

# Are Transformative Agreements Worth It?

## An Analysis of Open Access Publication Data at the University of Kentucky

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*Open access publishing is continuing to grow as funders such as cOAlition S, National Institutes of Health, and the White House implement mandates and requirements that publicly funded research be made immediately available for public consumption. Publishers have adopted open access as a business model through transformative agreements that combine subscription and publishing fees. However, it is unclear whether these agreements are beneficial for libraries. This article discusses a project by the University of Kentucky Libraries to gather and analyze open access publication data to aid in the evaluation of transformative agreement proposals. This article also discusses how the University of Kentucky compares to peer institutions in the Southeastern Conference and other benchmark institutions regarding open access publishing output. Additionally, this article discusses downsides of transformative agreements and highlights promising alternatives.*

The scholarly publishing landscape is shifting more and more to open access (OA). According to Delta Think's OA Market Sizing report, roughly 45 percent of scholarly articles published in 2021 were fee-based OA, meaning authors paid an article processing charge (APC).<sup>1</sup> The value of the OA publishing market in 2021 was nearly \$1.6 billion (15 percent of the total value of the journal publishing market) and is expected to grow to more than \$2 billion by 2024.<sup>2</sup> The main drivers of this shift have been funders. In Europe, this has been driven by Plan S, an initiative aimed at making scientific scholarship openly available with no embargo.<sup>3</sup> In the United States, it will be driven by the National Institutes of Health's (NIH) Data Management and Sharing Policy<sup>4</sup> and the White House Office of Science and Technology Policy's (OSTP) memo.<sup>5</sup> The goal of these funder mandates is to make publicly funded research immediately open and available to the public.

Realizing the potential to retain and grow revenue as a result of funder mandates and requirements and in the wake of libraries stepping away from Big Deal journal packages, publishers, particularly large commercial publishers, have integrated OA as a business strategy. The transformative agreement (TA) is the product of this strategy. These agreements aim to shift payments made by libraries from subscription-based content to open access publishing. As a result of increased participation in TAs, publishers are seeing greater growth in the number of articles published in OA journals, both gold and hybrid, than in the number of articles published in subscription journals. For example, the compound annual growth rate (CAGR) for articles published in Elsevier subscription journals was 4 percent between 2019 and 2021. During that same time frame, the CAGR for articles published in Elsevier's OA journals was 56 percent.<sup>6</sup> It is clear that TAs are beneficial for publishers; however, it is not clear whether TAs are beneficial for libraries nor how libraries determine the value of a TA proposal. In an

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effort to evaluate the value of TA proposals, the University of Kentucky (UK) Libraries has collected and analyzed open access publishing data.

## Literature Review

Although more and more institutions and consortia in the United States are signing TAs with publishers, much of the literature about TAs is coming from Europe. This is not completely surprising when one considers the united effort around OA in Europe, with the formation of cOAlition S in 2018 and their launch of Plan S. No such entity or plan exists in the United States, as each consortia or institution negotiates TAs independently. However, much of the available literature on TAs questions whether these agreements are helping to control costs, facilitating the transition to OA in a timely fashion, or doing anything other than benefiting large commercial publishers.

In their article “Transformative Agreements: Do They Pave the Way to OA?,” Borrego, Anglada, and Abadal argue that while these agreements may be more transparent than previous licensing agreements with publishers, it is doubtful that they are helping to control costs, which was one of the main issues with Big Deal packages.<sup>7</sup> While TAs have the potential to remove access barriers to research, it is unclear whether they are truly transforming the scholarly publishing landscape and fully facilitating a transition to OA as intended. Given the variance of these agreements among institutions and consortia in Europe, and now in the United States, it is also uncertain whether TAs will be a temporary solution or if they will become the permanent “solution” for transitioning to OA.

These same sentiments are echoed by Bansode and Pujar in their analysis of TAs in the Efficiency and Standards for Article Charges (ESAC) Transformative Agreement Registry. They state that the ability of TAs to contribute substantially to the spread of OA is limited because many of these agreements are largely limited to Europe and the United States.<sup>8</sup> It is also unclear whether publishers will want to continue these types of agreements if revenues are not sustained. An additional point of concern mentioned is that most TAs are with large commercial publishers and not with purely OA publishers and society publishers. This enables large commercial publishers to gain a large share of the revenues and publishing outputs, which creates inequities and threaten the sustainability of society publications.<sup>9</sup> Confirmation of this can be found in Moskovkin, Saprykina, and Boichuk’s analysis of the ESAC Transformative Agreement Registry. In their analysis they found that the most active publishers in TAs, based on total annual published articles, were Elsevier, Springer Nature, Wiley, Taylor & Francis, and Sage, the five largest commercial publishers.<sup>10</sup>

Farley et al. outline six myths about TAs in their article “Transformative Agreements: Six Myths, Busted.” They argue that TAs do not and will not lead to equity in the scholarly publishing landscape. Given that most of these agreements tend to be at research-intensive institutions, TAs essentially create a tiered system of OA publishing for authors. They push back on the notion that TAs are a proven way to transition from paywalled access to OA. These agreements do not move beyond the APC model, rather they “obfuscate them.”<sup>11</sup> There is not necessarily any greater transparency regarding publishing

costs, and any TA has the potential to reshape the market and negatively impact libraries in future negotiations. They also argue that TAs do not lead to more competitive pricing and do not put libraries in a better position to negotiate with publishers, particularly large commercial publishers.<sup>12</sup>

Parmhed and Säll provide insight on the impact of TAs at their institutions in Sweden. They point out that nationally, in Sweden, there has been an increase in OA publishing as a result of TAs, but there are noticeable concerns and issues. For example, it could become problematic if there is a preference to publish in journals that are part of TAs as opposed to those that are not part of TAs. They have also noticed a shift in questions from researchers from “which journal is the best for my article to get published in” to “where could I publish my article without having to pay an APC?”<sup>13</sup> Another pitfall of TAs, according to Parmhed and Säll, is that hybrid publishers are favored over fully OA publishers. Additionally, large commercial publishers have the ability to offer these types of agreements as opposed to smaller publishers and societies, who are often bypassed or left out completely. The goal at their institutions is to include and support different business models that also enable them to work with smaller publishers and societies to further OA publishing.<sup>14</sup> In Sweden, TAs are viewed as a temporary solution. A working group consisting of researchers, vice-chancellors, research funders, and librarians has been formed to develop a strategy to move beyond TAs.<sup>15</sup>

These agreements are still relatively new, and measuring their impact is somewhat challenging. While TAs may be currently seen as an effective tool in increasing OA publishing,<sup>16</sup> time will tell if they are a temporary solution or a permanent fixture in the scholarly publishing landscape.

