

Developing an Effective Market for Open Access Article Processing Charges

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Final Report to a consortium of research funders comprising Jisc, Research Libraries UK, Research Councils UK, the Wellcome Trust, the Austrian Science Fund, the Luxembourg National Research Fund and the Max Planck Institute for Gravitational Physics

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Invited experts:

Stephen Curry – Imperial College London

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The purpose of this report is to stimulate discussion and debate. It is important to emphasize that there is no implication that either the individual members of the Steering Group, or the organizations they represent, endorse or support all of the models proposed.

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Executive summary

This report was commissioned by a consortium of European research funding organizations led by the Wellcome Trust. The study was undertaken to stimulate thinking among research funders who have set up, or are considering setting up, mechanisms for direct “earmarked” funding of article processing charges (APCs) in open access (OA) journals.

The report covers both full OA journals (referred to in the report as “full OA”, such as those published by Biomed Central and PLOS) and subscription journals which offer authors the possibility of making their individual articles OA by paying an APC. This latter category is known as “hybrid OA”.

There are many full OA journals that are funded by means *other* than APCs and the term “gold OA” also includes these journals. When they are included in the discussion this will be made clear, the focus of the report is however on the segment of gold OA funded by APCs.

Current status of the APC market

The APC OA market is evolving rapidly and growing at about 30% a year.¹ The overall APC revenue was estimated to be approximately 182 million USD in 2012 and growing at about 34% a year, though the rate of growth is expected to tail off to about 20% over the next 5 years.²

Among the established OA publishers with journals listed in Scopus, the average APC grew by about 5% a year over the last two years. This increase was, however, attributed to a relatively small proportion of journals: the price of most journals remained unchanged. The current APC averaged about 1,418 USD. This estimate is higher than many others (including our earlier work³) because in this study we focused on established journals (at least two years old) that were indexed in Scopus.

Mega journals are the fastest growing segment of the OA market.⁴ While pricing varies, the more successful mega journals generally have followed PLOS ONE’s lead with APCs in the range of 1,350 USD.

Subscription publishers have in the last couple of years rapidly expanded the number of journals that offer the hybrid option, though uptake of this option continues to remain low. Some subscription publishers are moving away from a standard APC pricing of around 3,000 USD in order to make their hybrid offerings more competitive. Overall though, the average APC for publication in hybrid journals is 2,727 USD.⁵

The traditional subscription publishers are also entering the OA journal market, by creating their own full OA journals (e.g. Chemistry Open, from Wiley); by acquiring existing full OA publishers (e.g. NPG acquired Frontiers); and, in some cases, flipping subscription journals to OA (e.g. Stem Cell Research, published by Elsevier). As of August 2013 the average APC, levied by the five major subscription publishers studied, who offer a full OA journal publishing option, is 2,097 USD (i.e. on average 679 USD higher than the APC levied by “born digital” OA publishers, such as BMC and

¹ Extrapolation from data in Laakso M, Björk B-C. Anatomy of open access publishing: a study of longitudinal development and internal structure. BMC Medicine 2012, 10:124 doi:10.1186/1741-7015-10-124.

² Outsell: Open Access: Market Size, Share, Forecast, and Trends, Report, 2013.

³ Solomon DJ, Björk B-C. (2012) A Study of Open Access Journals Using Article Processing Charges. Journal of the American Society for Information Science and Technology 63(8):1485–1495.

⁴ For example see <http://tinyurl.com/ozcwvvg>

⁵ Based on our own estimates from aggregate prices across publishers.

PLOS). At the same time, many subscription publishers have also started to limit author self-archiving, for instance by lengthening embargo periods.

Type	Average APC
Full OA journal – published by “non-subscription” publishers	1,418 USD
Full OA journal – published by “subscription” publishers	2,097 USD
Hybrid journal – published by “subscription” publishers	2,727 USD

Proposed scenarios for funder APC policies

The primary goal of the project was to study how research funders, via their own policy choices, could encourage the development of a transparent, competitive and reasonably priced APC funded OA market. One of the key questions therefore, was how to create mechanisms where funders (and indirectly authors in some scenarios) have to factor in the APC price level against the service provided by the journal in question, thus putting competitive pressure on publishers to lower price.

Thus far, we believe that for full OA journals, author sensitivity to the levels of APCs has been working effectively in creating pressure to moderate the price of APCs. The fact that APCs correlate significantly with journal impact factors is also an indication that not only price but also perceived quality matters.

In contrast, hybrid OA articles are significantly more expensive than their full OA counterparts and the price level is an important factor in inhibiting uptake of the hybrid option. Other factors influencing hybrid uptake include how permissive publishers are for self-archiving in the journals in question; whether publisher or institutional OA mandates push authors into using the hybrid option; and whether the author has access to earmarked funding for paying the hybrid charges.

Developing mechanisms by which funders can help to make the hybrid OA market less dysfunctional is a key aspect of this study.

The hybrid OA market is fundamentally different from the full OA market in a number of important ways. One key difference is the risk of publishers charging twice for the same articles (often referred to as “double dipping”). Subscription publishers collect hybrid fees for making articles OA at little additional cost to the publisher, without adjusting their licence fees for the corresponding decrease in subscription only content. This dilemma can be addressed globally or locally. Subscriptions can be lowered to all institutions (globally) reflecting hybrid earnings, or locally rebating the cost of hybrid APCs in, for example, lower subscription costs to the institution that paid the APCs.

The local approach addresses the problem where research-intensive institutions face a substantial rise in their *total* cost of journal access with the combination of subscriptions *and* APC payments. Several interviews conducted during the study showed the difficulties in getting agreements with publishers on these issues and the concern of librarians (faced with limited budgets and the potential of a significant rise in costs to their university) of covering APCs *without* a concurrent drop in subscription fees.

We initially considered four full OA scenario and eight scenarios for hybrid journals. Several scenarios overlap. These are all idealized cases. In practice, elements from different scenarios could be combined to create individualized funder policies.

Based on our analysis we selected three combined (full OA and hybrid) scenarios that we believe are the most likely to be beneficial for achieving a reasonably priced, transparent and competitive market for APC-funded OA publishing. These are summarized below.

Scenario A: APCs are refunded at list prices, with mechanisms at the local level for hybrid articles to ensure savings in subscription costs for a specific institution.

The full OA APC market is relatively moderately priced at less than 1,500 USD and there are clear signs that in many cases authors consider the price of an APC in choosing where to publish. At this point it seems acceptable to continue to pay list prices for APCs of full OA journals. Given the APC market is changing rapidly, and there is a risk of further price inflation, this option, however, would need to be re-evaluated at regular intervals.

In the case of hybrid articles this scenario would be appropriate *provided* that mechanisms are put in place to ensure on the local level that “double dipping” does not occur. That is, institutions paying hybrid APCs must be reimbursed through rebates on subscriptions paid to that publisher to limit the increased costs of paying APCs along with subscriptions.

Only journals which put in place mechanisms to lower subscription costs at the local level should be eligible to receive APC funding at the prices the publishers ask (either individual list prices or discounted prices in bundled deals).

In the case of hybrid OA this scenario would be most appropriate for research-intensive institutions. It is also important to note that the adoption of this scenario is more problematic for research funders who pay APCs, but are not also responsible for paying subscriptions.

Scenario B: APCs are funded according to multi-tier, value-based price caps.

In this model, a maximum APC-price cap a funder is prepared to pay is set for each journal, based on some measure of its relative ‘value’.

Citation rates provide one generally-available metric which could be used as a proxy for value. We recognize, however, that there would be significant concerns over the notion of basing tiered caps solely on citation related journal-level indicators, especially given the current emphasis by funders on moving away from using impact factors. As such, we recommend that any system to measure value would need in reality to be based on quality of service (taking into account factors such as publication times, streamlined peer review service, repository deposit and so forth).

As metrics for these aspects of quality are not yet in place, for modeling purposes only, we have used a three-tier system of caps with maximum payments of 1,000, 2,000 and 3,000 USD and used SNIP values as an approximation of quality⁶.

The rationale for the model is that APCs would be tied to some aspects of the value provided by the journal, thus creating a level of transparency in cost and to limit funder payments for journals that provide relatively little value compared to their cost. It would also encourage authors to consider cost in their choice of a journal to publish.

In the case of full OA, our modeling suggests that the existing competitive market is currently achieving this goal and that the vast majority of journals are currently priced *below* the price caps corresponding to their SNIP-based quality level that we used for this study. For the hybrid market the majority of journals are currently priced *above* the price caps we used and hence this choice of funding scheme would put pressure on publishers to reconsider and differentiate their pricing.

⁶ Source Normalized Impact per Paper (SNIP) is a statistical weighting procedure designed to control for differences in citation rates across fields that has been developed based on Scopus citation statistics.

Scenario C: The funders cover a fixed percentage of the APCs above a maximum value whilst universities (or the authors) cover the remaining portion through other sources.

By having the institution or researcher bear part of the cost of the APC, there would be an incentive for authors to consider the price of an APC as one of the factors in choosing a journal to publish.

The goal here would be to provide an incentive for keeping the APC market, both full OA and hybrid, competitive and reasonably priced. We suggest the fixed percentage would only be applied to APC costs above a certain maximum (for example 1,500 USD). This would minimize the administrative overhead and the burden on authors of applying this scenario.

Conclusions

It should be noted that these scenarios could be combined in different ways by funding agencies and in all cases authors (or their institutions) could choose to pay the difference between what a funder is willing to pay under the scenario and the list price of the APC of the journal they wish to publish in.

It was clear to us that there is no single best scenario. Different funding agencies and universities interested in funding APC have different needs and goals. We see these proposed scenarios as a starting point for further discussion and development and it is likely that a combination of strategies will be needed to promote a competitive reasonably priced market for APC funded scholarly publishing.

I Introduction

I.1 Objectives

The primary aims of this report are:

1. To review the current market for Article Processing Charge (APC) funded open access, analyze emerging trends in the UK and internationally, and identify the key current and future drivers that will serve to determine costs.
2. To identify and appraise policy options for funders and other stakeholders, through which they can help ensure a competitive and transparent market for scholarly journal APCs that supports the continued development of innovative new approaches.

As noted in the request for proposals for this research, a mixed economy of fully Open Access (OA) journals, hybrid articles in subscription journals and green (self-archiving) is likely to exist for quite some time. OA journals, funded through APCs (what we shall term “full OA⁷”), are becoming an increasingly important segment of this economy, growing at about 30% per year.⁸

A number of funding agencies as well as universities and other organizations, both public and private, have made a policy decision to support the costs of publication in APC funded full OA journals and, potentially, in hybrid OA journals as a central channel for disseminating the research they fund. Funders are rightly concerned that the funding they provide for this purpose is well spent and that the APC funded OA market is transparent, competitive and reasonably priced. In a rapidly evolving market with a significant influx of funding, this is a very challenging problem.

The goal of this report is to assess the strengths, weaknesses, opportunities and threats of various approaches or scenarios funding agencies may employ to help achieve a well-functioning market for APC funded OA publication, both full OA journals and hybrid articles. It is important to note that in addition to APC funded full OA journals, gold OA encompasses traditional subscription journals which make their electronic versions free of charge as well as electronic only journals which are free to the authors and fund their operations via subsidies, use of open source IT platforms and voluntary work. Such alternative publishing models are more common in the social sciences and humanities and in particular regions like Latin America. Funding agencies could also play a role in supporting such journals but this was not within the scope of this study.

I.2 Methodology

We employed three strategies to assess the state of the market for APC-funded OA: a comprehensive literature review, consultations with experts, and a series of small focused studies of the current OA market.

The literature review analyzed peer-reviewed journal articles, news stories, government reports, blogs and other material. We identified key material from our experience in researching the development of the OA market, suggestions from the Steering Group members and interviewees, literature searches and references from the literature reviewed.

⁷ In general, the term “full OA” will in this report refer to journals funded by APCs, although such journals are a subset of all full OA journals.

⁸ Laakso M, Björk B-C. Anatomy of open access publishing: a study of longitudinal development and internal structure. *BMC Medicine* 2012, 10:124 doi:10.1186/1741-7015-10-124.

We interviewed 13 experts with a range of perspectives. A full list of the interviewees is appended at Appendix B. In some cases multiple experts were interviewed jointly and some interviewees were interviewed multiple times. Most of the interviews lasted about one hour, a few were in person but most were via phone. The interviews were used to gain background information, to explore the perspectives of different stakeholders in academic publishing and to obtain feedback on the proposed scenarios once they were developed. Since many of the interviews were fairly informal and a few address confidential material, we have chosen not to summarize them individually. The information gained from these interviews was extremely helpful and has shaped many aspects of this report.

The APC funded scholarly publishing market is evolving very quickly and even the most recent published reports are somewhat out of date. For this reason we conducted a series of small studies, most of which were based on retrieving systematic data from publisher web sites. We also used publicly available data from the Scopus citation database on citation rates and to determine the discipline of specific journals. Peter Binfield generously provided us with extensive and up-to-date information on the growth of “mega journals” and Robert Kiley provided us with information on the journals in which grantees from the Wellcome Trust published in 2012. We also used data from an extensive study of APC charges we conducted earlier as baseline data to determine the growth of full OA journals and the increase in their APC charges over a recent two year period.

Based on what we learned from the review of the current state of OA scholarly publishing and the interviews, we developed eight potential strategies or scenarios for hybrid articles and four for full OA journals. Funding hybrid OA poses somewhat different and more complex challenges than full OA journals hence the need to consider additional scenarios. We evaluated the scenarios on 10 criteria based on the literature, our research, feedback from the experts we interviewed and where no other information was available, we used our judgement.

Based on this review we chose three combinations of full OA and hybrid scenarios as the ones we felt most promising for funding agencies in addressing the goals of this project. We analyzed these in more detail using a SWOT format. We modeled two of these scenarios over a five year period using the 2012 publication data from Wellcome Trust researchers as a baseline. We felt these data provided a good model for researchers funded by other major biomedical funding agencies. We were unable to locate good data for modeling the impact of these scenarios in other disciplines.

1.3 Use of the findings

This report is intended for research funding organizations and policy makers. It should also be of interest to university administrators who are considering providing internal funding to support OA, as well as university librarians. It may also be of interest to publishers and individual academics interested in the OA phenomenon.

This report attempts to provide a clearer picture of the current state of the OA market and trends in full OA and hybrid journals as well as the state of publisher policies for author self-archiving. It also provides a set of proposed strategies or scenarios *as a starting point* for discussion on how funding agencies might influence the APC market to encourage transparency and competition.

It is also clear that successfully implementing an APC funding model requires stakeholders to address a much broader set of issues – such as developing effective payment and tracking systems and determining what the minimum requirements are that publishers must meet in order to qualify for receiving payments. We hope what follows can be a useful in furthering the discussion of these very complex issues.

2 Literature review

2.1 Scientific publishing from a business perspective

Many sources have argued that scientific journal publishing based on the subscription revenue model is a dysfunctional market. In particular two articles by Stuart Shieber⁹ make a clear analysis of the situation in microeconomic terms.

Shieber discusses the market for subscription access to scholarly journals. He notes that different journals in economic terms are complements rather than substitutes and hence do not compete. Second, he notes that providing journal access is a monopolistic good, meaning that leading publishers, who control large numbers of important journals, have been able to extract monopolistic rents for these journals. The very high profit levels of the leading commercial publishers provide tangible evidence of this fact.¹⁰ This situation has been further cemented by the bundling of journals made possible by electronic site licences, in which the price is controlled at the bundle level through individual contracts or “big deals” tailor-made for each subscribing institution. In summary, Shieber describes this market as highly dysfunctional due to the lack of competition, and one in which smaller society publishers in particular are disadvantaged compared to the major commercial ones.

Shieber characterizes the market of providing open-access dissemination services to authors as one where different journals are substitutes for each other, in contrast to the subscription market where they are complements. In the OA market, an author can usually choose between publishing in a handful of relevant journals, which are clear alternatives to each other. This provides a much more competitive situation. Combined with much lower barriers of entry for new innovative publishers, this model has led to a situation where market equilibrium between supply and demand seems to have been reached at an average price level of around 1,500 USD per article for higher quality full OA journal APCs.¹¹ This compares to a revenue level of around 5,000 USD per published article in the subscription market.¹²

Also Jacobs¹³ discusses a set of attributes for achieving a well-functioning competitive market, and applies these to APC funded OA. He in particular mentions low barriers to market entry and exit, including low transaction costs as well as price signals that are relevant to producers and consumers.

Estimates of the growth of full OA in recent empirical studies^{14,15} are in line with each other and show a continuous growth over the past decade of over 20% per year. Eleven percent of all articles

⁹ Shieber SM (2009) Equity for Open-Access Journal Publishing. PLoS Biol 7(8): e1000165. doi:10.1371/journal.pbio.1000165 and Shieber, Stuart (2013). Why open access is better for scholarly societies, The Occasional Pamphlet on scholarly communication, January 29th, 2013, <http://blogs.law.harvard.edu/pamphlet/2013/01/29/why-open-access-is-better-for-scholarly-societies/>

¹⁰ For example in 2011 the operating profit margins of the three leading STM publishers Informa, Elsevier and Wiley ranged between 35.9 % and 42.5 %. Informal communication from a business analyst.

¹¹ Based on a market analysis presented later in this report.

¹² Odlyzko A. Open Access, library and publisher competition, and the evolution of general commerce. arXiv:1302.1105v1.

¹³ Jacobs N, Gold OA: attributes of a well-functioning market, 01.04.2013, unpublished position paper.

