitudinal
 300 development and internal structure. *BMC Medicine* 10, 124. [http://doi.org/10.1186/1741-](http://doi.org/10.1186/1741-7015-10-124)
 301 [7015-10-124](http://doi.org/10.1186/1741-7015-10-124).

¹⁰<https://github.com/OpenAPC/openapc-de#contributors>

303 Lawson, S. (2015a). Article Processing Charges Paid by 25 UK Universities in 2014. *Journal of Open*
304 *Humanities Data* 1. <http://doi.org/10.5334/johd.2>.

305 Lawson, S. (2015b). Fee Waivers for Open Access Journals. *Publications* 3, 155–167. <http://doi.org/10.3390/publications3030155>.

306 Lawson, S., and Meghreblian, B. (2015). Journal subscription expenditure of UK higher education
307 institutions. *F1000Research*. <http://doi.org/10.12688/f1000research.5706.3>.

308 Noorden, R. V. (2013). Open access: The true cost of science publishing. *Nature* 495, 426–429.
309 <http://doi.org/10.1038/495426a>.

310 Peng, R. D. (2011). Reproducible Research in Computational Science. *Science* 334, 1226–1227.
311 <http://doi.org/10.1126/science.1213847>.

312 Pinfield, S. (2015). Making Open Access work. *Online Information Review* 39, 604–636. <http://doi.org/10.1108/oir-05-2015-0167>.

313 Pinfield, S., Salter, J., and Bath, P. A. (2015). The “total cost of publication” in a hybrid open-access
314 environment: Institutional approaches to funding journal article-processing charges in combination with
315 subscriptions. *Journal of the Association for Information Science and Technology*. <http://doi.org/10.1002/asi.23446>.

316 Ram, K. (2013). Git can facilitate greater reproducibility and increased transparency in science.
317 *Source Code for Biology and Medicine* 8, 7. <http://doi.org/10.1186/1751-0473-8-7>.

318 Reckling, F., and Kenzian, M. (2014). *Austrian Science Fund (FWF) Publication Cost Data 2013*.
319 Figshare. <http://doi.org/10.6084/m9.figshare.988754.v4>.

320 Schimmer, R., Geschuhn, K. K., and Vogler, A. (2015). *Disrupting the subscription journals’*
321 *business model for the necessary large-scale transformation to open access*. Max Planck Digital Library.
322 <http://doi.org/10.17617/1.3>.

323 Schimmer, R., Geschuhn, K., and Palzenberger, M. (2013). Open Access in Zahlen: Der Umbruch in
324 der Wissenschaftskommunikation als Herausforderung für Bibliotheken. *Zeitschrift für Bibliothekswesen*
325 *und Bibliographie* 60, 244–250. <http://doi.org/10.3196/186429501360532>.

326 Sikora, A., and Geschuhn, K. K. (2015). Management of article processing charges – challenges for
327 libraries. *Insights: the UKSG journal* 28, 87–92. <http://doi.org/10.1629/uksg.229>.

328 Solomon, D. J., and Björk, B.-C. (2011). Publication fees in open access publishing: Sources of
329 funding and factors influencing choice of journal. *Journal of the Association for Information Science and*
330 *Technology* 63, 98–107. <http://doi.org/10.1002/asi.21660>.

331 Suber, P. (2012). *Open Access*. MIT Press. Available at: [https://mitpress.mit.edu/](https://mitpress.mit.edu/books/open-access)
332 [books/open-access](https://mitpress.mit.edu/books/open-access).

333 Walters, W. H., and Linvill, A. C. (2011). Bibliographic index coverage of open-access journals in
334 six subject areas. *Journal of the Association for Information Science and Technology* 62, 1614–1628.
335 <http://doi.org/10.1002/asi.21569>.

336 Woodward, H. M., and Henderson, H. L. (2014). Report for Jisc Collections on total cost of owner-
337 ship project: Data capture and process. Information Power Ltd. Available at: [https://www.jisc-](https://www.jisc-collections.ac.uk/Global/News%20files%20and%20docs/IPL-Jisc-Total-Cost-of-Ownership-Data-Capture-Report.pdf)
338 [collections.ac.uk/Global/News%20files%20and%20docs/IPL-Jisc-Total-Cost-](https://www.jisc-collections.ac.uk/Global/News%20files%20and%20docs/IPL-Jisc-Total-Cost-of-Ownership-Data-Capture-Report.pdf)
339 [of-Ownership-Data-Capture-Report.pdf](https://www.jisc-collections.ac.uk/Global/News%20files%20and%20docs/IPL-Jisc-Total-Cost-of-Ownership-Data-Capture-Report.pdf).