## Background

The analysis of OA publication data was driven by a proposal UK Libraries received in the Fall of 2022. While UK Libraries have entered into TAs with some publishers (Cambridge University Press and ACM Open), these agreements have largely been neutral or minor in cost increase.<sup>17</sup> UK Libraries also has agreements with several publishers to offer discounts on APCs for UK authors. However, UK Libraries had communicated with the larger commercial publishers that there was not an interest in pursuing TAs. Despite that communication on several occasions from the Dean of Libraries and Director of Acquisitions, UK Libraries received a TA proposal from one of these commercial publishers. UK Libraries had also communicated the amount of the budget that had been allocated for this particular publisher. With this information in hand, the publisher proceeded with a TA proposal that was significantly higher, approximately 33 percent, than what UK Libraries had allocated in the budget. Other aspects of this proposal that were problematic were that it only included hybrid journals, which UK authors had only published in three times the prior year, and any unused APCs would expire at the end of the year. Additionally, the number of APCs proposed as part of this agreement exceeded the total publishing output of primary/corresponding UK authors, both OA and non-OA. The publisher was once again informed that there was no interest in a TA and asked if there was another option for UK Libraries to consider. Another option was not given, and the publisher was informed that UK Libraries would have to proceed with a title-by-title selection to meet the amount allocated in the budget.

This proposal and interaction with the publisher raised several questions for consideration as publishers continue to propose TAs. These questions included: Do these types of agreements make sense, both financially and strategically, for the institution? How is OA perceived on campus? How much are UK authors publishing in OA journals? Which publishers are UK authors utilizing to publish OA? Answering and addressing these questions would be insightful and help drive the collection strategy around OA publishing, especially since the UK Libraries are working on developing collection values that align with UK's mission and values. The UK Libraries began searching to see what data was available on OA publishing by UK authors. Additionally, the UK Libraries wanted to get an estimate of the overall amount of APCs that were paid by the UK authors during this time period. Initially, the goal was to analyze and evaluate OA publication data by UK authors, but that expanded to gathering OA publishing data about other institutions to compare where the UK is in regard to its peers. This included data on the University of Louisville, Southeastern Conference (SEC) institutions (University of Alabama, University of Arkansas, Auburn University, University of Florida, University of Georgia, Louisiana State University, University of Mississippi, Mississippi State University, University of Missouri, University of South Carolina, University of Tennessee, Texas A&M University, and Vanderbilt University),<sup>18</sup> and benchmark institutions that have established schools in agriculture, engineering, medicine, and pharmacy on a single, contiguous campus (University of Arizona, University of Florida, University of Minnesota Twin Cities, The Ohio State University, Rutgers University, West Virginia University, and University of Wisconsin–Madison).<sup>19</sup>

## Methodology and Assumptions

### Data Gathering and Refinement

The parameters of the data identified for the analysis were articles published in gold and hybrid OA journals by institutional authors from 2018 through 2022, the estimated amount of APCs paid by institutions, and the publishers utilized by UK authors from 2018 through 2022. To gather the OA publication data, UK Libraries utilized Scopus, an indexing and abstract database from Elsevier and provided through UK's Office of the Vice President for Research. In Scopus, the list of articles for UK was filtered by publication years (2018–2022), publication type (article), and OA (gold and hybrid gold). Once the results were narrowed down, the publication data (title, author(s), year, source title, DOI, document type, OA, affiliations, publisher, and correspondence address) was exported from Scopus into an Excel spreadsheet. This same process was repeated to collect OA publication data for the University of Louisville and each of the SEC and benchmark institutions. The APC data was collected from the Directory of OA Journals (DOAJ) exportable journal metadata dataset<sup>20</sup> and various publisher websites, including Elsevier,<sup>21</sup> Wiley,<sup>22</sup> Sage,<sup>23</sup> Taylor & Francis,<sup>24</sup> and Springer Nature.<sup>25</sup> The APC data was modified and combined into a separate Excel spreadsheet with information on journal title, APC, and publisher. This provided APC data from nearly 29,000 different titles.

Once the OA publication and APC data had been collected, the data was merged into one Excel workbook with two worksheets, one for the OA publication data and one for the APC data. For the OA

publication data, conditional formatting was applied to identify corresponding authors from UK and filtered accordingly, removing any records where a UK author was not identified as a corresponding author. This process was repeated subsequently for the University of Louisville and each SEC and benchmark institution. An additional column was added to the OA publication sheet to pull over APC data from the other sheet.

To pull over the APC data for each publication into the OA publication worksheet, the VLOOKUP formula was used. The VLOOKUP formula in Excel is used to look up a value in a table and return a corresponding value from another column. An explanation of the syntax of the formula is:

=VLOOKUP (what you want to look up, where you want to look for it, the column number in the range containing the value to return, return an approximate (1 or TRUE) or exact (0 or FALSE) match)<sup>26</sup>

To illustrate this, the formula to retrieve the APC data was:

=VLOOKUP(D2,APC!A\$2:B\$29001,2,FALSE)

This formula identifies D2 (journal title) as the value to look for and to look in the APC sheet in columns A (journal title) and B (APC) to find a match. The value to return is from column B, since 2 is specified as the column to return the value from. If there is an exact match (FALSE), the value from column B is added in the cell. When there was no match, the formula populated the value #N/A in the cell. This could be fixed by modifying the journal title information to ensure an exact match, such as changing the word “AND” in a title to an ampersand or vice versa. In the case where the journal title was not listed in the APC worksheet, a search was conducted to find the APC information for the journal title, which was then manually added to the APC worksheet. Once the APC data had been added to the OA publication worksheet, the data was exported as a CSV file.

### **Database and Website Creation**

Now that the OA publication data was in a CSV file, the next step was to create a MySQL database to store, retrieve, and analyze the data. MySQL is an open-source relational database management system (RDBMS) that is a popular choice for web applications. The database contained four different tables:

1. UK OA Publishing Data
2. UK and University of Louisville OA Publishing Data
3. SEC OA Publishing Data
4. Benchmark OA Publishing Data

The fields added to each of the tables were ID, title, author, year, publication title, DOI, publication type, OA type, APC, and publisher. The Higher Education Research and Development (HERD) rankings were then added to the University of Louisville, SEC, and Benchmark tables to determine if there was

any correlation between the HERD ranking and amount of OA publishing. The HERD ranking measures research and development expenditures at higher education institutions in the United States. After the database and tables were created, the CSV files containing the OA publishing data were imported. Next, a password-protected website was created to analyze and visualize the data. The website for this project was created using PHP, MySQL, and Bootstrap. To visualize the data, Highcharts—a JavaScript charting library—was used. These technologies were utilized because they are all open-source and free to use. They are also well-supported, have large communities of users and developers, and have documentation available.