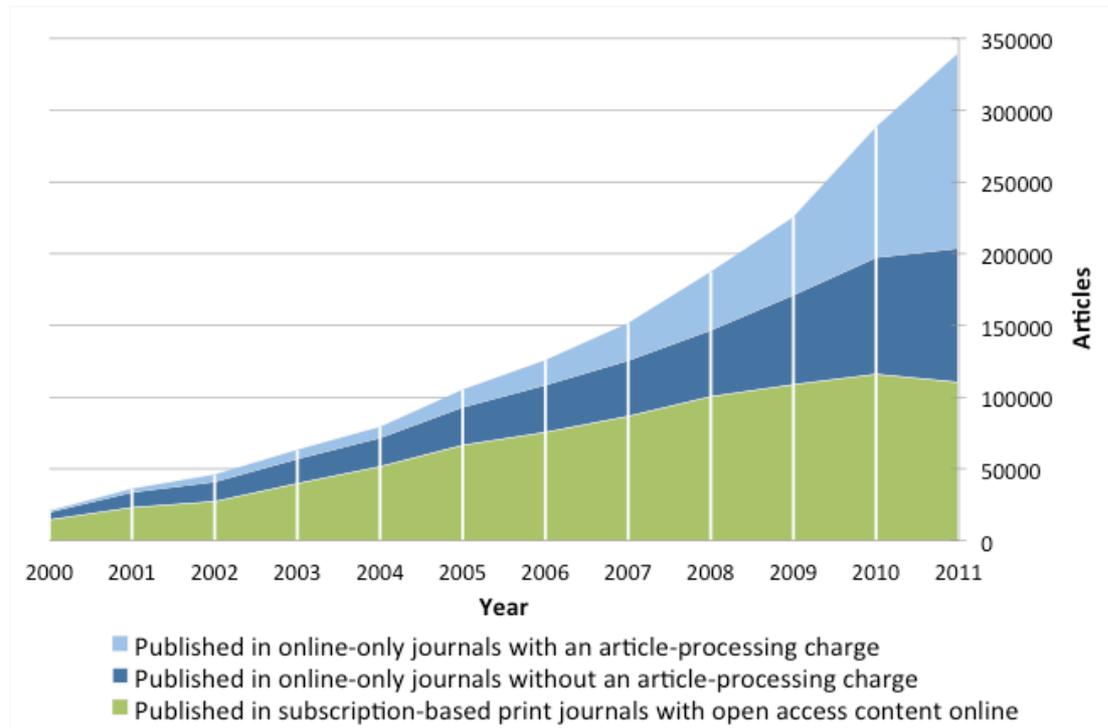
¹⁴ Laakso M, Björk B-C, 2012. Anatomy of open access publishing - a study of longitudinal development and internal structure, BMC Medicine, 10:124, doi: 10.1186/1741-7015-10-124.

¹⁵ Science-Metrix, 2013. Proportion of Open Access Peer-Reviewed Papers at the European and World Levels—2004-2011. http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf

indexed by Scopus were published in full OA journals (APC funded and others).¹⁶ Delayed OA journals add another 5% as well as perhaps 1% in hybrid journals. Extrapolating these data to 2014, we can estimate a share of almost 15% for gold OA, which would increase to around 20% if delayed OA journals were to be added.

The following graph from Laakso and Björk 2012 (**Figure 1**) shows the growth and internal distribution of gold OA articles in three major categories over the years. Based on current trends, we would expect the number of OA articles published in 2013 to have grown to around 500,000.

Figure 1: The development of gold OA articles 2000-2011



A key feature of the growth is that the APC-funded revenue model has increased its share of OA publications, from around 10% in 2003 to 50% OA in 2013.¹⁷

A recent report on the OA market by Outsell¹⁸ strives to give a comprehensive overview of the APC funded OA market, from a business-oriented view of the total revenue for publishers. It makes an interesting split of the market into traditional APC journals, mega journals, hybrid OA and institutional memberships, with traditional OA journals and mega journals dominating in terms of revenue. The estimated overall OA revenue was 81 million GBP for 2011 and 113 million GBP for 2012. Outsell calculated a 34% growth in revenue between 2011 and 2012, and in their growth forecast through 2015 they predict a decrease from 34% to 21% in the growth rate.¹⁹ If these estimates are accurate this would result in global revenue of 214 million GBP for 2015, roughly three times that of five years earlier.

¹⁶ Solomon DJ, Björk B-C. (2012) A Study of Open Access Journals Using Article Processing Charges. *Journal of the American Society for Information Science and Technology* 63(8):1485-1495.

¹⁷ Solomon DJ, Laakso M, Björk B-C. (2013) A longitudinal comparison of citation rates and growth among open access journals. *Journal of Informetrics* 7 642- 650. doi:10.1016/j.joi.2013.03.008.

¹⁸ Outsell: Open Access: Market Size, Share, Forecast, and Trends, Report, 2013.

¹⁹ There is however no justification for this predicted decrease in the growth rate.

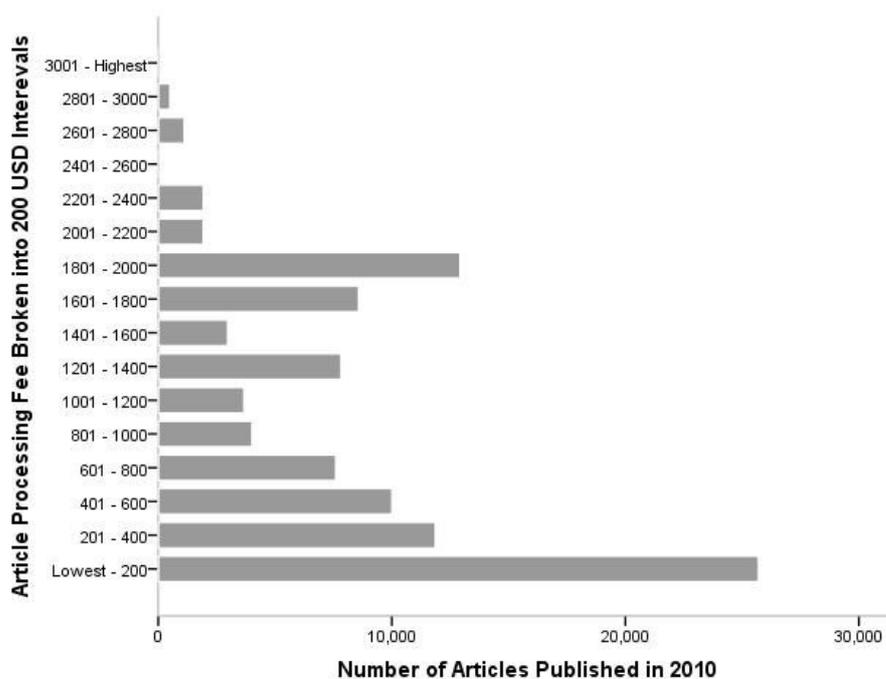
2.2 The level of APCs

Different studies have produced different estimates of the average level of APCs in full OA journals.

Outsell's overall estimate for an average APC is as low as 660 USD for 2011. They predict that this would increase to 950 USD by 2015, mainly due to the increasing emergence of more highly priced offerings from traditional brand publishers.

Our own empirical study²⁰ of the level of APCs in 2010 provides a baseline for a study discussed later in this report. We believe the figures are the most comprehensive currently available. The overall average is 906 USD, calculated over more than 100,000 articles. The results are also broken down by scientific discipline and other journal attributes showing the highest averages in biomedicine and the lowest in arts and humanities. **Figure 2** below shows the distribution of articles over different APC levels.

Figure 2: Distribution of APCs of full OA journals in 2010



Other studies, often when developing scenarios for the economics of gold and green OA^{21,22}, have used much higher figures, for instance based on average APCs paid by grantees from particular funders. It must be remembered that such grant recipients (for instance from the Wellcome Trust) often tend to publish a higher proportion of their work in more prestigious, and hence also more highly priced journals in biomedicine.

²⁰ Solomon D, Björk B-C, 2012. A study of open access journals using article processing charges. *Journal of the American Society for Information Science and Technology*, Volume 63, Issue 8, pages 1485–1495.

²¹ Swan A, Houghton J. Going for gold, 2013. report, http://www.ucml.ac.uk/sites/default/files/pages/131/Modelling_gold_Open_Access_for_institutions_-_final_draft3.pdf

²² Jubb M, Cook J, Hulls D, Jones D, Ware M. 2012. Costs, risks and benefits in improving access to journal articles. *Learned Publishing*, 24:247–260.

2.3 Transition scenarios

The question of how established subscription journals could transition to APC funding has been the focus for a number of articles. As early as 2003, David Prosser described how hybrid OA could be used to build a transition path from subscription only access to full OA.²³ The key parameter in Prosser's scenario was to set the hybrid charge at the level of the average production price per article from the very start, so that if there would be large scale migration to hybrid, the journal would end up getting the same overall income from APC as from subscriptions. This idea was implemented by Springer in 2004 in its Open Choice programme with a one-price fits all of 3,000 USD²⁴ and other big publishers have followed-up with similar programmes.

Björk and Hedlund²⁵ continued along the same lines as Prosser and proposed two ways in which publishers can convert journals to OA: a drastic one-time flip and a gradual transition using hybrid OA, in which the hybrid APCs for a whole university are bundled with the subscription costs. Under this model the total income to the publisher remains at the same level throughout the transition. This latter approach comes close to the proposals about avoiding “double dipping” on the local level, discussed later in the scenario part of this report.

A very important recent development has been the transition of a number of scholarly journals in High Energy Physics (HEP) to OA, through the SCOAP₃ initiative led by CERN in partnership with the research funders in the field and a worldwide alliance of libraries.²⁶ A price-per-article is derived from a competitive call for tender for existing subscription journals to “flip” to OA, and existing OA journals to provide services free of charge to authors. A capped overall budget envelope is used, resulting in average APCs (including journal growth) below 1,200 EUR per article. Journals are no longer selling subscriptions, and publishers are reducing costs to libraries worldwide. In turn, at a national level, these funds are used to offset a national contribution into a common SCOAP₃ fund. The fund is used by CERN, for the benefit of SCOAP₃, to pay for APCs. Ten journals (co-)published by 11 publishers, including Elsevier and Springer, are participating. This approach also avoids the “double dipping” issue.

This initiative is an important pioneer for the conversion of a full field of science to OA. However, the infrastructure and traditions of HEP are unique and especially well-suited for such an innovative approach for transitioning to full OA. In addition, HEP is a specialized field with relatively few journals and publishers. Implementing this approach would be much more difficult in a discipline such as biomedicine with thousands of journals and dozens of very diverse publishers. On the other hand, most of the libraries and funding agencies which have successfully converted their subscriptions into APCs are not specific to HEP, and the SCOAP₃ project provides a valuable model for future innovations in the broader conversion to a fully open access scholarly publishing system.

2.4 The “double dipping” issue

With the hybrid option, publishers could in principle receive subscription as well as APC income for the same article, at least in the initial stages of transition when there are low hybrid uptake

²³ Prosser D. From here to there: a proposed mechanism for transforming journals from closed to open access, *Learned Publishing*, Volume 16, Number 3, 1 July 2003, pp. 163-166.

²⁴ Peter Binfield who was involved in the hybrid development process at Springer confirmed that the 3,000 USD price was based on their estimate of the price necessary to replace subscription revenue.

²⁵ Björk B-C, Hedlund T 2009. Two Scenarios for How Scholarly Publishers Could Change Their Business Model to Open Access, *Journal of Electronic Publishing*, Vol 12, No 1, <http://dx.doi.org/10.3998/3336451.0012.102>

²⁶ The SCOAP₃ initiative, <http://scoap3.org/about.html>

levels. This phenomenon has often been termed “double dipping.” Although there are some costs to processing APCs, these costs are minimal compared with the typical hybrid APC. This has a potential of increasing publishers’ profits and creating higher costs to funders or universities willing to pay hybrid charges.

This is seen as a serious potential problem both in the literature^{27,28} and by a number of the experts we interviewed, particularly for research intensive institutions that pay for both subscription fees and hybrid payments for their researchers. We use the term double dipping in the discussion of this issue below but do so with no specific negative connotations intended.

2.5 Mechanisms for funding and paying APCs

Authors have often had to combine a number of sources of funding to pay for an APC (both in full OA and hybrid journals). These sources include allowable costs from grants, institutional dedicated APC funds, general overhead money and even personal funds. This has meant that authors are often sensitive to APC price level.²⁹ In microeconomic terms, the price elasticity of demand has been high.

A couple of studies have explored what level of APCs authors have been willing to pay and how they have funded the charges. The European SOAP study³⁰ found that for 28% of researchers grant money was used, in 55% of cases overhead funding from grants or the department was used, and in only 12% of cases the researchers paid themselves (with 5% other). Unfortunately, it is difficult from the answers given to know how many combined money from multiple sources. The results from a similar survey by Solomon and Björk³¹ show approximately the same distribution, with around 30% of researchers in industrialized countries using grant funding. The picture is different for developing nations, where 39% of the funding came from personal funds.

Both of the above studies also asked authors what level of APC they would be willing to pay for publication in an OA journal, giving the authors a range of choices.³² While the results indicate a clear price elasticity, the results must be interpreted with caution. For instance Solomon and Björk report on the answers to the question “If there were a journal in which you had a strong desire to publish, what would be the maximum APC you would be willing to pay?” The responses ranged from 0 to 5,000 USD with an average amount of 649 USD and a standard deviation of 749 USD. There is a risk that many respondents interpreted the question to mean the amount they would pay “out of pocket” rather than the actual APC they would be willing to pay from whatever source was available.

²⁷ House of Commons, Business, Innovation and Skills Committee, 2013. Open Access, Report, Volume I: Report, together with formal minutes, oral and written evidence, <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmbis/99/9902.htm>

²⁸ http://www.scienceurope.org/uploads/PublicDocumentsAndSpeeches/SE_OA_Pos_Statement.pdf

²⁹ In other cases authors are able to draw funding from accounts with no specific limits and may not be as sensitive to the price of an APC.

³⁰ Dallmeier-Tiessen S, Goerner B, Darby R, Hyppoelae J, Igo-Kemenes P, Kahn D, Lambert S, et al: Open access publishing - models and attributes. Max Planck Digital Library/Informationsversorgung; 2010. <http://edoc.mpg.de/478647>

³¹ Solomon D, Björk, B-C, 2012, Publication Fees in Open Access Publishing: Sources of Funding and Factors Influencing Choice of Journal, *Journal of the American Society for Information Science and Technology*, 63(1):98-107, 2012, DOI: 10.1002/asi.21660.

³² Dallmeier-Thiessen et al: The SOAP Symposium – III Open Access Publishing Today: What scientist do and why, presentation at the SOAP Symposium, January 13th, 2011, Berlin, slides 21-27. de.slideshare.net/ProjectSoap/soap-symposiumtalkiii. Solomon and Björk, see above.

In a survey with authors who had published in the prestigious Proceedings of the National Academy of Sciences (PNAS), editor Cozzarelli asked authors about their willingness to pay an extra charge for making their article immediately open access³³. It should be noted that PNAS articles are made OA after a delay of 6 months in any case, and that the journal levies page charges for all articles, meaning that there would be no extra effort to pay the hybrid OA charge. According to the survey half of the authors were willing to pay the extra charge, and the share of those willing to pay different levels showed a steep price elasticity (79% at 500 USD, 15% at 1,000 USD, 4% at 1,500 USD and 2% at 2,000 USD). The actual high uptake of the paid hybrid option is actually in line with this “feasibility study” study. At a regular price of 1,300 USD and a discounted price of 975 USD for authors from institutions with site licences to PNAS (probably the majority), the uptake in the five year period 2006 to 2011 was between 17 and 23%.

The uptake levels of different hybrid OA journals also demonstrate how sensitive authors are to the price. Björk³⁴ has shown uptake levels of 2% or less for publishers charging around 3,000 USD. The few “success stories” of hybrid journals that have achieved uptake levels of around 10% seem mostly to be due to much lower APCs or big discounts for society members, in combination with the journals being leading publications in their scientific fields. A notable exception is Nature Communications, which despite an APC price of 5,200 USD has managed to get significant hybrid uptake, most likely because of the high impact factor and the brand of the publisher. It is also worth noting that a significant share of the hybrid articles in Springer journals has come through bundled deals linking APCs with subscription licences. This has been limited to a few select universities or consortia.³⁵

Against this background, it is understandable why some funders, like the Wellcome Trust and the Austrian Research Fund, have started to provide dedicated funds for paying APCs as a way of increasing uptake, by insulating authors from the APCs.

Pinfield and Middleton³⁶ report the extent to which UK universities have established centralized funds and mechanisms for the handling of APCs (only 13% of responding universities had such systems in 2011). They also describe a case study of an institutional fund at the University of Nottingham. The mean cost paid through that fund in 2010-2011 was 1,216 GBP (1,997 USD), that is slightly less than the average for Wellcome Trust funded APCs, but clearly higher than the world average in our study. This can partly be explained by the fact that the vast majority of journals were in medicine or biomedicine.

A major focus of the debate in the UK in the past couple of years has been the mechanisms of funding APCs and their consequences. The Finch report³⁷ created a lot of discussion in the different OA camps and has been very influential on later developments in the UK. A key concern of the report is the balanced transition towards more OA, it states that:

it seems likely that the transition towards open access will accelerate in the next few years. The Group’s aim is to support that process, but to ensure that policies are implemented in

³³ Cozzarelli N, Fulton K, Sullenberger D. (2004). Results of a PNAS author survey on an open access option for publication, PNAS 2004 101(5), 1111. doi:10.1073/pnas.0307315101

³⁴ Björk, B-C, 2012. The hybrid model for open access publication of scholarly articles – a failed experiment? Journal of the American Society of Information Sciences and Technology, Volume 63, Issue 8, pages 1496–1504.