### **Assumptions**

In the analysis of the OA publication data, it was assumed that the first and/or corresponding author paid the APC. Based on the limited publishing data UK Libraries has been able to obtain directly from publishers, it was also assumed that the cost and number of OA articles are conservative estimates.

### **Open Access Publication Data**

As previously stated, the primary objective of this project was to analyze and evaluate OA publication data from UK authors in order to provide additional information for evaluating publisher TA proposals and to find out how UK compares to peer institutions. With this OA publication data, the UK Libraries could conduct an analysis to address questions like:

- What are the total estimated costs of APCs? What are the total estimated costs of APCs for gold OA journals? What are the total estimated costs of APCs for hybrid OA journals?
- What is the total estimated number of OA articles by the UK authors and authors at peer and benchmark institutions?
- What is the breakdown between articles in gold and hybrid OA journals?
- Where is OA publishing occurring? What publishers are authors publishing with? What journals are authors publishing in?
- What are the trends over this time period?

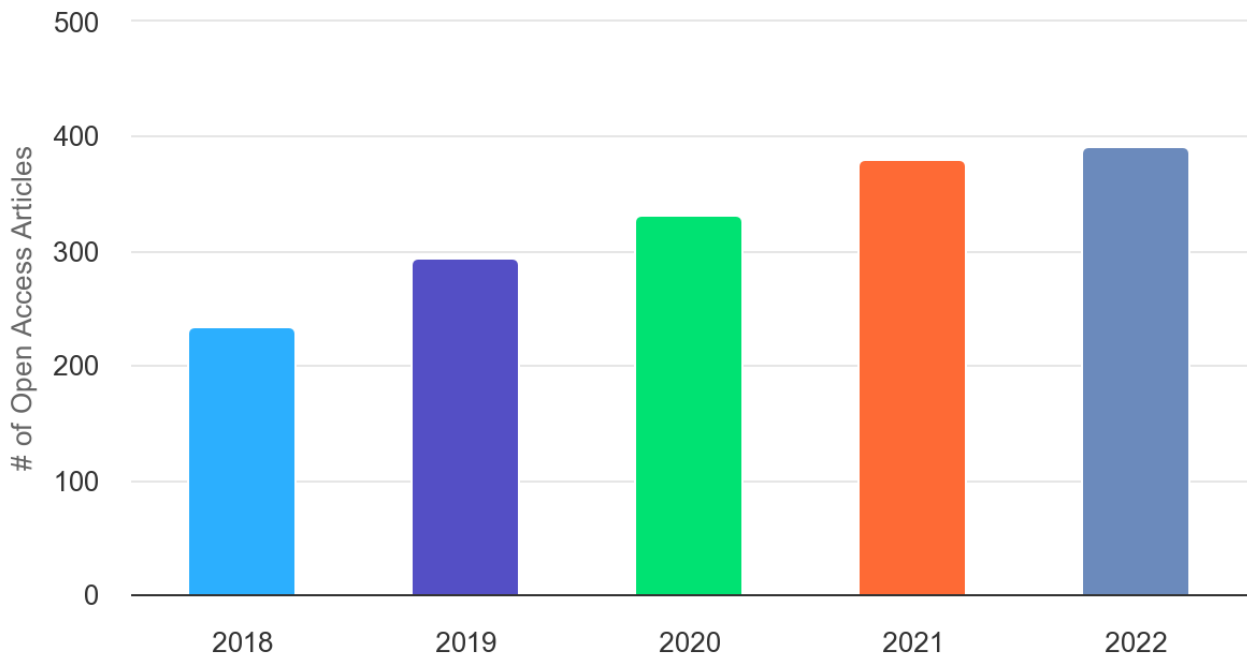
For each institution, this project looked at the total estimated cost of APCs, estimated cost of APCs for gold OA journals, estimated cost of APCs for hybrid OA journals, total number of OA articles, total number of gold OA articles, total number of hybrid OA articles, total number of publishers, and total number of journals. For the UK the data was also broken down by year and by publisher. For the UK, these figures amounted to \$3,550,944.56 in total estimated cost of APCs, \$2,854,956.97 in estimated APCs for gold OA journals, \$695,987.59 in estimated APCs for hybrid OA journals, 1,633 OA articles, 1,408 gold OA articles, 225 hybrid OA articles, 128 publishers, and 647 journals (figure 1).



**Figure 1.** OA publication figures for the University of Kentucky, 2018–2022

*OA Articles*

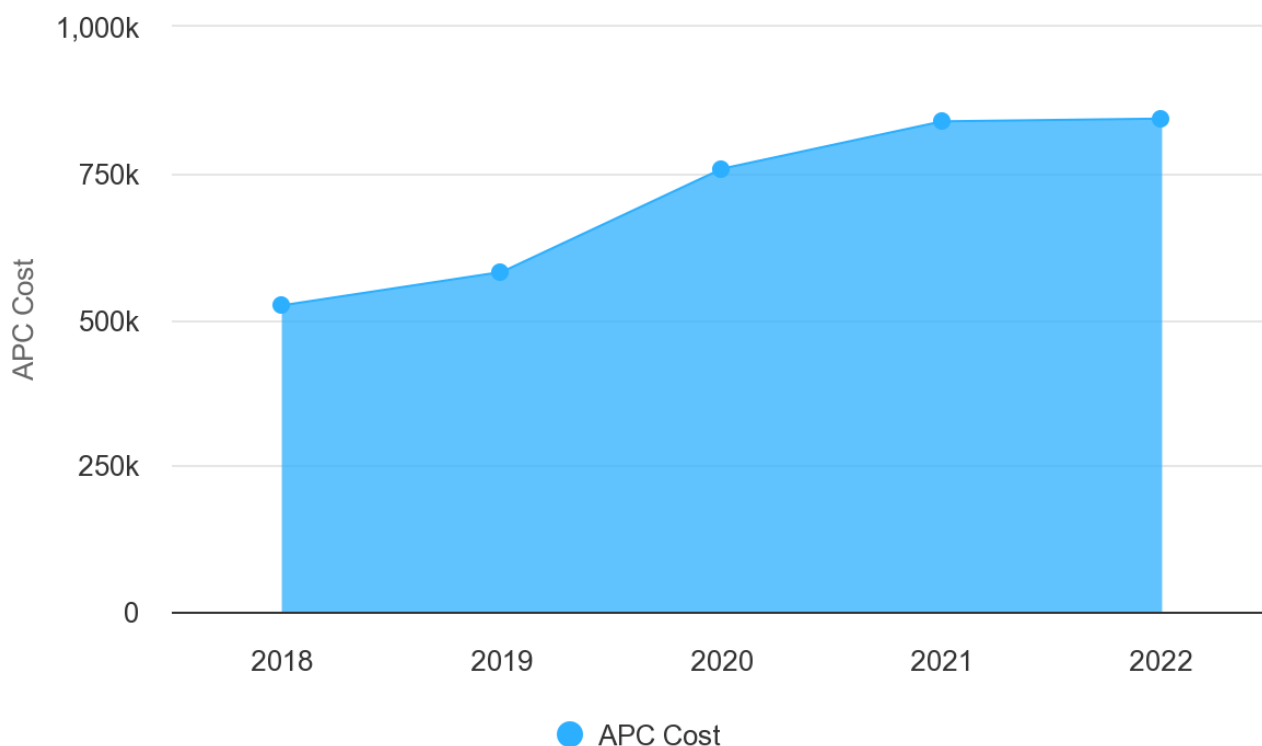
From 2018 to 2022, there was a consistent increase in the number of OA articles by UK authors (figure 2). In 2018, there were an estimated 234 OA articles. This number grew to an estimated 392 in 2022, representing a CAGR of 10.9 percent. This growth could be related to increased grant funding where OA publishing is written into the budget, an increase in awareness of OA, and/or the desires of the researcher(s) to make their scholarship more widely available. However, there are no clear institutional indicators on what drove, and continues to drive, this increase. Over this time frame, there has also been a growth in research publishing overall at UK (2.6 percent CAGR), albeit at a smaller rate than OA publishing. Despite a lack of clear indicators, the increase in OA articles is a positive development, as it makes research by UK authors more accessible.



**Figure 2.** OA publications by year for the University of Kentucky authors, 2018–2022.

## APCs

As expected, with the growth of OA articles, there was also an increase in the amount of APCs paid by UK authors (figure 3). In 2018, UK authors paid an estimated \$523,682.53 in APCs. That number grew to an estimated \$843,035.24 in 2022. Overall, the CAGR for APCs from 2018 to 2022 was 9.9 percent. The top ten publishers that UK authors paid APCs to were Springer Nature (\$712,393), MDPI (\$692,582), Elsevier (\$478,945), Frontiers Media S.A. (\$442,225), Wiley (\$215,975), Oxford University Press (\$130,777.56), Public Library of Science (PLoS) (\$122,570), Sage (\$81,400), National Academy of Sciences (\$54,725), and Impact Journals (\$50,750). These publishers account for 84 percent of the APCs paid by UK authors.



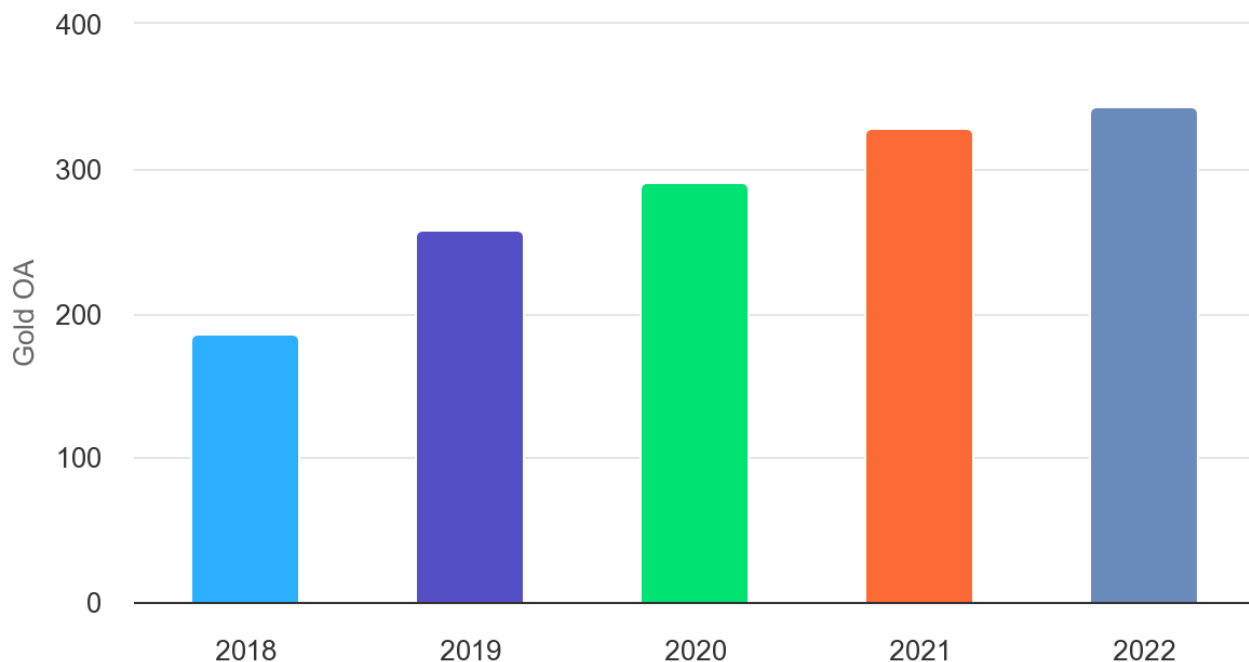
**Figure 3.** Estimated APCs paid by University of Kentucky authors, 2018–2022.

## Gold and Hybrid OA

There are some key distinctions between OA publishing in gold and hybrid OA journals. For example, a majority of OA publishing by UK authors occurred in gold OA journals. Of the 1,633 OA articles, 1,408 of those were in gold OA journals. This accounts for 86 percent of OA publishing by UK authors. There was a steady growth in the number of articles in gold OA journals year over year (figure 4). In 2018, there were 186 articles in gold OA journals. In 2022, there were 343 articles in gold OA journals. This represents a CAGR of 13 percent. There was a steady increase in the estimated APCs paid for gold OA journals. In 2018, the estimated APCs paid for gold OA publishing was \$380,220.75. In 2022, the estimated APCs paid for gold OA publishing was \$694,154.91. This represents a CAGR of 12.8 percent.