³⁵ Interviews with Ivy Anderson, California Digital Libraries, Ralf Schimmer, MPDL.

³⁶ Pinfield S, Middleton C, 2012, Open access central funds in UK universities, Learned Publishing, Volume 25, Number 2, pp. 107-116.

³⁷ Finch J. (2012). Accessibility, sustainability, excellence: how to expand access to research publications. Retrieved from <http://www.researchinfonet.org/publish/finch/>

ways that do not disrupt the essential features of a high-quality and continuously-developing research publishing ecology, or the high performance and standing of the UK research community.

The report puts much emphasis on simplifying the mechanisms for funding APCs in both full OA and hybrid OA journals. It points out that, in addition to the publication charges themselves, the transaction costs for handling the payments can be considerable – both for publishers and the institutions of the authors. Like many other earlier studies, the report tries to model the short-term economic effects of open access assuming different levels of average APCs and OA uptake.

The report highlights several important issues related to the funding and payment of APCs, including how costs associated with multi-author articles and articles which have not been funded via specific grants should be provisioned. It also discusses the mechanisms that universities are starting to set up to centrally deal with APC funding.

A later House of Commons select committee (BISCOM) report³⁸ voices strong criticism of the Finch report and its follow-up in the form of the Research Councils UK (RCUK) OA policy. It puts much more stress on green self-archiving as the preferred route to OA and is highly critical of the current RCUK policy. Among the concrete recommendations two are note-worthy. First, it suggests that the allowed maximum embargoes for green OA should be shortened to 6 months for STM and 12 months for the social sciences and humanities. Second, it recommends that: “If RCUK and the Government continue to maintain their preference for gold, they should amend their policies so that APCs are only paid to publishers of pure gold rather than hybrid journals.”

Recently the Finch committee issued a review of progress one year after the original report³⁹, based partly on written input from 25 stakeholders. One central observation was that few universities had added internal funding to the APC-funds set up using the earmarked lump sums given to them by RCUK. In contrast to the BISCOM report, The Finch committee recommends that hybrid OA should be funded, although it highlights the problems involved in ensuring that the sum total of APC and subscription cost doesn't grow too much for research intensive universities.

A further input into this discussion was provided by the UK Government response to the House of Commons report⁴⁰. A central position statement is:

Government does not consider it appropriate for publishers to rely on retrospectively amortising their APC revenue to discount global subscription rates, as some now do. This may address 'double-dipping' in one sense, (no increase in total revenue to the publisher) but it does nothing to address the concerns of research intensive individual institutions, wherever they are located around the world. Such institutions paying APCs for gold OA publication in particular journals should see some related and proportional discount in their total subscription fees, with the same publisher, to avoid them disproportionately funding the translation to gold OA.

³⁸ House of Commons, Business, Innovation and Skills Committee, 2013. Open Access, Report, Volume I: Report, together with formal minutes, oral and written evidence, <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmbis/99/9902.htm>

³⁹ Accessibility, Sustainability, Excellence: How to Expand Access to Research Publications. A Review of Progress in Implementing the Recommendations of the Finch Report, October 2013. <http://www.researchinfonet.org/wp-content/uploads/2013/02/Final-version.pdf>

⁴⁰ House of Commons, Open Access: Responses to the Committee's Fifth Report of Session 2013-14 - Business, Innovation and Skills Committee, 27.11.2013.

2.6 Discussion

The full OA market so far appears to be competitive. New entrants have created a niche for themselves by offering value with relatively low APCs. The leading companies have now been in business for around a decade and seem to be profitable at their current APC levels. Acquisitions by major subscription publishers of OA companies such as BMC (by Springer) and Frontiers (by Nature Publishing Group) are also indications that the market is functioning well.

The hybrid market on the other hand is highly dysfunctional with very low uptake for most hybrid journals and a relatively uniform price in most cases without regard to factors such as discipline or impact. Growth in the last few years has mainly been in the total number of journals for which the option has become available. Offering the hybrid option is low risk and inexpensive to set up for the publishers. Since publishers are not dependent on the hybrid income stream they have not been motivated to lower the prices to what most customers are willing to pay.

Both the full OA and hybrid market demonstrate that the uptake of APC funded OA is highly dependent on the price elasticity of the authors' willingness to pay certain levels of APCs. This is especially the case where the authors have had to meet these costs from their own or their university's limited discretionary funds as well as from "allowable project costs" in research grants. We believe that this is a major reason why hybrid OA, which usually has been priced at around 3,000 USD, has had such a low uptake. It is nevertheless important to bear in mind that the hybrid market functions differently from the full OA market, in the sense that the decision to pay the hybrid charge is usually taken long after the journal has already been chosen, and is usually optional, since the author can in most cases self-archive the work at no cost or simply allow their article to remain behind a subscription paywall. In that situation, price sensitivity can also vary a lot depending on discipline. For some authors it is not the price that hinders them in using the hybrid option as much as the extra effort of getting permissions from superiors and carrying out the payment.

If earmarked APC funding starts to become more available (for instance in the form of university-wide funds) there is likely to be far less pressure on authors to be price conscious in choosing where to publish their research. Making decisions about rationing the use of this resource will then fall on the administrators of such funds, given that there is likely to be a scarcity of money to meet all requests. One way of dealing with such scarcity would be the use of price caps, but hardly any of the reports in this literature review discuss this possibility. Another option is for these funds to cover only a portion of the APC and require authors to locate funds from other sources for the remaining portion of the APC. We consider both of these options in the scenarios we set out in Chapter 6.

Most publishers offering hybrid OA pledge that they don't engage in "double-dipping" and that they will reduce subscription prices to journals proportionally as the uptake of the hybrid option increases. Unfortunately, subscription prices to individual titles from the larger commercial publishers are more or less meaningless, due to the dominance of bundled electronic licences. Such big deals are multiyear contracts, which are usually the result of long negotiations and often covered by non-disclosure clauses.

Consequently, it is almost meaningless to ask if a hybrid uptake of 1-2% for the publisher in question has had any marginal effect on the price level of the deal. Several of our interviewees confirmed this to be the situation. The situation might change if hybrid uptake becomes more noticeable, say around 10%.

There is also the issue that addressing “double dipping” on a global scale by across-the-board reductions in subscription prices puts a significant financial burden on those institutions that are willing to pay hybrid APCs, diluting any benefit from reduced subscription fees for them to the point where it does little to cover the expenses of paying hybrid APCs. Many (including the recent UK government statement) advocate that double dipping must be addressed at a local level where reimbursements for hybrid payments would be directed back to the institutions that actually made the payments.

The fact that raising the funding and paying the APCs is a non-trivial task has been discussed in some studies, and was raised in several interviews with both OA publishers and librarians. This involves dealing with difficult issues - such as articles with authors from many institutions and countries, articles published outside the time limits of the grants they stemmed from, and rules for waivers for authors without access to funds to pay.

Processes for handling APC payments have in large part been extremely challenging and inefficient causing a great deal of frustration for both publishers and librarians. While intermediaries would seem to be a good solution for addressing these problems, neither publishers nor librarians (including those interviewed for this study) seem to feel that efforts to date have been very effective. The lack of effective administrative and work-flow structures for payments appears currently to be a serious impediment to a wide scale conversion from subscription to APC funded OA publication.

It is also important to note that implementing changes to a complex publishing ecology can be extremely challenging. The history of the publishing agreements between the Max Planck Institutes (as well as a number of universities) and Springer around 2007 is instructive. These agreements provided subscription access to Springer journals and allowed researchers covered by the agreements to publish articles as hybrid OA in Springer’s Open Choice journals at no additional cost. While these agreements were attempts in good faith both by Springer and the sponsoring institutions to implement a programme to provide hybrid OA options for authors, they were ultimately not successful and were terminated after a few years. Even though there was no additional cost to publish OA, the uptake of the hybrid option by MPG authors was extremely low due to a variety of factors that involved changes in workflows, communication to authors and confusion about the programme.⁴¹

One could speculate what the APC market would look like if it worked on similar terms as the subscription market. Under such a model, we posit that individually paid APCs would be very expensive (as is the subscription model with an estimated cost of 5,000 per article). Consequently those publishers who controlled big portfolios of APC funded OA journals would make bundled deals with universities and funders, which would result in seemingly lower APCs per article if they committed to paying the publisher a fixed sum per annum, a sort of APC “subscription”. The price differential when compared to individually paid APCs would be large enough to effectively push universities to predominantly pay for APCs via these deals, and thus tie up their earmarked APC funds. Such deals would also streamline the administrative effort to pay APCs which further increases their attractiveness. This would result in a loss of transparency and would be very detrimental to smaller OA publishers and innovative companies wishing to break into the market.

⁴¹ We would like to thank Ralf Schimmer for informing us about the agreement between MPG and Springer.

3 Current status of the APC market

This chapter presents an analysis of the current status of APC-funded OA publishing in both full OA and hybrid journals.

The first part of this chapter discusses the full OA journal market. We update a previous study conducted in late 2011 concerning the APCs charged by 1,370 OA journals publishing over 100,000 articles annually. We then review the growth of newly founded full OA journals published by the major traditional subscription publishers and the growth over the last few years in what are often termed mega journals. We also briefly discuss the problems caused by commercial low-quality journals from so-called “predatory publishers”.

The second part of this chapter discusses the current situation in the hybrid market, and how this has changed over the last two years.

3.1 Full OA journals

3.1.1 Growth in APC charges for established OA journals

For this analysis we used baseline data from a previous study referenced above of full OA journals, which charge authors an APC and were registered in the Directory of Open Access Journals (DOAJ) in August 2011.⁴²

The goal was to assess the increase in APC pricing and the growth in article volumes in established OA journals over the past two years. We assessed the growth in the number of articles and the change in APC prices based on a sample of 187 journals included in our original study, which was weighted towards the larger and higher quality publishers. The detailed description of the methodology used can be found at **Appendix E**.

From 2010 to 2012, the average number of articles published per journal per year increased from 107 to 188. If PLOS ONE is removed from the sample, the average increased from 71 articles a year to 110 articles a year, which is a growth of 55% or approximately 24.5% per year.

This finding is consistent with both the literature and data about the total article volume growth from the larger publishers in the Open Access Scholarly Publishers Association (OASPA), as can be seen in Figure 3 below. It is evident that the article volumes of established OA journals are approaching the average of subscription journals.

From 2011 to 2013⁴³ the average APC of the sampled journals increased from 1,292 USD to 1,418 USD, about 10%, or 5% per year (although most of the journals had not changed their APC charge during this period). The difference between the average APC in this study (1,292 USD) and the 906 USD in our original study can be explained by the fact that the subsample of journals used in this study were from more prestigious and well established journals.

For comparison, the Periodicals Price Survey 2013⁴⁴ suggests the overall inflation in serial pricing during this period was about 6% per year. Virtually all of the journals we sampled are in the

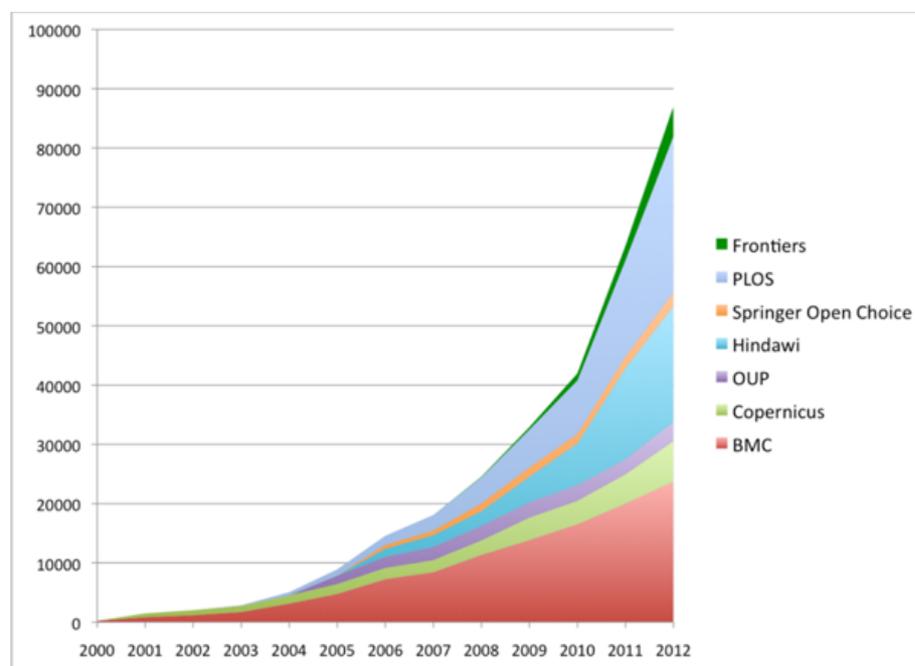
⁴² Solomon DJ, Björk B-C. (2012) A Study of Open Access Journals Using Article Processing Charges. *Journal of the American Society for Information Science and Technology* 63(8):1485–1495.

⁴³ The time span for number of articles per journal was based on the last complete year at the time of data collection (2010 and 2012). For the APC the time span needed to be the date of data collection hence 2011 and 2013.

⁴⁴ http://lj.libraryjournal.com/2013/04/publishing/the-winds-of-change-periodicals-price-survey-2013/#_

Scientific, Technical and Medical (STM) area, where the inflation rate has been around 9% per year suggesting the inflation in APCs is somewhat less than the price inflation in equivalent subscription journals. This however does not take into account the increase in the number of articles published in these subscription journals.

Figure 3: Article volume growth for major OASPA member publishers⁴⁵



3.1.2 Creation of new OA journals by the leading subscription publishers

The OA publishing options for six of the major traditionally subscription publishers were evaluated. These included Elsevier, Wiley, Nature, Sage, Taylor & Francis, and Wolters Kluwer. This analysis was conducted separately from the study above, using information found on publisher web pages, since many of these new journals are not yet included in the DOAJ index.

- **Elsevier** has summarized its OA policies and journals on its web pages.⁴⁶ As of the end of August 2013 Elsevier had 46 fully OA journals across a range of scientific of scientific and medical fields. By early December 2013, the number had grown to 72. A few, such as FEBS Open Bio and EuPA Open Proteomics, are society journals that are published by Elsevier. Elsevier also recently “flipped” seven existing journals to OA.⁴⁷ Two of these were part of the SCOAP₃ contract but the other journals were the result of independent decisions to convert to APC funded full OA journals.
- **Wiley** currently has 28 fully OA journals⁴⁸ most with affiliated societies.
- **Nature Publishing Group** publishes 17 OA journals including the mega journal Scientific Reports, which is discussed in more detail below. In the spring of 2013, Nature Group acquired the Swiss OA publisher Frontiers which published over 5,000 articles in 2012⁴⁹.

⁴⁵ Growth of Open Access - Major Publishers. Cameron Neylon, OASPA. figshare. <http://dx.doi.org/10.6084/m9.figshare.650799>

⁴⁶ <http://www.elsevier.com/about/open-access/open-access-journals>

⁴⁷ <http://online.wsj.com/article/PR-CO-20131217-903941.html?dsk=y>

⁴⁸ <http://www.wileyopenaccess.com/details/content/12f25e0654f/Publication-Charges.html>

⁴⁹ <http://www.startupticker.ch/en/news/march-2013/emerging-swiss-publisher-frontiers-acquired-by-nat#.Uo-3rMSSim4>

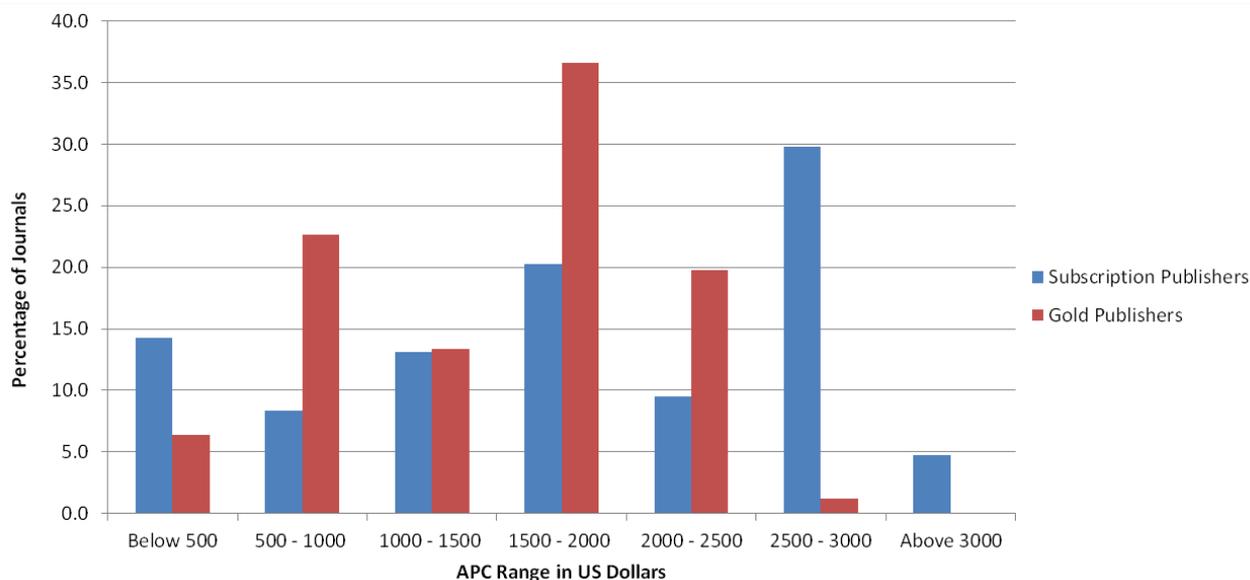
- **Sage** currently publishes 15 fully open journals.⁵⁰
- **Taylor & Francis** has 18 fully OA journals.⁵¹
- **Wolters Kluwer** acquired Medknow, a large OA publisher based in India in 2011.⁵²

While these full OA journals represent a small fraction of the thousands of journals published by major traditionally subscription publishers, many appear to be rapidly expanding into the full OA publishing market by either acquiring existing OA publishers (e.g. NPG's acquisition of Frontiers), creating new fully OA journals (e.g. Chemistry Open from Wiley) or, to a much smaller degree at present, converting their subscription journals to full open access (e.g. Stem Cell Research published by Elsevier). This trend began when Springer launched Springer Open in 2010 after acquiring BioMed Central in 2008.

Unlike the hybrid market, publishers have tended to diversify their full OA journal prices and set them more competitively. But still, on average, APCs are higher than those charged by the full OA publishers included in the analysis above. Figure 4 below compares the distribution in APC prices between these two groups of publishers. The comparison is between the current APC prices of the 187 fully OA journals in the study above with 102 journals identified as being published by the traditionally subscription publishers. These data were collected in August 2013.⁵³

The APCs of the new fully OA journals published by subscription publishers are, on average, 679 USD higher than the prices levied by the more established “born digital” full OA publishers. The distribution of the APCs in these two groups of journals can be seen in **Figure 4** below.

Figure 4: Distribution of APC charges for traditionally subscription and full publishers



Many of the new, full OA journals have little or no content at this point in time and a significant portion are not charging an APC as the publishers attempt get these journals established. With

⁵⁰ <http://www.sagepub.com/openaccess.sp>

⁵¹ <http://www.tandfonline.com/page/openaccess/openjournals>

⁵² <http://www.stm-assoc.org/industry-news/wolters-kluwer-health-acquires-leading-open-access-stm-journal-publisher-medknowin-india/>

⁵³ The journals did not include those acquired from purchasing existing fully OA publishers. We included APC prices when they were published even if APCs were temporarily waived.

their considerable resources, brand name recognition and expertise, these large publishers could quickly become a major force in the full OA publishing market.

3.1.3 *Mega journals*

Following the success of PLOS ONE a growing number of publishers have created journals often termed “mega journals” that have largely emulated the PLOS ONE model. These journals normally have:

1. very broad scopes generally encompassing a whole discipline or multiple disciplines;
2. a review process that focuses exclusively on whether the methodology is sound and the research and publication followed acceptable ethical standards without regard to the importance of the research topic or results; and
3. an accelerated review and publication process.

A listing of 19 mega journals, the number of articles published and their launch year along with eight journals with tentative launch dates in 2014 is provided at Appendix F.

Mega journals are becoming an established form of peer reviewed publication. Based on the success of PLOS ONE, most of the other journals were launched starting around 2011. Their success in attracting submissions has varied significantly as can be seen in **Appendix F**. A few, like BMJ Open (published by BMJ) and Scientific Reports (published by the Nature Publishing Group) are growing exponentially. The effect of the strong brand name of the publisher, plus the fact that both have recently been accepted for indexing in ISI, meaning they will soon get impact factors, could have contributed to their success in attracting submissions.

PeerJ is a mega journal that is using a new approach to OA publishing, based on a membership model. The membership fees are a one-time charge and allow authors to publish articles for life. However, all authors of a paper must meet the membership requirements. The base membership is 99 USD for one publication a year. Launched in early 2013, PeerJ has published around 220 articles in the first nine months of operation. It is not clear at this point if the journal will scale up to a level that will make it financially sustainable but it offers an innovative funding model.

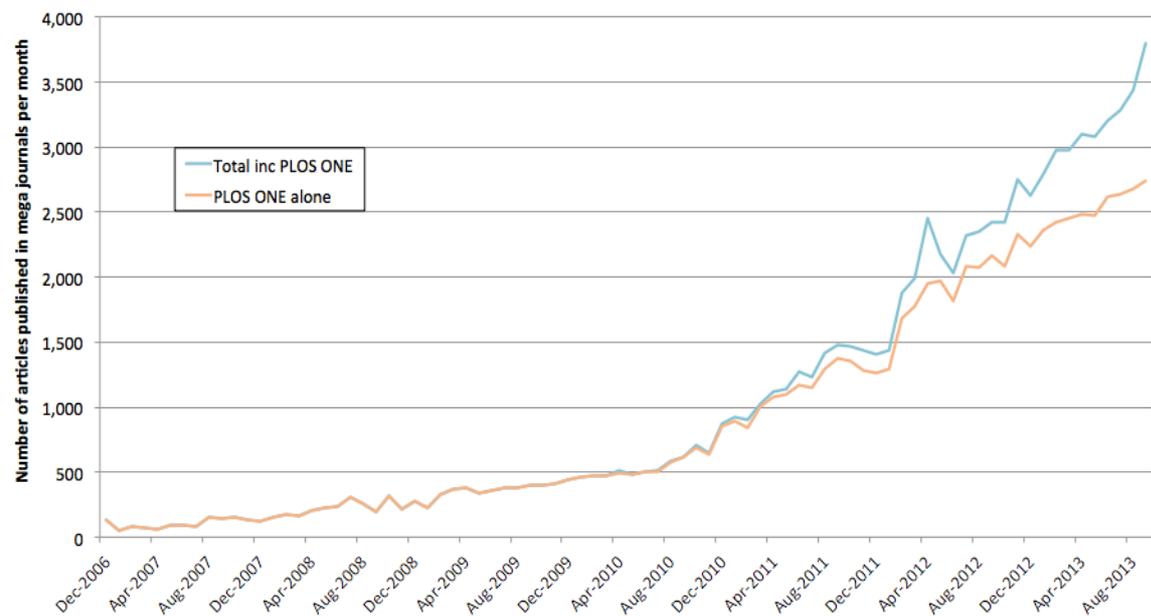
The growth in mega journals can be seen in **Figure 5** below⁵⁴. What is interesting is that the increase in articles from new mega journals contributes to a continuing exponential growth in the total numbers of articles published, despite the growth in PLOS ONE articles having slowed down somewhat. It appears that authors who are interested in publishing in the mega journal format are starting to take advantage of the variety of options available.

The APC of 1,350 USD set by PLOS ONE has become a rough pricing standard, although there are a number of exceptions. More detailed information is provided in Appendix F. The operating costs for a journal with an efficient model and the relatively high acceptance rates (common with mega journals) could, potentially, be far less than the typical APC of 1,350 USD, making this a very lucrative publishing model and suggesting that publishers could reduce their APC charges and still remain profitable.⁵⁵ With the rapid growth of PLOS ONE, Scientific Reports and BMJ Open, it seems unlikely at this point that at least these publishers will lower the APCs since authors are willing to pay the current price level.

⁵⁴ Data and graph supplied by Peter Binfield (<http://tinyurl.com/ozcwvvg>). More detailed information is supplied in the Appendix.

⁵⁵ Van Noorden R. Open access: The true cost of science publishing. Nature News. 27 March 2013. <http://www.nature.com/news/open-access-the-true-cost-of-science-publishing-1.12676>

Figure 5: Growth of PLOS ONE and other “mega journals” since the launch of PLOS ONE



3.1.4 Low quality journals from “predatory” OA publishers

There has been a significant amount of discussion concerning the rapid growth of low quality publishers funded by APCs, often termed “predatory” journal publishers.⁵⁶ We feel that while these journals pose a potential threat to the reputation of professional OA publishing, they have very little impact on the actual scholarly literature, compared to the amount of spam email they generate. We addressed this issue in an earlier article:⁵⁷

To take a concrete example, the OA publisher Bentham Open has launched over 200 journals in a very short time, charging a uniform fee of \$800 USD for research articles. After 3–4 years in operation, the average number of articles published in these journals is nine, with many journals appearing to be more or less empty placeholders in a uniform publishing information technology platform. This would suggest that authors are not satisfied with the value offered compared to the price.

In addition, we reanalyzed the data from the study above and found that 78% of the articles published in the journals listed in the DOAJ as charging APCs were in journals also indexed in the Journal Citation Report, Scopus or in both indexes.

In contrast, “predatory publishers” tend to have large fleets of journals with little content and will usually have a hard time being accepted in these indexes. These journals are therefore unlikely to be chosen as outlets by authors receiving government or foundation research grants, at least in academically leading countries such as the UK. That does not mean, however, that these low quality and often unscrupulous publishers cannot do significant damage to the reputation of APC funded OA publishing. Organizations like OASPA and indexes such as DOAJ are currently trying

⁵⁶ Beall’s List of Predatory Publishers 2013. <http://scholarlyoa.com/2012/12/06/bealls-list-of-predatory-publishers-2013/>

⁵⁷ Solomon DJ, Björk B-C. A Study of Open Access Journals Using Article Processing Charges. *Journal of the American Society for Information Science and Technology* 63(8) page 1492.

to address this problem, not by black-listing publishers or journals, but by applying more stringent inclusion criteria.⁵⁸

3.2 Hybrid OA journals

Since the study by Björk⁵⁹ was published, the major commercial and society publishers have rapidly increased the number of their journals offering a hybrid option. **Table 1**, below, shows the approximate development in the number of hybrid OA journals offered by a number of leading subscription publishers from 2009 to 2013, based on measurements at three points in time.

It was difficult to obtain exact figures for the total number of subscription journals from these publishers in the same time period, but a rough estimate of around 10,000 could be assumed. The Finch update report also mentions a Publisher Association survey indicating that 70% of member journals are full OA or have a hybrid option.

Table 1: The number of hybrid OA journals offered by thirteen major publishers in October 2009, January 2012 and August 2013

	October 2009	January 2012	November 2013
Elsevier	68	1160	1600
Taylor & Francis	300	577	1600
Springer	1100	1360	1570
Wiley & Blackwell	300	726	1240
Sage	54	177	730
Inderscience	0	0	375
Emerald	0	0	290
Oxford University Press	90	109	235
Cambridge University Press	15	120	202
Nature Publishing Group	14	37	47
American Chemical Society	35	38	40
BMJ Group	19	28	40
IOP Science	0	27	34
Sum	1995	4359	8003

In view of these figures, we can confidently say that the hybrid option is, almost as a rule, available for most subscription journals (at least from the bigger publishers). Many of the journals which so far have *not* started offering a hybrid option are journals published by major publishers on behalf of scientific societies.

The overall uptake of hybrid OA is still very low; a recent Elsevier report mentions an uptake for all publishers of only 0.5 % of Scopus articles.⁶⁰ Uptake is unevenly distributed across journals, with a few journals in fields such biology dominating the picture. It is extremely difficult to obtain journal level statistics, but Cambridge University Press and Elsevier have published exact numbers.⁶¹

⁵⁸ For example see: <http://oaspa.org/principles-of-transparency-and-best-practice-in-scholarly-publishing/>

⁵⁹ Björk B-C. The hybrid model for open access publication of scholarly articles: A failed experiment? (2012) JASIST 63,(8), 1496–1504.

⁶⁰ International Comparative Performance of the UK Research Base – 2013, A report prepared by Elsevier for the UK’s Department of Business, Innovation and Skills (BIS), 6.12.2013.

⁶¹ http://cdn.elsevier.com/assets/pdf_file/0009/129339/No_Double_Dipping_Policy_2013.pdf

It is plausible to assume that the journals most likely to attract hybrid uptake, for instance in biomedicine, as well as the journals with greater article volumes, were among the earlier ones for which the option became available.

The market also seems to be diversifying in terms of pricing. After some experimentation in the early years with lower prices⁶², all major publishers seemed to follow the lead of Springer by setting a “one-price fits all” figure of around 3,000 USD. Since this has resulted in very low average uptake levels, publishers have started to experiment with two different pricing policies. The first consists of “big deals” with individual universities, consortia or research funders. These are not very transparent but typically involve prepaid APCs, discounts from the list prices, and even bundling of hybrid or full OA APC fees with subscription licences. For instance California Digital Libraries had such a deal for a period with Springer.⁶³

The other approach consists of differential pricing for individual journals or whole categories of journals, both based on the quality of the individual journals and on the ability of the customers from different research disciplines to pay. For instance, Sage has an APC of 3,000 USD for STM journals and an APC of 1,500 USD for journals in the social sciences and humanities.⁶⁴

Elsevier has also moved away from the “one size fits all” hybrid OA price. Using as a base the list of 1,532 titles that offer a hybrid option⁶⁵ we were able to develop software to “scrape” the APC from 1,207 of these journals’ websites. In addition, the Source Normalized Impact per Paper (SNIP) value for these journals as well as discipline categories was obtained from the Journal Metrics website⁶⁶ and then merged with the APCs for these journals.

The breakdown of the average hybrid APC, price range, correlation between the APC and the SNIP and the number of journals in each discipline for Elsevier is given in **Table 2** below. It seems clear that Elsevier is pricing journal APC fees primarily based on discipline, in light of levels of the funding available. It is also differentiating pricing within disciplines based on the scientific quality/prestige of the journal.

⁶² Björk B-C. The hybrid model for open access publication of scholarly articles: A failed experiment? (2012) JASIST 63,(8), 1496–1504.

⁶³ Interview with Ivy Anderson.

⁶⁴ <http://www.sagepub.com/sagechoice.sp>

⁶⁵ http://cdn.elsevier.com/assets/pdf_file/0008/109448/journal_list.pdf

⁶⁶ <http://www.journalmetrics.com/>

Table 2: Elsevier Hybrid Journal APCs

Discipline Category	Average APC in USD	APC Price Range in USD	Correlation APC with SNIP*	Number of Journals**
Arts and Humanities	1452	750 – 1800	0.41	25
Biomedicine	2551	1100 – 5000	0.30	487
Business and Economics	1612	750 – 3300	0.39	160
Chemistry	2675	1000 – 3750	0.32	131
Earth Sciences	2631	1000 – 3750	0.15	232
Engineering	2524	750 – 3750	0.21	424
Mathematics	2099	750 – 3300	0.46	81
Physics and Astronomy	2479	1800 – 3750	0.36	117
Social Sciences	1835	750 – 3750	0.25	201

* Source Normalized Impact per Paper.

** Since some journals are multidisciplinary, the number of journals across disciplines totals to more than 1207, the actual number of journals.

It is difficult to estimate the global average of APCs charged for hybrid OA articles, due to the lack of systematic uptake statistics on the journal or even publisher level. However, a very crude estimate can be made of the average APC list prices for the six biggest publishers. For three, a uniform price level can be used. These are Springer (3,000 USD), Taylor & Francis (2,950 USD) and Wiley & Blackwell (3,000 USD). For Elsevier, the average over journals calculated using the data in Table 2 above is 2,366 USD. Sage has a price of 3,000 USD for STM and 1,500 for Social Sciences. Assuming that two thirds of Sage’s journals are in the social sciences, the average APC is 2,000 USD. An average across all these publishers, weighted by the number of hybrid journals, results in a global average of 2,727 USD.

One noticeable trend concerning hybrid OA is that major publishers have also become aware of the critique of possible double-dipping (charging hybrid APCs without the corresponding reductions in subscription prices). They have consistently and emphatically denied the charge, largely citing the extremely low uptake of the hybrid option as the reason for prices not having noticeably decreased.⁶⁷ However, when reductions in prices have been reported, they have concerned the list prices of individual journal subscriptions, which in this age of journals generally being sold in bundled contracts is of little relevance. The issues raised by funders paying hybrid APCs will be addressed in more detail in the section on scenarios.

3.3 Summary

The APC funded journal market is growing very rapidly and is in a state of flux. The number of articles published by a sample of full OA journals from major full OA publishers grew by 55% between 2010 and 2012 even without including the phenomenal growth of PLOS ONE. At the same time we found that the APC prices had increased by 5% a year. This suggests the established fully OA market remains healthy and that, while APCs are growing, it is at a moderate rate.

Mega journals have become the fastest growing segment of the APC funded OA journal market. There are now at least 19 mega journals with another 8 slated to begin publication within a year. PLOS ONE published over 30,000 articles in 2013. While the rapid growth of PLOS ONE is beginning to moderate, the overall growth of mega journals continues at an extremely rapid pace.

⁶⁷ http://www.elsevier.com/about/open-access/open-access-policies/Sponsored_Articles_2011.pdf

The major traditionally subscription publishers are rapidly entering the OA market in four ways – namely: providing a hybrid option for their subscription journals; creating new full OA journals (often in partnership with societies); acquiring existing full OA publishers; and converting subscription journals to full OA.

Uptake of the hybrid option as a percentage of eligible articles has been exceedingly low. Nevertheless, publishers have greatly increased the number of journals offering this option in the last two years. Originally, most used a de facto standard hybrid APC of 3,000 USD. More recently, some publishers have started to experiment with differential pricing schemes apparently in the hope of increasing uptake; others have tried bundling APCs with their e-licence bundled deals.

Many publishers are lengthening permitted embargo periods, and some require bilateral agreements with funders and institutions for green self-archiving, including embargoes (see appendix H for more details). They can do this because experience indicates that self-archiving rules don't feature in the minds of authors in choosing where to publish, nor do they affect the revenues they are able to get from subscribing institutions via big deal licences. The sudden surge of new hybrid journals as well as the possibility of more earmarked funder money for paying hybrid APCs further strengthens this trend.