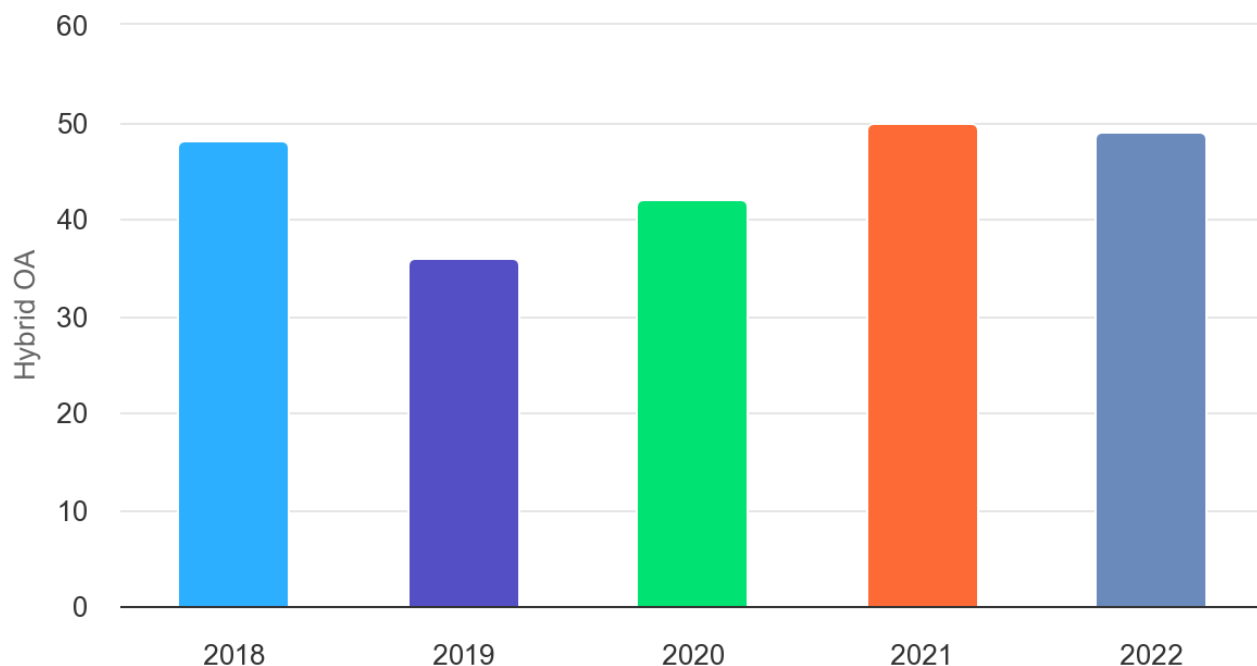
Overall, the estimated APCs paid to publish in gold OA journals was \$2,847,438.97, which accounts for 80 percent of the total estimated APCs paid by UK authors. The top ten publishers for gold OA were MDPI (326 articles), Springer Nature (247 articles), Elsevier (158 articles), Frontiers Media S.A. (156 articles), PLoS (seventy-six articles), Wiley (seventy-two articles), Sage (forty-three articles), Oxford University Press (twenty-nine articles), the Royal Society of Chemistry (nineteen articles), and Impact Journals (fifteen articles). These publishers account for 81 percent of the gold OA publishing output by UK authors.



**Figure 4.** OA publishing in gold OA journals by the University of Kentucky authors, 2018–2022.

Publishing in hybrid OA journals accounts for a significantly smaller portion of the total OA publishing output by UK authors. Of the 1,633 OA articles, only 225 of those articles were in hybrid OA journals. This accounts for 14 percent of OA publishing by UK authors. Unlike gold OA publishing, there has not been consistent growth year over year (figure 5). In 2018, there were forty-eight articles in hybrid OA journals. In 2022, there were forty-nine articles in hybrid OA journals. While this does represent a very minor CAGR of 0.004 percent, articles in hybrid OA journals in 2019 (thirty-six articles) and 2020 (forty-two articles) were below the number of OA articles from 2018. The estimated APCs paid to publish in hybrid OA journals were \$695,987.59, which accounts for 19 percent of the total estimated APCs paid by UK authors. The pattern for estimated APCs paid for hybrid OA journals has followed the same pattern as the hybrid OA articles, albeit with a higher CAGR. In 2018, the estimated APCs paid for hybrid OA publishing were \$143,461.78. In 2019 and 2020, the estimated amount of APCs were below (\$100,180 and \$140,968.46) the APC amount from 2018. In 2022, the estimated APCs paid for hybrid OA publishing were \$148,880.33. Overall, this represents a CAGR of 1 percent. The top ten publishers for hybrid OA were Elsevier (seventy-three articles), Springer Nature (twenty-eight articles), Wiley

(twenty-one articles), Oxford University Press (fourteen articles), National Academy of Sciences (eleven articles), American Chemical Society (six articles), Cambridge University Press (six articles), Lippincott Williams & Wilkins (six articles), Sage (five articles), and Scientific Scholar (five articles). These publishers account for 78 percent of the hybrid OA publishing output by UK authors.



**Figure 5.** OA publishing in hybrid OA journals by the University of Kentucky authors, 2018–2022.

### *Publishers*

From 2018 to 2022, UK authors published in OA journals with 129 different publishers. The top ten publishers were MDPI (326 articles), Springer Nature (275 articles), Elsevier (231 articles), Frontiers Media S.A. (156 articles), Wiley (ninety-three articles), PLoS (seventy-six articles), Sage (forty-eight articles), Oxford University Press (forty-three articles), the Royal Society of Chemistry (twenty-one articles), and Impact Journals (fifteen articles). These publishers account for 79 percent of the total OA publishing output by UK authors. Additionally, the estimated APCs paid to these publishers were \$2,946,912.56, which is 83 percent of the total estimated APCs paid by UK authors. Three of the top ten publishers UK authors published with are purely gold OA publishers (MDPI, Frontiers Media S.A., and PLoS). Table 1 outlines the overall publication and APC data for the top ten publishers.