4. Potential policy options for funding agencies

The primary objective of this work was to identify and appraise policy options for funders and other stakeholders through which they can help ensure a competitive and transparent market for scholarly journal APCs. The section contains a series of scenarios reflecting policy options that funders might use to help achieve these goals. The starting point for the scenarios are the rules for APC funding set up by funders such as Wellcome Trust, Research Councils UK and the Austrian Science Fund. Although we explore a number of different scenarios, we feel that there needs to be a consistent set of conditions that must be met by a journal in order for funders to pay APCs irrespective of these scenarios.

Other aspects may also be of importance, such as the sufficiency of the earmarked APC funding and, when funds are limited, how to allocate the monies available. Other assumptions also need to be made about the general growth of full and hybrid OA, green OA, publisher green OA rules and embargoes, proliferation of OA mandates and so forth.

4.1 The scenarios

Given the differences in how these markets operate, the scenarios need to address full OA journals and hybrid articles separately. Since there are more possible variations on how hybrid OA payments could be managed, these scenarios are presented first.

To assess the potential impact of these scenarios, we carried out quantitative modeling on what we feel to be the most promising scenarios, based on the journals in which Wellcome Trust grantees published articles in 2012. To model how these scenarios might evolve over time, we made what we felt to be reasonable assumptions based on the best data available. These models are presented in **Appendix G**.

We would like to emphasize that in all scenarios in which the funders are *not* willing to pay the full asking price of APCs or only pay a fixed percentage of the asking price, universities and/or authors could always choose to pay the difference from other funds. This introduces an incentive for authors and their institutions to evaluate the benefit of publishing the article in question in a particular journal against the portion of the APC they have to cover versus the less expensive option of publishing in a full OA journal, or self-archiving the article for free if published in a subscription journal which permits this. The goal here is to encourage competition on pricing in the APC market. It should be noted that requiring the university or author to pay a portion of the APC also adds complexity and overhead costs to the process of paying the APC and may limit publishing options for some authors who cannot obtain additional funding.

The scenarios below are designed such that each contains a clear main principle. In reality, the situation is likely to be considerably more complex and elements from several scenarios could well be combined. It would, however, not be practical to try to model a variety of options simultaneously in these models, due to the large number of possible combinations.

For the predicted effects to be achieved it is assumed that a number of influential funders worldwide adopt similar APC funding principles. A critical mass would be needed to have significant influence on, for example, global uptake levels, publishers' stances towards green OA and their willingness to negotiate rebate agreements for hybrid APCs. In practice, developments would likely be slower and less clear-cut with funding agencies choosing different paths towards open access. In addition, as shown in the previous chapters, the APC funded OA market is evolving very quickly and in ways that would have been difficult to predict just a few years ago. We see no reason why this rapid evolution will not continue at least in the near term.

We considered eight hybrid and four full OA scenarios. They are listed below and will be referred to throughout the report as H1 – H8 (hybrid) and F1 – F4 (full OA). A brief description and rationale for each scenario is listed below. A detailed analysis based on ten criteria for each scenario is contained in **Appendix C**.

4.1.1 Hybrid journal scenarios

H1. APCs refunded at list prices.

The base case, in which funders agree to pay what publishers ask.

H2. APCs refunded at list prices, but only for a limited transition period (for instance five years) or until the uptake of the hybrid option reaches a global threshold level, after which the publishers are expected to convert journals to full OA.

Hybrid OA has been promoted as a means for subscription publishers to transition to an APC funded OA model with minimal financial risk. This scenario models this concept by phasing out external funding for hybrid APCs based on the assumption that as uptake rises subscriptions will be cancelled and/or pricing reduced allowing libraries to use the funds saved from subscription fees to pay APCs.

H3. APCs are refunded at list prices, with mechanisms in place to ensure that “double dipping” on a *global* scale does not occur.

Under this model, subscription pricing for *all* subscribers will be reduced to reflect the increased income from hybrid payments. In this option, funding agencies would only pay hybrid APCs where publishers demonstrate that extra revenues from implementing the APC model are reflected in lower subscription prices for the journals.

H4. APCs are refunded at list prices, with mechanisms in place to ensure that “double dipping” at the *local* level does not occur.

Institutions paying hybrid APCs will be reimbursed through rebates on subscriptions paid to that publisher or other means to limit the increased costs of paying APCs along with subscriptions for the journals in which the hybrid articles are published. Only journals from publishers filling such criteria will be eligible.

This model, like H3, requires publishers to return additional hybrid revenues. However, in this case the revenue is rebated back to the institution that paid the APCs.

H5. The funders cover a fixed percentage of the APCs and the universities or the authors need to cover the remaining portion of the APC through other sources.

By having the institution or researcher bear part of the cost of the APC, there would be an incentive for authors to consider the price of an APC as one of the factors they consider in choosing a journal to publish in. This could also be implemented above a certain cap such that only the percentage above the cap would need to be paid. This would avoid the administrative overhead and the need for authors to locate additional funding for journals charging lower APCs.

H6. APCs are funded according to multitier value based price caps.

In this model, a maximum price cap for an APC is set based on some measure of the journal's relative 'value'.

For modeling this scenario we used a three-tier system of caps. The rationale for the model is that APCs would be tied to the value provided by the journal and the article being openly available.

H7. Journals bid for hybrid contracts based on services, quality measures and price. Contracts to a select number of journals will be awarded by the funder based on available funding.

This model is fashioned after the approach currently being used by the SCOAP₃ initiative in high energy physics. Competition through a blind bidding process is used to encourage publishers to provide good value in pricing and services.

H8. APCs are not funded for hybrid journals.

In this model hybrid OA is not funded. Support for APCs would be limited to publishing in full OA journals.

4.1.2 Full OA journal scenarios

The issues involved in full OA are somewhat different than in hybrid OA. Full OA journals do not offer the potential option for subscription publishers to gradually transition their established journals to full OA, nor does it present the potential of "windfall" profits from the combination of subscription and APC income from a single journal. For that reason, several of the hybrid scenarios are not relevant for funding APCs in full OA journals. Despite the differences, we did not envision any scenarios for full OA that would not be at least in principle also be applicable for hybrid OA.

F1. APCs refunded at list prices (parallel to the first hybrid scenario).

The base case, in which funders agree to pay what publishers ask.

F2. The funders cover a fixed percentage of the APCs and the universities (or the authors) need to cover the remaining portion of the APC through other sources (parallel to hybrid scenario 5).

This scenario (which could be combined with others) would provide authors and their institutions with an incentive to consider cost in choosing where to publish, helping keep the market elastic and competitively priced. Also, like H5, this could be implemented above a certain cap such that only the percentage above the cap would need to be paid. This would avoid the administrative overhead and need to locate additional funding for journals charging lower APCs.

F3. APCs are funded according to multitier value based price caps (parallel to hybrid scenario 6).

As in H6, creating price caps based on a combination of services and measures of quality

may also be a reasonable mechanism for ensuring a competitively priced full OA market in the future.

F4. Journals bid for contracts based on services, quality measures and price (parallel to hybrid scenario 7).

Contracts to a select number of journals will be awarded by the funder based on available funding.

4.2 Proposed minimum quality standards for eligibility for funding

No matter what scenario is employed, we feel that funding agencies should set minimum standards that must be met before APCs are paid to *any* journal. Among other factors, there is a clear need for criteria that exclude journals that fail to provide real peer review and to follow basic professional publishing ethics and other standards. The criteria will by necessity be different for full OA and hybrid journals, due to the availability of data in central indexes. In addition, funders could selectively add journals not covered in the indexes, for instance regional journals and journals in other languages.

We propose that for OA fees to be paid to **full OA journals**, the following criteria should be met:

- Journals must be indexed in the Directory of Open Access Journals (DOAJ) thus meeting its newly developing selection criteria.⁶⁸ This requirement would help ensure that journals meet basic standards for peer reviewed scholarly journals. Funding agencies may wish to consider whether journals should have the DOAJ Seal of Approval, which defines a further set of service values (for example digital archiving and preservation arrangements, ability to re-use content, and so forth). Potentially, this could be required for the higher level of reimbursement in scenario F3, where multiple price caps would be applied.
- Publishers should meet the Principles of Transparency and Best Practice in Scholarly Publishing proposed by COPE, the DOAJ, OASPA and WAME.
- In the interest of maintaining a transparent and competitive market for publishing services, at a minimum, the average APC paid to the publisher for a specific journal should be provided to the funder. This information cannot for instance be hidden behind non-disclosure clauses.

For **hybrid OA journals**, we propose the following criteria:

- While the DOAJ cannot serve as a basis for minimum quality for journals which are not full OA, we propose that hybrid journals should be indexed in a comprehensive citation index (such as Web of Science or Scopus) or a subject based index (such as PubMed, ERIC, or PsycINFO). In some countries, funders could additionally allow certain national journals or membership in other accrediting organizations such as SciELO in Latin America.
- Publishers should meet the Principles of Transparency and Best Practice in Scholarly Publishing proposed by COPE, the DOAJ, OASPA and WAME.
- At a minimum, the average APC paid to the publisher for a specific journal should be provided to the funder. This information cannot for instance be hidden behind non-disclosure clauses.

⁶⁸ <http://www.doaj.org/doaj?func=news&nId=303>

4.3 Analysis of combined scenarios

A detailed analysis for each of the eight hybrid scenarios and four full OA scenarios (H1-8, F1-4) is contained in Appendix C. Based on this analysis, we believe that the most promising scenarios for consideration are H3 through H6 in some meaningful combination with F1, F2, or F3. We would suggest that the following three combined scenarios (which we label scenarios A, B and C) would deliver the greatest potential benefit, and are worthy of further discussion and debate.

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis for these three combined scenarios is presented below. For scenario B, the effect of price caps was modeled quantitatively using available data on APCs charged and quality levels for all Scopus indexed journals.

4.3.1 *Scenario A: APCs are refunded at list prices, with mechanisms at the local level for hybrid articles to ensure savings in subscription costs for a specific institution [H4 and F1]*

Rationale

At the present time, APCs in full OA journals are fairly transparent. Both individual prices and institutional discounts are in general readily available. There is evidence many authors pay APCs from limited discretionary and personal funds and are hence sensitive to APC pricing. Journals appear to be reflecting this sensitivity in how they are pricing their APCs, particularly those journals that are less prestigious. APCs for the types of journals likely to be used by authors with external funding average about 1,500 USD. In this light, funding APCs at list prices in full OA journals may be a reasonable option. However, there is evidence the market is changing rapidly and may not remain transparent and sensitive to price, particularly if a large number of funders agree to pay list prices. If chosen, this option would need to be re-evaluated at regular intervals in the future.

The hybrid market is currently not competitive and the issue of “double dipping” remains a concern. For these reasons we do not feel that the option of paying APCs at list price for hybrid journals (scenario H1) is viable. Instead, we suggest scenario H4, in which APCs are refunded at list prices provided that mechanisms are put in place to ensure that “double dipping” at the local level doesn’t occur.

SWOT analysis

Strengths – As noted, the current full OA APC market seems to be functioning reasonably well. It has sustained a consistent high growth level and is maturing into a stable market, with a variety of profitable publishers and an established respected professional organization in the Open Access Scholarly Publishers Association (OASPA). APC pricing is moderate averaging less than 1,500 USD for established high quality professionally published journals. There is evidence that funding is coming from a variety of sources, a significant portion of which are either the authors’ personal or discretionary funds. Authors appear to consider price along with other factors in choosing a full OA journal in which to publish.

In an analysis of the relationship between full OA journal APCs and SNIP values we found correlations of 0.67 in a broad sample of journals and 0.85 in the journals published in by Wellcome Trust funded authors, suggesting these publishers are in part pricing their APCs based on the impact and prestige of their journals.

Scenario H4 provides a mechanism for libraries (or library consortia) to fund hybrid APCs from a relatively fixed total budget enabling them to continue to provide the subscription based material

their researchers need while hybrid OA uptake increases. The scenario helps address the tendency for APC payments to shift the cost of publishing from less research-intensive institutions to research-intensive institutions.

Weaknesses – In general, the payment processes for APCs used by libraries and funding agencies are not especially transparent nor are they functioning particularly well. This conclusion is based on a number of interviews and a published report.⁶⁹ Effective processes of this type would be a prerequisite for establishing the controls for avoiding double dipping. Further, the use of intermediaries to handle payments from multiple funding sources for multiple publishers does not seem as yet to be working effectively. While it is quite likely these problems will eventually be resolved, it currently is a significant impediment to implementing a functional payment system for APCs.

Double dipping controls at a local level are only appropriate for funding organizations that pay both APCs and subscription fees or in some national settings where it is possible to implement controls on a much broader level. For instance in a country like Finland the key players would be the Ministry of Education which would finance both library subscriptions and APCs. Nevertheless the money is channeled through relatively independent players such as the Academy of Finland (equivalent of RCUK) the Universities and their umbrella Library Consortium and, as such, achieving coordination might not always be easy. Other funders, in particular large private charities and organizations like the EU, have no direct involvement in also funding subscriptions.

A clear weakness of H4 is that it does not promote price competition, nor do anything in respect of overall cost control.

Opportunities – Increasing funding for researchers to publish in full OA and hybrid journals will likely accelerate the transition to a fully OA publishing market. It may be possible to maintain a transparent reasonably priced full OA journal market without the complications and additional costs of more complex scenarios.

Controls at the local level to avoid double dipping could be an effective scenario for libraries (and library consortia) that must ensure broad access to the scholarly literature for research-intensive institutions, and which fund their researchers to publish their research in hybrid journals. Without local control of double dipping, the overall cost subscriptions and APCs would rise dramatically and outstrip their budgets. Local double dipping controls could also allow funding agencies to recapture some of their funding for hybrid APCs that would otherwise be excess profit and use these funds to support other types of open access.

Threats – Several potential threats exist for maintaining a transparent and reasonably priced market if a significant number of funding agencies agree to pay list prices for APCs.

- The major traditionally subscription publishers are entering the full OA market very quickly. While they presently only have a small market share in terms of articles published, this could change rapidly. Their full OA journals tend to be more expensive than the journals from OA-only publishers and they could begin to bundle APCs with subscription pricing, which would quickly erode the existing transparency in the market.
- The acquisition of pure OA publishers by major subscription publishers could have similar effects.

⁶⁹ Harris S. Implementing Open Access APCs: the role of academic libraries. A report on a roundtable commissioned by SAGE, in association with Jisc.
<http://www.uk.sagepub.com/repository/binaries/pdf/apc.pdf>

- Although the market is currently competitive, if a significant number of funding agencies agree to pay APCs at full price, cost could become less of a factor in the author's choice of a journal resulting in a less price competitive market and growing increases in APC prices.
- Implementing double dipping controls would be very challenging.
 - Initial indications suggest that many of the major subscription publishers will resist rebating a portion of the APCs paid for hybrid publication, making it difficult to implement double dipping controls at a local level.
 - Double dipping controls would require negotiating rebate terms with a variety of different publishers, which could be quite time consuming.
- This would create additional administrative overhead. Libraries are currently having real difficulty managing APC payments. This model would be even more complex to implement.
- Rebates would likely be in a different accounting period from the initial payment, potentially creating cash flow problems and additional complexity in accounting.
- APCs are often paid out of a variety of different budgets within the institution, making disbursement of the rebates administratively challenging.

4.3.2 Scenario B: APCs are funded according to multi-tier, value based price caps [H6 and F3]

Rationale

The introduction by funders of multi-level price caps would provide a framework in which journals have to compete both on quality and price to qualify for funding. The rationale is to construct a scheme which takes into account the 'value' provided by a journal.

We stress that even if a journal is priced above the cap, authors should be allowed to pay the difference between the cap and the full APC if they have the necessary funding and think it is worthwhile to pay above the cap for publishing in the journal.

Measuring value

Citation rates provide one generally available metric that could be used as a potential proxy for value, in terms of the impact the articles in a journal have on the scholarship within the academic community. One could make the argument that the greater the impact of the scholarship, the more value a given journal provides and hence the more incremental value the open accessibility of an article generates.

We recognize however that funders would be highly unlikely in reality to ever consider a system based solely on journal-level citation metrics, particularly given the current emphasis on moving away from impact factors. We stress that any system to measure value would need to be based on the quality of services provided by the journal (taking into account factors such as publication times, and quality and efficiency of peer review, repository deposition, and so forth). The overhead associated in managing a system to make assessments of this type might be considerable, and one option might be to require journals to provide specified additional services to qualify for a higher level of reimbursement (for example, provision of the services specified in the DOAJ's Seal of Approval).

Because agreed metrics to measure these aspects of quality are not yet in place, for modeling purposes only we have set caps on APC fees based on a measure of the average citations generated by the articles in a journal.

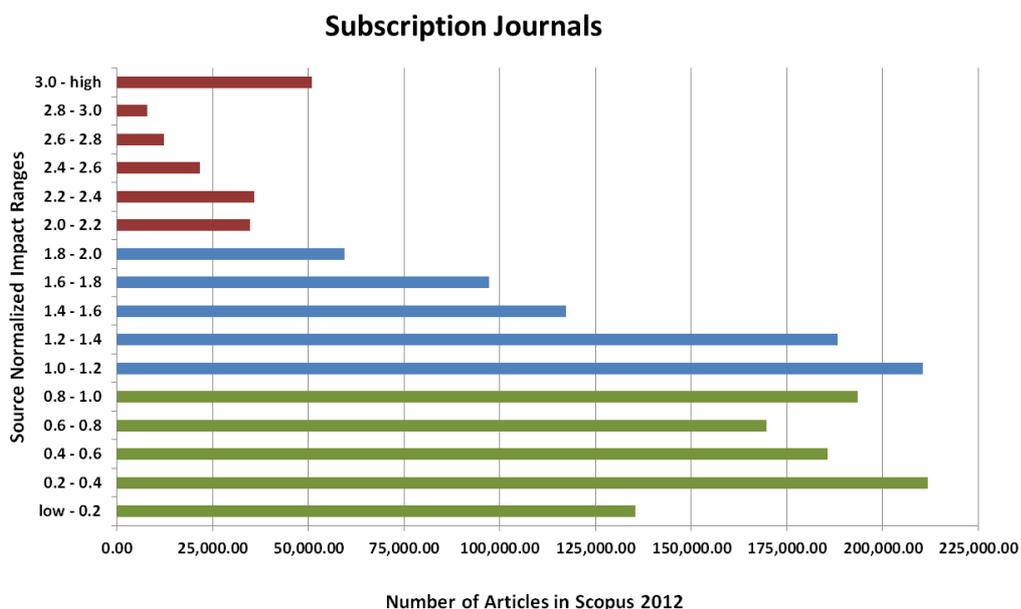
There are two widely used citation indexes. The Journal Citation Report (JCR) based on the Web of Science is the most widely used. The JCR is owned and maintained by Thomson Reuters, which is not involved in scholarly publishing. Scopus is a larger and more inclusive index. An important advantage of Scopus is that it includes a much larger set of full OA journals and generally indexes new journals more quickly. Scopus is owned and operated by Elsevier. While the citation data within the JCR is only available by subscription, Scopus journal level statistics are freely available via the SCIMago Journal and Country Rank web site.⁷⁰

Both indexes suffer from the fact that citation rates vary substantially across academic disciplines, making comparisons of average citation rates across disciplines problematic. Source Normalized Impact per Paper (SNIP) is a statistical weighting procedure designed to control for differences in citation rates across fields that has been developed based on Scopus citation statistics.⁷¹ Impact factors from the JCR could be normalized by a number of procedures but it would be very complex and difficult to do.

Scopus is owned and maintained by Elsevier, which creates an appearance of a conflict of interest given that journals published by Elsevier would be included in any scheme involving payments based on citation rankings. Despite this limitation, we used SNIP values to model using citation rates as a means of categorizing journals for implementing value based capped APC payments because the data were readily available and it offered a viable approach for testing this type of model.

Modeling results – Using data on yearly article counts and SNIP values for each journal in Scopus, as well as indicators from the DOAJ, it was possible to construct distribution curves of SNIP values for all subscription journal articles and for APC funded articles in full OA journals published in 2011 indexed by the Scopus database (**Figure 6**).

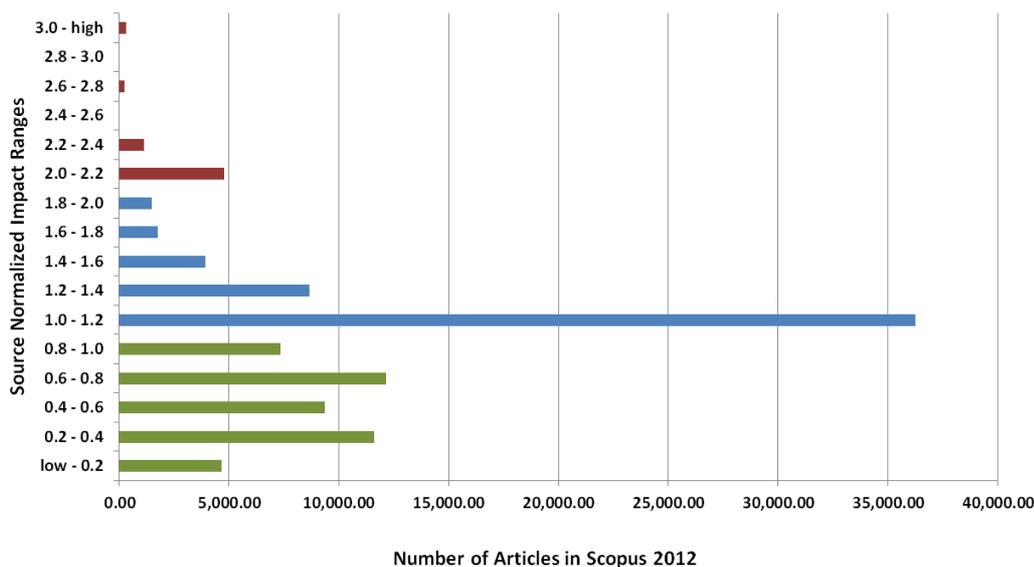
Figure 6: Distribution of SNIP levels for articles



⁷⁰ <http://www.scimagojr.com/>

⁷¹ <http://www.journalmetrics.com/>

APC Funded OA Journals



This data can be used to construct schemes for maximum allowable APCs that funders are willing to cover. We modeled a very simple scheme, set to three quality levels. The graphs above have been colour-coded to reflect the scheme below.

- Red: Articles in journals with SNIP ≥ 2.0
- Blue: Articles in journals with SNIP between 1.0 and 2.0
- Green: Articles in journals with SNIP below 1.0

We applied price levels of 3,000, 2,000 and 1,000 USD respectively to each of these quality levels as an example of a potential model that could be applied.

For the OA journals, the price asked by the publisher has a significant correlation with citation level as can be seen in **Table 3b** below. It is evident that low quality OA journals asking APCs in excess of 2,000 USD would not get many customers. In contrast, hybrid journals can charge these high prices because their costs have already been covered via subscriptions. Hence it doesn't matter if the uptake is low.

The top limit, 3,000 USD, is one which only a small percentage of full OA journals exceed. Many of the top tier OA journals, for instance PLOS Biology and OUP's Nucleic Acids Research, charge just below 3,000 USD. From our prior research the average APC charged by journals in Scopus and/or the JCR is approximately 1,200 USD.

Tables 3a and **3b** below show actual APCs charged by full OA journals in Scopus that charge APCs and the weighted estimates for articles published by Wellcome Trust funded authors broken down by the three quality levels. The analysis was weighted by the number of articles published in each journal so as to reflect the number of articles that would have been published in each of the three value based caps.

Table 3a: APCs of full OA journals indexed in Scopus compared to the caps that would apply to them ⁷²

Price cap	Average APC	Articles	Std. Deviation
Cap of \$1000	809.92	29,628	657.37
Cap of \$2000	1,576.08	29,195	391.08
Cap of \$3000	2,466.89	2,258	828.54

Correlation between SNIP and APC = 0.67

Table 3b: APCs of full OA journal articles published by Wellcome Trust funded authors compared to the caps that would apply to them⁷³

Price cap	Average APC	Articles	Std. Deviation
Cap of \$1000	1,350.00	140	657.37
Cap of \$2000	1,673.49	628	391.08
Cap of \$3000	2,799.86	74	828.54

Correlation between SNIP and APC = 0.85

As can be seen in the tables above, most full OA journals would fall close to or under the respective caps for their given SNIP-based category. The moderately high correlations between SNIP values and APCs suggest that SNIPs provide a reasonably good indicator of where OA publishers should set their APCs. This provides indirect evidence of the elasticity of the current market for full OA journals.

SWOT analysis

Strengths – This scenario increases competition and transparency by the need for publishers to provide “value” in order for higher APCs to be reimbursable. It could provide a means of controlling the inflationary pressure of directly funding APC payments and can limit the cost of funding APCs for funding agencies and universities. Our analysis of full OA journals in Scopus suggests that a simple three category model based on citation rates reasonably approximates the existing market for full OA journals and provides a convincing rationale for applying the model for hybrid journals. A nice feature of this method for setting caps is that it treats full OA and hybrid journals in exactly the same way using a uniform scheme applicable to both markets.

As noted above, a model based on quality of services provided, or a combination of services provided and measures of impact/value such as citation rates, would ideally be used. But the data to model this are not available.

Weaknesses – The biggest weaknesses is that no single metric can be used to measure the quality of a journal. Using services provided as a means of determining caps has intrinsic appeal but

⁷² APCs were recorded in 2011. Journals identified in both the DOAJ and Scopus based on data current as of December 2013. The analysis was based on 595 fully OA journals identified in both Scopus and in the DOAJ that published 61,081 articles.

⁷³ APCs were recorded in 2013. The results from the Wellcome Trust authors were based on a weighted estimate from a random sample of journals. The sampling methodology is described in Appendix G. The sample included only 10 fully OA journals. Given the small number of journals, the results in Table 3b should be viewed with caution.

services that are easily and objectively measured such as providing DOIs, XML and licences that enable re-use (e.g. CC-BY) are relatively inexpensive and easy to provide. These might be required as a baseline for receiving higher caps but are probably not adequate as the sole criteria. Other, more important, services (such as high quality peer review, copy editing, and fast review/publication times) would be much more difficult to quantify and monitor.

In the absence of these other metrics, we used citation rates as a proxy for the scientific quality, but existing citation measures have serious limitations. Also, the notion of using journal-level citation rates as a sole basis for tiered price caps would raise significant concerns.

Opportunities – This scenario can align the APC market so that pricing is based on value and the services offered. It offers a means of significantly increasing the uptake of OA both through full OA journals and hybrid articles. By limiting payments the scenario would encourage efficiencies in the publication process and help provide a means of transitioning to full OA while limiting the cost of the transition.

Threats – Whenever criteria are used to set specific cut points with significant economic consequences such as much higher reimbursement rates, there is a potential for manipulating the criteria. In the case of services provided, this may well have a positive impact in encouraging publishers to provide better services in order to receive a higher APC. In the case of citation rates, it may result in publishers manipulating citation rates for journals near the cut point. Examples of this practice already exist.⁷⁴

The APCs of many full OA journals are well under the caps used for our modeling. If this model was widely implemented by funders, some OA publishers might raise prices to the maximum level of the cap causing rapid inflation in the market.

4.3.3 Scenario C: The funders cover a fixed percentage of the APCs above a maximum value whilst universities (or the authors) cover the remaining portion through other sources [H5 and F2]

Rationale

Asking authors and their institutions to cover a portion of the cost of an APC is the most direct way of ensuring cost is one of the considerations in the choice of where to publish. The goal would be to provide an incentive for keeping the APC market (both full OA and hybrid) competitive and reasonably priced. We feel this scenario would work best in combination with other scenarios above but in theory could still be applied if hybrid APCs are paid according to list prices (without there being mechanisms to mitigate double dipping at a local level), as a means of encouraging publishers to lower the APC of their hybrid option in order to increase the uptake.

Two concerns about this scenario are the administrative overhead of having the author/institution pay a portion of the APC and the possibility authors would not have access to funding to cover their portion of the APC. One means of addressing this is to require authors to pay a portion of the fee only if the APC charged is above a certain price (for example, 1,500 USD). This would avoid the administrative overhead when APCs were below the threshold, while still providing an incentive to lower APCs.

⁷⁴ <http://scholarlykitchen.sspnet.org/2012/06/29/citation-cartel-journals-denied-2011-impact-factor/>

SWOT analysis

Strengths – This scenario would encourage authors to consider cost in their choice of where to publish, particularly when considering journals with high APCs. It could hence encourage publishers to price their journals competitively. By adopting this approach, funding agencies could encourage the uptake of full OA and hybrid OA, while mitigating some of the financial burden of transitioning to OA. If this model works as envisaged it should help foster a market that is transparent and price competitive.

Weaknesses – This scenario would increase the overhead for universities and researchers by requiring the use of multiple sources of funding for APCs above the threshold. Authors without access to additional funding would be at a significant disadvantage and could have their publishing options limited and perhaps be forced to pay their portion of the APC out of their personal funds.

Opportunities – There is evidence the full OA market is reasonably priced and elastic. We believe this is because a significant number of authors pay APCs out of their own funds, limited discretionary funds or directly out of the fixed budgets of their grants. This scenario would help maintain the full OA market in its current form and could potentially help to make the hybrid market operate in a similar manner.

Threats – Making authors aware of the price as a factor in considering where to publish is the most direct and effective means of ensuring a transparent and competitive market for full OA and hybrid OA. It will, however, be difficult to achieve the correct balance in setting a price threshold and a percentage that authors should pay which achieves significant uptake of OA (full OA and hybrid OA), while keeping price an important consideration. The correct balance is likely to vary by institution and discipline, increasing the complexity of applying this scenario.

Moreover, libraries and publishers are already having significant difficulty managing APC payments. This scenario will make APC payments even more complex on the institutional side.

5. Conclusions

Both the literature review and the empirical data collected during the study have highlighted that the APC funded full OA and the hybrid OA market differ.

The APC funded full OA market has had over 10 years to develop and is a relatively normal economic market where publishers have to compete for “customers” via a combination of quality, innovative services and price. Although some researchers have their APCs fully covered and might not consider price in their choice of a journal, there is evidence from a variety of sources that APC price is a consideration for many researchers and is helping moderate APC prices. The key strategic issue for stakeholders like research funders is to ensure the APC market is kept innovative and competitively priced. The traditional publishers are now entering this market, increasing the possibility that APCs will be bundled with subscription prices, reducing transparency and competitiveness. If funders provide unconditional “earmarked” funding to meet APCs at the list price, this could further erode the competitive pressure on pricing. A further risk is that the market will evolve in the same direction as the subscription market, with a few big players gaining a huge competitive advantage via bundled “big deals”, which also involve prepaid APCs.

The hybrid market is dysfunctional as illustrated by the very low uptake levels at the current price level of around 3,000 USD. On the other hand the hybrid route would, due to the fact that the vast majority of subscription journals now offer this option, offer a rapid way to increase the share of articles that become OA immediately while allowing authors to continue to publish in the journals they have always used. This is provided that earmarked funding is available in sufficient amounts. The big question is under what conditions should hybrid OA be funded?

Several publishers have pledged that they will reduce subscription prices in the same proportion as the increase in hybrid APC revenue, so that customers pay only for the non-OA content. While this sounds reasonable in principle, it is extremely difficult to assess the extent to which this happens in practice. Reductions in the list prices of individual titles are almost meaningless since the bulk of the publishers’ subscription revenue comes from multi-year bundled contracts or “big deals”, the details of which often are hidden behind non-disclosure agreements.

An additional concern is that research intensive universities, and universities in countries such as the UK where earmarked money for funding hybrid APCs will be provided on a large scale, could end up funding a high percentage of the APCs. But if subscription prices are lowered only at the global level, it will provide little benefit to these universities and countries. This has led to a number of proposed mechanisms via contracts with publishers that would lower subscription costs for individual universities or consortia in direct proportion to the hybrid APCs paid by them. Early experience, highlighted in several of the interviews that formed part of the study, indicates that such agreements may be difficult both to negotiate and implement.

The Austrian Science Fund (FWF), the Austrian Academic Consortium (Kooperation E-Medien Österreich), and the Austrian Central Library for Physics at the University of Vienna have implemented a pilot project with IOP Publishing that will provide funding for Austrian researchers to publish hybrid articles in IOP’s subscription journals where APCs will offset subscription and licence fees paid by the Austrian Academic Consortium for access to IOP’s journals. If this pilot project is successful it could demonstrate the feasibility of using this mechanism for funding for APCs without significantly increasing the costs of accessing the literature for research intensive universities and university consortia.⁷⁵

⁷⁵ <http://iopublishing.org/newsDetails/Austria-open-access>

In this report, a number of alternative scenarios for APC-funding policies are presented and evaluated. Since the full OA and hybrid markets present quite different issues they were addressed separately in eight hybrid and four full OA journal scenarios. Three combined scenarios were felt to be potentially the most promising. These are not mutually exclusive and could be combined in different ways.

An aspect which is very difficult to analyze is how rapidly funders will start to adopt APC policies and how widespread they will become, since different stakeholders have varying perspectives and needs. As such, no single scenario is recommended as the 'best' option. We believe that funders could combine and adapt the scenarios to cater to their different requirements and goals.

In addition to providing direct funding for the APCs (or part of them) there are ways in which funders could support alternative types of gold OA, including through supporting openly accessible journals which do not charge authors. For example, they could provide funding via grants for these journals or support via national portals (i.e. Scielo, JSTAGE). Possible models for this were not studied in this project but are worthy of further exploration and thought.

We hope that the report provides a useful input into the internal discussions of funding organizations, and will stimulate a broader dialogue with the different stakeholders in scholarly publishing, both in terms of the new background data provided on current developments and the proposed alternative solutions.

Appendixes

- A. Glossary of terms
- B. List of interviewees
- C. Scenarios for hybrid and full OA APC payments
- D. Description of datasets
- E. Methodology for the study of the current APC market
- F. Current and proposed mega journals
- G. Effects of scenarios A and B on the APC expenditure of Wellcome Trust
- H. Current status of publisher self-archiving OA policies

Appendix A: Glossary of terms

Article processing charge (APC)

A fee often charged by full OA journals as well as by hybrid journals for the OA dissemination services provided. These charges are the major source of revenue for professional OA publishers.

Bundled or “big deal” subscription contracts

Electronic access to a broad package of journals from a single publisher or aggregator is negotiated with a university consortium or a single university, generally including a substantial discount compared with the list price of access to the journals in the package.