Table 1. Estimated OA articles and APC data from Top 10 publishers for the University of Kentucky authors

<b>Publisher</b>	<b>Articles</b>	<b>Gold OA</b>	<b>Hybrid OA</b>	<b>Total APCs</b>	<b>Gold APCs</b>	<b>Hybrid APCs</b>
MDPI	326	326	0	\$692,582.00	\$692,582.00	\$0.00
Springer Nature	275	247	28	\$712,393.00	\$593,313.00	\$119,080.00
Elsevier	231	158	73	\$478,945.00	\$259,875.00	\$219,070.00
Frontiers Media S.A.	157	157	0	\$442,225.00	\$442,225.00	\$0.00
Wiley	93	72	21	\$215,975.00	\$154,725.00	\$61,250.00
PLoS	76	76	0	\$122,570.00	\$122,570.00	\$0.00
Sage	48	43	5	\$81,400.00	\$71,300.00	\$10,100.00
Oxford University Press	43	29	14	\$130,777.56	\$78,707.97	\$52,069.59
The Royal Society of Chemistry	21	19	2	\$19,295.00	\$13,020.00	\$6,275.00
Impact Journals	15	15	0	\$50,750.00	\$50,750.00	\$0.00

### Journals

From 2018 to 2022, UK authors published in 647 different OA journals. The top ten OA journals (table 2) during this time frame were *Scientific Reports* (seventy-seven articles), *PLoS One* (sixty-two articles), *Journal of High Energy Physics* (twenty-four articles), *Journal of Biological Chemistry* (twenty-four articles), *Sustainability* (twenty-one articles), *Radiology Case Reports* (twenty articles), *Journal of Applied Clinical Medical Physics* (twenty articles), *International Journal of Environmental Research and Public Health* (twenty articles), *Forests* (twelve articles), and *PLoS Pathogens* (twelve articles). Additionally, half of the six publishers (PLoS, MDPI, and Frontiers Media S.A.) of these journals are exclusively gold OA publishers. These ten journals account for 292 OA articles, which is 18 percent of the total OA publishing output by UK authors.

Table 2. Top 10 open access journals published by the University of Kentucky authors 2018–2022

Journal	Publisher	OA Type	Articles
Scientific Reports	Springer Nature	Gold	77
PLoS ONE	PLoS	Gold	67
Journal of High Energy Physics	Springer Nature	Gold	24
Journal of Biological Chemistry	Elsevier	Gold	24
Sustainability	MDPI	Gold	21
Radiology Case Reports	Elsevier	Gold	20
Journal of Applied Clinical Medical Physics	Wiley	Gold	20
International Journal of Environmental Research and Public Health	MDPI	Gold	20
Forests	MDPI	Gold	12
PLoS Pathogens	PLoS	Gold	12

## Comparisons

In addition to analyzing OA publication data by UK authors, there was interest and curiosity on how UK compared to our peer institution (University of Louisville) within the state, SEC institutions, and benchmark institutions.

### *University of Louisville*

The University of Louisville is the other research institution in Kentucky. In looking at the OA publishing data for both the UK and the University of Louisville, this project sought to compare OA publishing at each institution to see the comparison and to determine if there was any correlation in the HERD ranking and OA publishing. In 2021, the HERD ranking for the UK was 64 and the HERD ranking for the University of Louisville was 124.<sup>27</sup> Based on the publication data from Scopus, the OA publishing output for the University of Louisville is lower than the UK's, which aligns with the HERD ranking for each institution. For the University of Louisville, the OA publishing figures amounted to \$2,206,839.57 in total estimated cost of APCs (38 percent lower than UK), \$1,782,418.53 in estimated APCs for gold OA journals (38 percent lower than UK), \$424,421.04 in estimated APCs for hybrid OA journals (39 percent lower than UK), 966 OA articles (41 percent lower than UK), 828 gold OA articles (41 percent lower than UK), 138 hybrid OA articles (39 percent lower than UK), 93 publishers (27 percent lower than UK), and 439 journals (32 percent lower than UK). There are several trends that are consistent across both institutions, such as consistent growth in OA publishing at both institutions. In 2018, there were an estimated 147 OA articles by University of Louisville authors. That number grew to an estimated 225 in 2022, representing a CAGR of 8.7 percent, slightly lower than UK. The top ten publishers for University of Louisville authors were MDPI (189 articles), Elsevier (135 articles), Springer Nature (107 articles), Frontiers Media S.A. (89 articles), PLoS (61 articles), Wiley (46 articles), BioMed Central (45 articles), Oxford University Press (20 articles), Sage (19 articles), and IEEE (13

articles). In line with the increased OA articles, there was an increase in the amount of APCs paid by University of Louisville authors. In 2018, University of Louisville authors paid an estimated \$319,536.10 in APCs. That number grew to an estimated \$554,191.20 in 2022, representing a CAGR for APCs of 11.6 percent, which is higher than that of UK. Additionally, like UK, a majority of the OA publishing occurred in gold OA journals. Articles in gold OA journals accounted for 86 percent (826 articles) of the total OA publishing output by University of Louisville authors, and the estimated APCs for gold OA journals accounted for 81 percent (\$1,782,418.53) of the total estimated APCs.

### SEC

Comparing OA publishing at the UK to peers within the SEC, the UK ranks fifth out of fourteen institutions in terms of total OA publishing output. SEC institutions that exceed the total OA publishing output of UK were University of Florida, Texas A&M University, Vanderbilt University, and University of Georgia (table 3). All the institutions with a higher total OA publishing output than UK also have a higher HERD ranking, and all those with a lower total OA publishing output than UK have a lower HERD ranking.

Table 3. Open access publishing by Southeastern Conference institution, 2018-2022

<b>Institution</b>	<b>HERD Ranking</b>	<b>Total OA Articles</b>	<b>Gold OA Articles</b>	<b>Hybrid OA Articles</b>
University of Florida	27	5,161	4,433	728
Texas A&M University	16	3,448	2,972	476
Vanderbilt University	24	2,668	2,102	566
University of Georgia	57	2,375	1,900	475
University of Kentucky	64	1,633	1,408	225
University of Tennessee	85	1,404	1,221	183
University of Missouri	71	1,361	1,168	193
University of South Carolina	113	1,140	961	179
Auburn University	100	977	862	115
Louisiana State University	91	943	769	174
University of Arkansas	140	937	771	166
Mississippi State University	97	886	759	127
University of Mississippi	158	698	622	76
University of Alabama	150	562	481	81

A comparison of OA publishing at the UK with another institution in the SEC with a similar student body size, academic programs, and HERD ranking, such as the University of Missouri, reveals some notable differences. OA publishing figures for the University of Missouri were \$3,139,802.50 in total estimated cost of APCs (12 percent lower than UK), \$2,483,905 in estimated APCs for gold OA journals (13 percent lower than UK), \$655,897.50 in estimated APCs for hybrid OA journals (6 percent lower than UK), 1,361 OA articles (17 percent lower than UK), 1,168 gold OA articles (17 percent lower than UK), 193 hybrid OA articles (14 percent lower than UK), 107 publishers (16 percent lower than UK), and