Creative Commons licence

A standard set of licences that are widely used to regulate electronic use of copyrighted material. These licences are widely used for OA journals and provide options for specifying what types of uses are allowed. The CC-BY licence, which only requires appropriate attribution, is widely used by APC-funded OA journals and is required by many funding agencies.

Delayed OA

Subscription journals which make articles available at no charge after a delay of typically one year. Many of these journals are high impact, for instance New England Journal of Medicine.

DOAJ (Directory of Open Access Journals)

An index of OA scholarly journals including various descriptive metadata and currently containing almost 10,000 titles.

Elasticity

Elasticity as used in this document is a micro-economic concept illustrating how the supply and demand of a commodity or service reacts to changes in the price. In a competitive market supply increases and demand decreases as the price increases.

Gold OA

Scholarly articles available OA immediately upon publication at the publisher’s site. Full OA journals can either charge APCs to obtain revenue, they can be subscription journals making the electronic version only OA, or they can be electronic only journals which are free both for authors and readers and the resources for publication are provided by other means. Hybrid OA articles can also be seen as form of gold OA.

Green OA

Green OA is a complement to gold OA. Some version of the manuscript, often not the final published version of article, is freely available. The term “green OA” is often used as a synonym for self-archived OA, though in some cases the publisher archives the green copy.

Hybrid OA

A form of OA where a publisher opens up and makes freely available an individual article in an otherwise subscription based journal based on an author, their institution or funder paying an article processing fee.

Impact factor

A metric used to measure how frequently articles in a journal listed in Web of Science are cited by other journals listed in the Web of Science. The index is widely used as a measure of quality for journals. The most commonly used impact factor is based on citations over a two-year period after articles are published.

Journal Citation Reports

A report published yearly by Thomson-Reuters reporting the impact factors of journals indexed in Web of Science.

Mega journal

A new type of scholarly journal, made possible by electronic only publishing and pioneered by PLOS ONE. These journals typically have the following features:

- Very broad scope usually covering a whole discipline such as biomedicine or social science
- Fast review and publications times
- Modest APCs typically in the range of 1,350 USD
- Narrowly review criteria largely focused on the scientific soundness of the research methodology and ethical conduct of the study without regard to the importance of the research.

Open Access (OA)

OA is the practice of providing unrestricted access via the Internet to scholarly research reports, most commonly scholarly articles though it can also refer to other types of written material and research data.

OA mandate

A regulation issued by a university or research funder, stipulating that articles must be available either in full OA journals, as hybrid OA articles or as a manuscript self-archived within a specified period in a repository.

Publisher embargo

A period after which an author, in the copyright agreement with the publisher, is allowed to self-archive an OA version of the manuscript of an article in a repository.

Repository

An archive of manuscripts, usually a version of a published (or publishable) research report as submitted for publication or as accepted for publication. These archives are generally screened to ensure that the material is appropriate and include searchable metadata. There are a variety of types of repositories:

- Institutional Repository – a database for the storing and dissemination of the publications, theses, teaching material, data sets etc of a university or research institution
- Subject Repository – a database of self-archived manuscripts of publications from a particular scientific field, for instance high energy physics, biomedicine or economics.

Scopus

A citation index owned by Elsevier, with similar functionality as the Web of Science but covering more journals.

Self-archiving

An author of an article making a manuscript version (before or after the review process) available for free somewhere on the web, typically in a subject or institutional repository.

Source-Normalized Impact per Paper (SNIP)

SNIPs are similar to impact factors listed in the Journal Citation Reports, but calculated using citation data from Scopus. The impact factors are normalized around one for each discipline to neutralize the effects of differences in citation practices across different disciplines.

Web of Science

The Web of Science is an index of journals and citation statistics owned by Thomson-Reuters. The inclusion criteria for new journals are significantly more restrictive than Scopus.

Appendix B: List of interviews

We would like to thank the experts who were kind enough to consult with us on this project. The interviews have been very helpful informing the study, in particular for defining the scenarios and appraising their consequences.

Ivy Anderson is Director of Collections at the California Digital Library, which is the library consortium serving the needs of the different campuses of the University of California. This is one of the biggest such operations worldwide with faculty publishing around 45,000 journal articles per year. CDL handles e-licence negotiations with over 30 different publishers and has been a forerunner in experimenting with different schemes related to OA.

Peter Binfield is the co-founder of PeerJ and previously the Publisher of PLOS ONE. Dr. Binfield is a physicist who has been involved in scholarly publishing for 20 years holding positions at Institute of Physics, Kluwer Academic, Springer, SAGE and most recently the Public Library of Science (PLOS).

Lorraine Estelle has been the Chief Executive Officer at Jisc Collections since 2006 and a member of the Knowledge Exchange Licensing Group, which looks at the issues of digital licensing and procurement at multi-national level, and she is an active participant in ICOLC conferences. She is a member of the EDINA Management Board, and the chair of the ETHOS Governance Steering Committee.

Clifford Haka is the Director of Libraries at Michigan State University (MSU). MSU is a major State funded research university with approximately 50,000 students and a library acquisition budget of approximately 15 million USD. MSU is a member of the Committee on Institutional Cooperation (CIC) which is a consortium of 15 large research oriented universities that jointly negotiate contracts with major publishers and collaborate on promoting open access.

Hugh Look is the Banding Manager for JISC Collections since 2012. He initially managed the eBooks for Skills project and subsequently has been re-assessing and making recommendations for revision of the JISC Banding structure. Hugh Look has been a senior manager in digital publishing companies, a consultant in digital media and a writer and editor.

Donna Okubo is Senior Manager of Community Outreach and Advocacy for the Public Library of Science (PLOS). She joined PLOS in 2004 and has more than 15 years of non-profit membership and fundraising management experience.

Falk Reckling works at the Austrian Science Fund (FWF), which is a government funded organization providing grants for basic research in all fields of science. FWF has an active OA policy and is for instance providing grants for OA journals in the social sciences and humanities and is also one of the forerunners in funding APCs systematically.

David Prosser is executive director of Research Libraries UK, one of the organizations that commissioned this study. Having earlier worked for many years as director of SPARC Europe he has been able to closely monitor the development of OA for over a decade.

Ralf Schimmer is head of the Division for Information – Scientific Information Provision of the Max Planck Digital Library. The Max Planck Society is Germany's most successful research organization with a yearly output of more than 15,000 publications. Schimmer's unit has been actively engaged in OA development for several years.

Steven Sowards is an Associate of Libraries at Michigan State University (see description of the MSU University library above). Mr. Sowards oversees acquisitions for the MSU library.

Caroline Sutton is one of the Co-Founders and Director of Sales and Marketing for Co-Action Publishing. Dr. Sutton was one of the founding members and the original President of the Open Access Publishing Association. Prior to founding Co-Action Publishing she was a managing editor in a major academic publishing company.

Neil Thakur is Special Assistant to the Deputy Director for Extramural Research at the US National Institutes of Health (NIH), a position he has held since 2005. He also serves as program manager for the NIH Public Access Policy. Prior to his time at NIH, he was Assistant Director of Health Services Research and Development at the Department of Veterans Affairs.

Arja Tuuliniemi is head of Services at the Licensing Unit of The Finnish National Electronic Library. FinELib is a consortium of Finnish universities, universities of applied sciences, research institutes and public libraries, the aim of which is to acquire electronic resources centrally on behalf of its member organizations.

Appendix C: Scenarios for hybrid and full OA APC payments

The scenarios are:

For hybrid OA journals

- H1. APCs for hybrid journals are fully funded.
- H2. APCs refunded at list prices, but only for a limited transition period (for instance 5 years) or until the uptake of the hybrid option reaches a global threshold level. After which the publishers are expected to convert journals to full OA.
- H3. APCs are refunded at list prices, with mechanisms to ensure on a global level that “double dipping” doesn’t occur.
- H4. APCs are refunded at list prices, with mechanisms to ensure on the local level that “double dipping” doesn’t occur.
- H5. The funders cover a fixed percentage of the APCs. Universities and/or authors will need to cover the rest from other sources of funding.
- H6. APCs are funded according to multitier value based price caps.
- H7. Journals bid for hybrid contracts based on services, quality measures and price. Contracts to a select number of journals will be awarded by the funder based on available funding.
- H8. Hybrid APCs are not funded.

For full OA journals

- F1. APCs refunded at list prices.
- F2. The funders cover a fixed percentage of the APCs and the universities or authors through other sources must cover the remaining portion of the APC.
- F3. APCs are funded according to multitier value based price caps.
- F4. Journals bid for funding contracts based on services, quality measures and price. Contracts to a select number of journals will be awarded by the funder based on available funding.

Each hybrid and full OA scenario has been assessed on the following dimensions:

- Effects on the green OA conditions of publishers
- Effects on full OA publishing of major established publishers
- Effects on the uptake of hybrid OA
- Effects on the pricing policies of publishers
- Administrative overhead required
- Sufficiency of available funder funds for paying APCs
- Effects on the subscription + APC budgets of individual universities
- Effects on competition and transparency in the APC “market”
- Opportunities
- Risks/challenges

Scenario H1: APCs for hybrid journals are fully funded.

Effects on the green OA conditions of publishers

The trend of major publishers tightening up their green policies to the maximum allowable will continue, since they will have very strong incentives to steer authors into the hybrid alternative.

Effects on full OA publishing of major established publishers

Compared to other scenarios there will be less incentive for established publishers to start and promote full OA journals.

Effects on the uptake of hybrid OA

This scenario will strongly increase the uptake of hybrid OA. The budget allocations of funders for earmarked APC money will constitute an upper limit on uptake.

Effects on the pricing policies of publishers

Publishers will have strong incentives to keep hybrid APCs at their current levels and this scenario may even result in an increase in APCs while funding is available. The impact will be moderated by the number of funders following this policy since publishers can't easily differentiate the prices according to the funding of authors.

Administrative overhead required

The overhead could be considerable since funders and universities will have to set up schemes to prioritize author and article payments, due to the likelihood there would not be adequate funds to cover all hybrid APCs.

Sufficiency of available funds for paying APCs

Funds will be rapidly used up.

Effects on the subscription + APC budgets of individual universities

If the budgets for APCs come from funding agencies, university acquisition budgets might not be affected. From the perspective of the total cost of access to the literature, costs will rise dramatically.

Effects on competition and transparency in the APC "market"

The major share of earmarked APC funding will go to hybrid publishers thus strengthening the current oligopolistic situation in the scientific publishing market. This is neither transparent nor normal in a competitive market. The effects are thus very negative.

Opportunities

Of all the scenarios this one could lead to the fastest rise in the general uptake of OA.

Risks/challenges

This scenario is very risky. The established strong subscription players will gain a significant share of the APC market, not so much based on added value delivered, but on brand names and scale effects. The price levels for hybrid OA will remain at the current level, set by publishers in order to guarantee the sustainability of their current profit levels in a post OA world. The total APC and subscription costs will rise a lot in countries using this funding scheme.

Scenario H2: APCs refunded at list prices, but only for a limited transition period (for instance 5 years) or until the uptake of the hybrid option reaches a global threshold level. After which the publishers are expected to convert journals to full OA.

Effects on the green OA conditions of publishers

Similar to H1.

Effects on full OA publishing of major established publishers

Compared to other scenarios there will be less incentives in the short run to invest a lot in full OA journals though publishers may take a longer view and put some resources toward the development of full OA.

Effects on the uptake of hybrid OA

This scenario will have a strong effect on the uptake of hybrid OA, in particular if other research funders follow suit. On the other hand the budget allocations of funders of earmarked APC money will constitute a very clear upper limit, since prices are unlikely to go down. Towards the end of the set period the effects are unclear, and at the limit there might be a dramatic drop in uptake. How payments are phased out would be critical.

Effects on the pricing policies of publishers

Initially similar to H1. If different funders choose different scenarios within this scenario and/or different time periods, publishers will have difficulty addressing this in their business planning.

Administrative overhead required

Similar to H1.

Sufficiency of available funder funds for paying APCs

Similar to H1.

Effects on the subscription + APC budgets of individual universities

Similar to H1.

Effects on competition and transparency in the APC "market"

Similar to H1 but towards the end of the time period hybrid publishers must start changing their business models. Hence this scenario increases competition towards the end of the period. How APC payments are phased out will have a significant impact on this issue.

Opportunities

This scenario could rapidly hasten a transition towards full OA.

Risks/challenges

It would in practice be very difficult to streamline different funders' policies concerning time periods/cut off points, and this could lead to a rather chaotic situation. The overall cost of access (subscriptions plus APCs) would likely rise dramatically, quite possibly outstripping funding and creating a huge windfall in income for the large subscription publishers. In the short run many of the same risks as H1.

Scenario H3: APCs are refunded at list prices, with mechanisms to ensure on a global level that “double dipping” doesn’t occur. That is, subscription pricing for all subscribers will be reduced to reflect income from hybrid payments. Only journals from publishers demonstrating they are meeting this criterion will be eligible.

Effects on the green OA conditions of publishers

Similar to H1 though impact may be less.

Effects on full OA publishing of major established publishers

There is likely to be little if any impact.

Effects on the uptake of hybrid OA

Slightly less than H1, due to the fact that only publishers meeting the criteria will be eligible.

Effects on the pricing policies of publishers

Similar to H1 though there may be less pressure to maintain or raise APC prices.

Administrative overhead required

Funding hybrid APCs could potentially increase overhead significantly by increasing the number of publishers/journals participating in granting programmes that pay APCs. This could in theory be mitigated by the use of third party intermediaries to manage invoicing, payments and accounting. At least initially there appear to be some problems implementing this methodology in practice. It is quite likely these initial problems will be worked out over time and third party payer systems will be able to handle APC payments from a large number of publishers and institutions efficiently. Implementing systems to track hybrid payments and reduce subscriptions on a global basis would be administratively complex and costly particularly with bundled (“big deal”) contracts.

Sufficiency of available funder funds for paying APCs

Funding for APCs will increase substantially as hybrid uptake increases.

Effects on the subscription + APC budgets of individual universities

The impact on the cost of access (subscriptions plus APC payments) might in theory globally be relatively neutral. This would however result in cost shifting, with research intensive institutions and research funders paying an increased share of the costs with less research intensive universities paying less of the share of the costs.

Effects on competition and transparency in the APC “market”

This scenario would ensure that institutions purchasing subscriptions are not continuing to pay for content that becomes freely available and funded through APCs. On the other hand increased transparency on the global level would require that bundled licences (big deals) no longer could be hidden behind non-disclosure agreements. Also in this scenario the major share of earmarked APC funding will go to hybrid publishers thus strengthening the current oligopolistic situation in the scientific publishing market. The price levels for hybrid will remain at the current level, set by publishers in order to guarantee the sustainability of their current profit levels in a post OA world. This is neither transparent nor normal in a competitive market.

Opportunities

This scenario could rapidly hasten a transition towards full OA while potentially mitigating an overall increase of hybrid + subscription costs.

Risks/challenges

This scenario as noted above would be very difficult to implement. It would do little to implement price competition and lower overall costs. It would create significant cost shifting from less research intensive institutions to more research intensive institutions and research funders. This may or may not be a desirable consequence.

Scenario H4: APCs are refunded at list prices, with mechanisms to ensure on the local level that “double dipping” doesn’t occur. That is, institutions paying hybrid APCs will be reimbursed through rebates on subscriptions paid to that publisher or other means to limit the increased costs of paying APCs on top of subscriptions for the journals in which the hybrid articles are published.

Effects on the green OA conditions of publishers

This is very difficult to predict. Paying hybrid APC payments at the same time as funders allow long green embargoes will encourage publishers to implement more restrictive green OA policies.

Effects on full OA publishing of major established publishers

There is likely to be little, if any impact.

Effects on the uptake of hybrid OA

Slightly less than H1, due to the fact that not all publishers will be eligible.

Effects on the pricing policies of publishers

Similar to H1, however there may be less incentive to maintain or raise APC pricing given much of the revenue will be returned in rebates on subscription fees.

Administrative overhead required

Funding hybrid APCs could potentially increase overhead significantly by increasing the number of publishers/journals participating in granting programmes that pay APCs. This could in theory be mitigated by the use of third party intermediaries to manage invoicing, payments and accounting. At least initially there appear to be some problems implementing this methodology in practice. Over time third party payer systems for handling APC payments are likely to develop.

Sufficiency of available funder funds for paying APCs

Funding for APCs will increase substantially as hybrid uptake increases, to the point where funders will run out of money to pay all requests for APC. Rebates and other means of mitigating the increase in funding for APC payments for hybrid articles will likely be of limited value since they will be implemented in a limited number of institutions and any impact will likely be deferred for a year.

Effects on the subscription + APC budgets of individual universities

This is a big concern for many universities as well as national funds working in liaison with a limited number of universities. Double dipping can probably be avoided via exclusive agreements, but such agreements can probably only be reached with a limited number of funders.

Effects on competition and transparency in the APC “market”

While this scenario could address transparency on a local level, it would do little to implement competition and transparency globally. Also, in this scenario the major share of earmarked APC funding will go to the large traditionally subscription publishers helping maintain an oligopolistic situation in the scholarly publishing market hindering price competition.

Opportunities

This scenario could potentially address the risk of an escalation in the total cost of access (subscriptions plus APC payments) at the institutional level for research intensive institutions.

Risks/challenges

Initial indications are that the publishers will in practice resist the model and it could prove very difficult to negotiate for agreements on a broader scale. Double dipping could continue on the global level, for all other institutions not having such agreements. Another problem is that rebates are received a significant period of time after APC payments creating budgeting challenges and also that APCs are often paid out of a variety of different budgets within the institution making disbursement of the rebates administratively challenging.