555 journals (14 percent lower than UK). Not surprisingly, there has been consistent growth in OA publishing at the University of Missouri. In 2018, there were an estimated 173 OA articles by University of Missouri authors. That number grew to an estimated 323 in 2022, representing a CAGR of 13.3 percent, which is higher than UK. The top ten publishers for University of Missouri authors were MDPI (272 articles), Springer Nature (218 articles), Elsevier (171 articles), Frontiers Media S.A. (144 articles), Wiley (ninety articles), PLoS (sixty-four articles), Oxford University Press (forty-nine articles), Sage (thirty-five articles), Hindawi (nineteen articles), and IEEE (sixteen articles). There was also an increase in the amount of APCs paid by University of Missouri authors. In 2018, University of Missouri authors paid an estimated \$372,392.80 in APCs. That number grew to an estimated \$808,565.26 in 2022, representing a CAGR for APCs of 16.8 percent, which is higher than UK. Additionally, a majority of the OA publishing occurred in gold OA journals. Articles in gold OA journals accounted for 86 percent (1,168 articles) of the total OA publishing output by University of Missouri authors, and the estimated APCs for gold OA journals accounted for 79 percent (\$2,483,905) of the total estimated APCs.

In totality, figures for OA publishing within the SEC, including data from UK, amount to \$56,390,459.72 in total estimated cost of APCs, \$44,432,233.41 in estimated APCs for gold OA journals, \$11,958,226.31 in estimated APCs for hybrid OA journals, 24,193 OA articles, 20,429 gold OA articles, 3,764 hybrid OA articles, 596 publishers, and 3,623 journals (figure 6).



Figure 6. OA publications for Southeastern Conference institutions, 2018–2022.

Similarly to UK and the University of Louisville, there was a consistent growth in the amount of OA publishing at SEC institutions. In 2018, there were an estimated 3,170 OA articles by SEC authors. That number grew to an estimated 6,127 in 2022, representing a CAGR of 14.1 percent. The top ten publishers for SEC authors were MDPI (4,948 articles), Springer Nature (3,455 articles), Elsevier (2,895 articles), Frontiers Media S.A. (2,257 articles), Wiley (1,661 articles), PLoS (1,128 articles), Oxford University Press (749 articles), Sage (511 articles), American Society for Microbiology (387 articles), and Cambridge University Press (331 articles). In regard to APCs, in 2018, SEC authors paid an estimated \$7,032,390.51 in APCs. That number grew to an estimated \$14,843,800.67 in 2022, representing a CAGR for APCs of 16.1 percent. Additionally, as has been the case with OA publishing at UK and the University of Louisville, a majority of the OA publishing in the SEC has occurred in gold OA journals. Articles in gold OA journals accounted for 84 percent (20,429 articles) of the total OA publishing output by SEC authors, and the estimated APCs for gold OA journals accounted for 79 percent (\$44,432,233.41) of the total estimated APCs.

## Benchmarks

The UK is one of eight institutions in the United States to have established schools in agriculture, engineering, medicine, and pharmacy on a single, contiguous campus. The other institutions are the University of Arizona, University of Florida, University of Minnesota Twin Cities, The Ohio State University, Rutgers University, West Virginia University, and University of Wisconsin–Madison. Comparing OA publishing at these benchmark institutions, the UK ranks seventh in total OA publishing output (table 4). Although the six institutions with higher OA publishing outputs than UK did have a higher HERD ranking, the HERD ranking did not correlate with a higher level of OA publishing. This suggests that the HERD ranking is not a reliable indicator of OA publishing.

Table 4. Open access publishing by benchmark

Institution	HERD	Total OA Articles	Gold OA Articles	Hybrid OA Articles
University of Florida	27	5,161	4,433	728
University of Minnesota Twin Cities	22	4,421	3,488	933
The Ohio State University	12	3,941	3,090	851
University of Wisconsin–Madison	8	3,849	3,030	819
University of Arizona	36	2,492	2,056	436
Rutgers University	45	2,460	1,997	463
University of Kentucky	64	1,633	1,408	225
West Virginia University	125	1,123	978	145

In totality, figures for OA publishing at these benchmark institutions, excluding data from the UK, were \$56,797,094.35 in total estimated cost of APCs, \$42,508,010.02 in estimated APCs for gold OA journals, \$14,289,084.33 in estimated APCs for hybrid OA journals, 23,447 OA articles, 19,072 gold OA articles, 4,375 hybrid OA articles, 570 publishers, and 3,848 journals (figure 7).



Figure 7. OA publication figures for Benchmark institutions, 2018–2022.

In line with the data from other institutions as part of this study, there was a consistent growth in the amount of OA publishing. In 2018, there were an estimated 3,229 OA articles by authors at benchmark institutions. That number grew to an estimated 6,281 in 2022, representing a CAGR of 14.2 percent. The top ten publishers for benchmark authors were Springer Nature (3,641 articles), MDPI (3,596 articles), Elsevier (2,775 articles), Frontiers Media S.A. (1,995 articles), Wiley (1,778 articles), PLoS (1,180 articles), Oxford University Press (704 articles), Sage (546 articles), Taylor & Francis (430 articles), and American Society for Microbiology (423 articles). Regarding APCs, in 2018 authors at

benchmark institutions paid an estimated \$7,599,219.84 in APCs. That number grew to an estimated \$15,862,443.38 in 2022, representing a CAGR for APCs of 15.9 percent. Additionally, as has been the case with OA publishing at the other institutions analyzed as part of this project, a majority of the OA publishing at benchmark institutions has occurred in gold OA journals. Articles in gold OA journals accounted for 81 percent (19,072 articles) of the total OA publishing output by benchmark authors, and the estimated APCs for gold OA journals accounted for 75 percent (\$42,508,010.02) of the total estimated APCs.

## Discussion

Overall, the data showed that there was consistent growth in OA publishing at each of the institutions analyzed in this project. The data also showed that a majority—more than 80 percent—of OA publishing occurred in gold OA journals. Returning to the original publisher proposal that led to the analysis conducted in this project, TAs centered around hybrid journals are problematic and unappealing. These agreements do not reflect the current trends in OA publishing, require libraries to assume all the risk, and are mostly beneficial to publishers. The hope and goal of TAs was to provide a bridge and facilitate the transition to OA in a timely fashion. Unfortunately, that has not been the reality. This has caused cOAlition S, a consortium of national research agencies and funders in Europe, to announce that they are ending financial support for TAs and journals in the transformative journal program at the end of 2024.<sup>28</sup> The goal in supporting these agreements for cOAlition S was to give publishers time to facilitate the transition from subscription models to OA models by the end of 2024. Since this transition will not occur within the given timeline, they believe that “providing financial support for these arrangements . . . beyond 2024 would significantly increase the risk that these arrangements will become permanent and perpetuate hybrid OA, which cOAlition S has always firmly opposed.”<sup>29</sup>

Going further, cOAlition S outlines six specific arguments on why hybrid journals do not lead to full and immediate OA: (1) hybrid has not facilitated the transition to OA; (2) the research community pays twice (double-dipping); (3) hybrid journals are more expensive than fully OA journals; (4) hybrid journals provide a poor quality of service; (5) hybrid journals crowd out new, fully OA publishing models; and (6) hybrid journals are a random mix of paywalled and OA articles that require a subscription in order for readers to take full advantage.<sup>30</sup> For publishers, the hybrid OA publishing model offers little incentive to change publishing models to be fully OA. The hybrid model has opened up a new revenue stream for publishers that enables them to retain and increase their revenue as libraries are moving beyond Big Deal packages. As cOAlition S has argued, there is the concern of double-dipping, where the publisher is paid an APC and the reader is charged for the subscription. Elsevier and other publishers are adamant that double-dipping does not occur.<sup>31</sup> However, when asked to provide data on APCs charged to institutions, some publishers have communicated that they are not able to provide that data because they do not have it. This makes it unclear whether double-dipping does occur, and it will continue to be a speculation until publishers are more transparent with providing OA publishing data. Publishing in hybrid OA journals is also more expensive than publishing in gold OA



journals. Looking at APC data from Elsevier, Sage, Springer Nature, Taylor & Francis, and Wiley illustrates that point (table 5). Based on this data, the APC for publishing in a hybrid OA journal is approximately \$1,635 higher, on average, than an APC to publish in a gold OA journal.

Table 5. APCs for gold and hybrid open access journals by publishers

<b>Publisher</b>	<b>Avg. Gold APC</b>	<b>Avg. Hybrid APC</b>	<b>Difference</b>
Elsevier	\$1,919.44	\$3,321.67	\$1,402.23
Sage	\$1,334.00	\$3,316.12	\$1,982.12
Springer Nature	\$1,902.24	\$3,454.26	\$1,552.02
Taylor & Francis	\$1,224.42	\$3,251.70	\$2,027.28
Wiley	\$2,341.16	\$3,550.29	\$1,209.13

Aside from the issues with the hybrid OA publishing model and TAs centered around this model, there are some other significant issues with TAs. For research institutions like the University of Kentucky, these agreements typically have a cap on the number of OA articles that can be published by authors at the institution signing the agreement. They stipulate that any of the unused allocation of OA articles expire at the end of each year. This puts all the risk on libraries while publishers fully benefit, regardless of the OA publishing output of the institution. These agreements shift the barriers from readers to authors and create further inequities within the scholarly publishing landscape. There are currently mechanisms, such as interlibrary loan, to help address the access barrier for readers. While publishers do offer APC waivers, it is not a comparable mechanism that adequately addresses the publishing barrier for authors. These agreements tend to privilege authors from research-intensive institutions and consortia, since these are the places many of the agreements have been signed.<sup>32</sup> Additionally, these agreements are structured around APCs, which causes concern for their long-term sustainability. Increases in OA publishing output could result in significant increases for libraries, which would effectively put libraries in a similar situation as the unsustainability of the Big Deal journal packages, which many institutions have or are starting to unbundle.<sup>33</sup>

There are some emerging alternatives to TAs. One such alternative is the Subscribe to Open (S2O) model. The S2O model enables publishers to convert subscription-based journals to OA, one year at a time. To participate in S2O, publishers offer subscribers continued access to journal content. If all current subscribers accept the S2O offer (by not opting out and continuing their subscriptions), the publisher will make the journal content covered by that year's subscription openly available. If participation is not sufficient, then that year's content remains behind a paywall. The offer is repeated every year and is dependent on sufficient participation.<sup>34</sup> There appears to be growing support for this model, but none of the large commercial publishers are participating in this model on a significant scale. Another promising alternative to TAs is the New Read Deal<sup>35</sup> proposed by A. J. Boston, Scholarly Communications Librarian at Murray State University. In this model, libraries would prepay for a predetermined amount usage of a publisher's entire portfolio at an agreed-upon flat rate. This flat rate would be determined by historical usage cost divided by the length of the deal. Under this model, publishers would also develop a "Bronze Border" mechanism on their sites to enable free public access

to any of the paywalled content at least equal to the annual surplus of libraries' prepaid uses. Additionally, libraries and publishers would negotiate a "Golden Gateway" to convert any paywalled article that surpasses a certain agreed upon number of downloads (which amounts to funding) to OA based on historical APC rates.<sup>36</sup>

## Conclusion

The continued push toward OA by funders in both Europe and the United States has given publishers additional motivation and incentive to push TAs as a means of compliance with funder requirements. As this push continues, libraries need to determine their strategies around OA publishing agreements and how they fit into their collections budget, if they do at all. There is the possibility that collections budgets could shift from access fees to publishing fees, especially as OA continues to grow. At some point the market will effectively determine that strategy. In order to be intentional about the needs of the campus and UK Libraries budget, discussions are ongoing at UK with a variety of different stakeholders that include the Provost's Office, academic deans, associate deans of research, and the Office of the Vice President of Research, among others. Through these discussions, UK Libraries has found that there is mixed concern about OA publishing across disciplines. Some do not see it as an issue because they have access to grant funding with APCs factored in, while others expressed concern about the lack of access to funding. Others have communicated that they do not want to pursue any OA agreement that would result in the loss of access to journals.

In addition to campus conversations, UK Libraries has been reaching out to publishers to request publishing data, OA and non-OA, to see where faculty are publishing overall and to compare it to the OA publishing data gathered as part of this project. Getting this data from publishers has been a mixed bag. Some publishers have been able to provide the data, while others have only been able to provide partial data. Still others have communicated that they do not have the ability to provide the data requested, such as the total amount of APCs paid by UK authors. The data that has been provided by publishers has confirmed that the estimated costs and OA articles gathered from Scopus are conservative estimates. Equipped with the estimated OA publishing data from this project, UK Libraries are able to utilize additional data points in evaluating TAs and any OA proposal from publishers. As of right now, the data has helped to inform UK Libraries' decision not to pursue any TAs from the large commercial publishers because they are, at the present and in their current form, not worth it.

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