Scenario H5: The funders cover a fixed percentage of the APCs. Universities and/or authors will need to cover the rest from other sources of funding.

Effects on the green OA conditions of publishers

Perhaps less effect on green embargoes as some of the other scenarios as authors will still have a financial incentive to seek lower priced alternatives for their publications making full OA and hybrid OA less lucrative for publishers.

Effects on full OA publishing of major established publishers

Impact would depend on scenario chosen for full OA funding.

Effects on the uptake of hybrid OA

The increase in hybrid uptake is likely to be slower than models where APCs are fully funded. Authors are likely to be drawn to fully OA journals where APCs tend to be lower or, if lacking sources of funding, turning to green alternatives. The scenario would put pressure on publishers to lower hybrid charges. This scenario may discourage publishers from offering a hybrid option, or promoting it, if they feel hybrid payments will not cover their costs of publication.

Effects on the pricing policies of publishers

This scenario will put pressure on publishers to lower their hybrid APC prices, since authors will be price sensitive.

Administrative overhead required

There will be considerably more overhead as funding for each individual APC will be coming from multiple sources within the university or research institution.

Sufficiency of available funder funds for paying APCs

Better than in scenarios H1-H4. The impact on the availability of funding will largely depend on the percentages coming from other sources but also from authors seeking more competitively priced options and possibly publishers lowering prices in a more competitive market. Also, a higher percentage of authors may choose a green option if funding is not available.

Effects on the subscription + APC budgets of individual universities

Total costs will still rise for research intensive universities, since publishers will not voluntarily avoid double dipping. A portion of the costs will come from other sources within the universities so the impact of the increase in payments may be felt more widely within research intensive universities.

Effects on competition and transparency in the APC "market"

Since authors and institutions will have to pay a part of the APCs, and the decisions will mainly be made on the individual article level, this scenario will increase competition by putting pressure on publishers concerning the APC levels as well as differentiating APCs based on scientific value and field. Large publishers are likely to turn to bundled deals for APCs perhaps in conjunction with subscriptions. This would lower transparency and hinder competition quite possibly resulting in higher prices in the long term.

Opportunities

In principle this is an excellent scenario for creating a healthy competitive climate in which authors would be quite sensitive to the level of APCs asked for in comparison with the quality level of the journals in question.

Risks/challenges

One main risk is that uptake levels particularly for hybrid OA will be much lower. The extra administrative burden per additional APC transaction could be considerable. This scenario will put pressure on universities to negotiate bundled deals for APCs reducing transparency and competition. This will be difficult to control.

Scenario H6: APCs are funded according to multitier value based price caps.

Effects on the green OA conditions of publishers

It is difficult to predict the impact. Compared to H1 and H3 this scenario is less attractive for the big publishers hence publishers are less likely to increase embargo periods or other restrictions.

Effects on full OA publishing of major established publishers

Full OA journals tend to have lower APCs that are to some extent are correlated with quality. Compared to H1 and H3 there is likely to be more interest in full OA, but compared to H7 less.

Effects on the uptake of hybrid OA

The uptake is likely to be less than in H1 and H3 as authors/institutions will often have to pay the difference between the cap and the APC charged. It is not clear how publishers and authors would react to caps. Authors will mainly face the choice between hybrid and green, and will have to trade between the additional funding needed versus the embargo conditions.

Effects on the pricing policies of publishers

Some publishers may opt to ignore this type of funding, but many will increasingly start to differentiate their pricing of hybrid APC according to the quality of the journal in question, in order to go below the price limits. There will also be strong incentives for publishers to differentiate prices according to client. This may result in bundled deals in order keep prices under the caps, while other authors will have to pay higher list prices.

Administrative overhead required

Some additional overhead will be required since authors and their institutions will need to check the caps prior to paying, and in cases where they choose to pay the balance for higher prices the administrative effort to organize payments.

Sufficiency of available funds for paying APCs

This model should significantly reduce costs for funders compared to H1-H4. It will encourage publishers to lower APCs and authors/institutions to seek lower cost alternatives.

Effects on the subscription + APC budgets of individual universities

Total costs could rise for research intensive universities, since publishers will not voluntarily avoid double dipping. APCs at least in some cases are likely to exceed caps and the balance must be made up from university funds. Costs may be lower than other models through reductions in APC rates and authors choosing lower cost options.

Effects on competition and transparency in the APC "market"

The overall impact should be positive since hybrid journals will have to compete with the combination of price and quality. If combined with the F3 scenario it may also be more transparent than other models. This will depend to some extent on the control of bundled "big deal" contracts with nondisclosure agreements.

Opportunities

In principle this should create a healthy competitive climate in which funders are sensitive to the level of APCs asked for in comparison with the quality level of the journals in question. It will limit the rise in the overall cost of access.

Risks/challenges

Controversies might arise about the principles for determining which journals fall into which categories as well as how the cap levels are determined. It may have various unintended consequences on the market with publishers attempting to manipulate the criteria for caps particularly if a journal is right at the cut point between categories. This will be true no matter which model is used for determining quality. Implementing caps will result in higher administrative overhead.

Scenario H7: Journals bid for hybrid contracts based on services, quality measures and price. Contracts to a select number of journals will be awarded by the funder based on available funding.

Effects on the green OA conditions of publishers

The impact will depend on how many journals get accepted into the scheme. If the number is low the impact will be negligible.

Effects on full OA publishing of major established publishers

Again the impact is highly dependent on how many journals/publishers bid and are accepted.

Effects on the uptake of hybrid OA

The impact on uptake is likely to be minimal, unless a very large number of journals are included.

Effects on the pricing policies of publishers

For accepted journals there will obviously be a clear effect. Many publishers may, however, opt to ignore this type of funding and not even bother bidding, unless a significant critical mass of funders issue the call in co-operation.

Administrative overhead required

Substantial work needed in organizing bidding procedures, comparing journals etc.

Sufficiency of available funds for paying APCs

Funds should be sufficient and probably usage will be lower than in most other hybrid schemes.

Effects on the subscription + APC budgets of individual universities

Difficult to foresee. Depends if the scenario is combined with no double dipping controls (as in SCOAP₃).

Effects on competition and transparency in the APC "market"

Positive effect if this method becomes widespread.

Opportunities

In principle this should create a healthy competitive climate in which funders are sensitive to the level of APCs asked for in comparison with the quality level of the journals in question.

Risks/challenges

The biggest risk is that publishers simply will ignore such requests for bids since it will require a lot of work to prepare them for hundreds of journals and perhaps many different funders. The work on the receiving end of comparing bids could also be very time-consuming. Much would depend on whether funders co-operate. A second major drawback will be that authors will feel that their choice of journals in which to publish will be severely curtailed.

Scenario H8: Hybrid APCs are not funded.

Effects on the green OA conditions of publishers

Although it is difficult to predict, publishers will likely concentrate their attention on full OA. There may thus be less incentive to put in place embargoes and more restrictive green policies.

Effects on full OA publishing of major established publishers

Since funder APC money is concentrated on full OA, major publishers will increase their offering of full OA journals and their marketing, in order to recapture as big a market share as possible. In addition to starting up their own journals large publishers will try to buy up successful OA publishing companies (examples BMC, Versita, Frontiers, Medknow). They will most probably try to raise the overall level of APCs in these full OA journals. Existing OA publishers may benefit with increased market share. This model will also encourage new start-up OA publishers.

Effects on the uptake of hybrid OA

The uptake of hybrid OA will remain very low unless publishers drop the prices substantially, and also start to differentiate price according to field of science and journal quality. Authors and universities will have a strong incentive to publish in full OA journals or choose a self-archiving option over a hybrid option if full OA APCs are reimbursed by funding agencies.

Effects on the pricing policies of publishers

This could be publisher specific. Some publishers may no longer see hybrid OA as a viable option. They may drop the hybrid option or leave it in place at current pricing levels since there is little overhead. Some publishers, in the absence of double dipping control mechanisms, will still want the extra revenue they get even at lowered APCs.

Administrative overhead required

The administrative overhead would be low. There would be fewer vendors to pay APCs and simpler negotiations with publishers.

Sufficiency of available funder funds for paying APCs

Available funding will likely last longer with lower average APC payments and wider use of green OA as opposed to APC funded OA.

Effects on the subscription + APC budgets of individual universities

Since hybrid uptake will remain very low subscription licences will remain as they are. Cost will rise to the extent universities fund full OA payments but likely be much lower than if hybrid payments were allowed.

Effects on competition and transparency in the APC "market"

Only the full OA market will be of major importance and in that market the chosen strategy (F1-F4) will determine the degree of competition. One possible negative consequence is an increased interest in the full OA market resulting in a consolidation of the full OA market and the same sort of oligopolistic situation as in the subscription market.

Opportunities

The risks of "double dipping" will be minimized. Administrative overhead will be relatively low. The overall cost of access will rise at a relatively slow pace.

Risks/challenges

Transition from subscription to some form of full OA will likely be much slower.

Scenario F1: APCs refunded at list prices.

Effects on the green OA conditions of publishers

This is essentially the current state for funders like Wellcome Trust so should have no additional impact on green OA.

Effects on full OA publishing of major established publishers

The major subscription publishers and to a lesser extent society publishers are rapidly entering the full OA market. This model provides an incentive for established subscription publishers to enter the full OA market. The level of incentive will be significantly impacted by the hybrid model chosen.

Effects on the uptake of hybrid OA

This depends on which funding scheme is applied to hybrid journals. There has been a large percentage increase in full OA publications particularly in “mega journals”. If funding for hybrid OA is available, some authors may choose that option over full OA.

Effects on the pricing policies of publishers

Major publishers starting up new OA journals will choose relatively high initial prices for their journals. This scenario will tend to reduce competition based on price as authors will have little incentive to choose lower priced journals. The effects would be modest unless a significant number of funding agencies adapted the policy.

Administrative overhead required

The overhead will be relatively low.

Sufficiency of available funder funds for paying APCs

Due to the initially low volumes of full OA articles, funding will likely be sufficient. This largely depends on the combination of scenarios.

Effects on the subscription + APC budgets of individual universities

This model should have virtually no impact on subscriptions if and until there is a large shift to full OA publishing. The impact will largely be dependent on hybrid policy. Funding for full OA will just add to the cost of access until the percentage of the market is enough to reduce subscription cost.

Effects on competition and transparency in the APC “market”

If bundled discounts are allowed particularly if tied to subscription contracts, there will be a loss of transparency and competition. There will be a reduction in price competition in full OA publishing that will favour the big publishers who can negotiate discounted contracts for publishing in newly developed full OA journals based on publisher reputation alone.

Opportunities

This scenario can help in increasing uptake of full OA, in particular if combined with more restrictive scenarios for hybrid OA.

Risks/challenges

The scenario may contribute to a price escalation of APCs. Bundled contracts particularly coupled with non-disclosure clauses could significantly reduce transparency and price competition in the full OA publishing market.

Scenario F2: The funders cover a fixed percentage of the APCs and the universities or authors through other sources must cover the remaining portion of the APC.

Effects on the green OA conditions of publishers

Not relevant. See F1.

Effects on full OA publishing of major established publishers

This scenario would provide less incentive compared with scenarios F1 and F3 to enter the market. It would provide competitive pressure to moderate APC pricing.

Effects on the uptake of hybrid OA

Not relevant. See F1.

Effects on the pricing policies of publishers

This scenario would put pressure on publishers to lower prices or maintain current APC prices.

Administrative overhead required

This scenario would create additional administrative overhead to manage payments from multiple accounts as additional funding is likely to be coming from a variety of accounts within the university or research institution.

Sufficiency of available funder funds for paying APCs

The funds necessary would be proportionally less than in F1 based on percentage paid by the funding agency. Funding needs will also likely be reduced by creating competitive pricing pressure in the market.

Effects on the subscription + APC budgets of individual universities

Costs of research intensive universities will go up based on the percentage of the APC that will be their responsibility. The scenario is unlikely to impact on subscription pricing within the foreseeable future.

Effects on competition and transparency in the APC "market"

This scenario increases competition by putting more pressure on publishers to lower APCs. If bundled pricing or other discount contracts are allowed particularly with non-disclosure clauses, this could impact on transparency though may reduce costs locally in the short term.

Opportunities

In principle this is an excellent scenario for creating a healthy competitive climate in which authors would be sensitive to APC cost in comparison with the quality level of the journals in question.

Risks/challenges

The main risk is that the uptake of full APC funded publishing could be significantly lower. There will be additional administrative overhead. There is the potential for reduced transparency and competition from bundled contracts particularly if non-disclosure clauses are allowed.

Scenario F3: APCs are funded according to a multitier value based price caps

Effects on the green OA conditions of publishers

See F1.

Effects on full OA publishing of major established publishers

There will be slightly less incentive to enter the full OA publishing market as compared with F1. Our market analysis suggests most current APCs would be within proposed caps.

Effects on the uptake of hybrid OA

See F1.

Effects on the pricing policies of publishers

This will put pressure on a minority of OA publishers with relatively high priced journals that exceed the caps to lower prices. This appears to include some journals from major subscription publishers who are now entering the market.

Administrative overhead required

There will be some additional overhead to track and apply cap levels. See H6.

Sufficiency of available funder funds for paying APCs

Our modeling suggests under most reasonable assumptions costs would be substantially reduced as compared with other scenarios, particularly F1.

Effects on the subscription + APC budgets of individual universities

Costs to research intensive universities will go up but modestly if they pay the difference for higher APCs since most full OA APCs are within caps based on our modeling.

Effects on competition and transparency in the APC "market"

This will increase competition and transparency on the market by the need to show value for higher APCs at least as measured by citation rates.

Opportunities

In principle this is an effective scenario for creating a healthy competitive climate in which the level of funding for APCs is tied to the quality level of the journals in question.

Risks/challenges

See H6 for the risks and challenges posted by this scenario.

Scenario F4: Journals bid for funding contracts based on services, quality measures and price. Contracts to a select number of journals will be awarded by the funder based on available funding.

Effects on the green OA conditions of publishers

The impact will depend on how many journals get accepted into the scheme. If the number is low the impact will be negligible.

Effects on full OA publishing of major established publishers

Depends a lot on where the price level settles. If the level for newly established journals with no track record is lower than say 1,500 USD major publishers might become discouraged.

Effects on the uptake of hybrid OA

The impact on uptake is likely to be minimal, unless a very large number of journals are included.

Effects on the pricing policies of publishers

For accepted journals there will obviously be a clear effect. Many publishers may, however, opt to ignore this type of funding and not even bother bidding, unless a significant critical mass of funders issue the call in co-operation.

Administrative overhead required

There would be substantial work in organizing bidding procedures, comparing journals etc.

Sufficiency of available funds for paying APCs

Funds should be sufficient and probably usage will be lower than in most other schemes since only a minority of journals will be included.

Effects on the subscription + APC budgets of individual universities

This is difficult to foresee and depends if the scenario is combined with no double dipping controls (as in SCOAP₃).

Effects on competition and transparency in the APC "market"

Positive effect if this method becomes widespread.

Opportunities

In principle this should create a healthy competitive climate in which funders are sensitive to the level of APCs asked for in comparison with the quality level of the journals in question.

Risks/challenges

The biggest risk is that publishers simply will ignore such requests for bids since it will require a lot of work to prepare them for hundreds of journals and perhaps many different funders. Also the work on the receiving end of comparing bids could also be very time-consuming. Much would depend on whether funders would co-operate. A second major drawback will be that authors will feel that their choice of journals in which to publish will be severely curtailed.

Appendix D: Description of data sets

We developed five data sets as part of this project. In some cases more detailed information concerning these data sets are contained in the body of the report.

2013 Welcome Trust publications with data from Scopus – This data set includes a systematic random sample of journals in which researchers receiving funding from the Trust published in 2012. The number of articles, a weighting factor to correct for sampling and information from Scopus are contained in the file.

Elsevier Hybrid Pricing – This data set contains 1,207 Elsevier journals offering a hybrid option with the APC in USD for the hybrid option obtained in November 2013. These data are merged with data from Scopus obtained from the JournalMetrics website including 2012 SNIP and SRJ citation statistics and discipline coding.

Growth in APC and article count analysis – This data set includes the APC and number of articles for a sample of 187 journals at two time points approximately 2 years apart and was used for the analysis of the growth of established OA journals and the increase in their APCs.

Major publisher fully OA journals – This data set describes the fully OA journals of five of the major traditionally subscription publishers. Although the data were collected in August 2013, they are already significantly out of date at the time this report is being published.

Society policy summary – This data set includes a description of the OA publication policies of 27 societies across 9 general discipline categories.

Appendix E: Methodology for the study of the current APC market

For this analysis we used data from a previous study as a baseline for the volume of articles published and APC prices of established fully OA journals.⁷⁶ For article counts we used the most recent full year of data, 2010, in the original study and 2012 in the follow-up study. In the original study, we collected data about the APC charges during mid-fall 2011 and in the follow-up study during August 2013. Where the APCs were not available in USD, we converted the currency to USD using the current established rates of conversion at the time of data collection.

Our original study included all journals listed in the Directory of Open Access Journals (DOAJ) that charged APCs.⁷⁷ We attempted to select a sample of journals that were most likely to be chosen by researchers receiving government or foundation funding for their research. These included journals from publishers that had at least eight journals included in our original study and where at least two of these journals were indexed in the Journal Citation Report. For publishers with more than 30 journals in the original study, 30 journals were randomly selected for inclusion in the reanalysis (marked * in the table below). We originally included journals from Copernicus Publications; however, due to the fact they use a complex system for calculating APCs based on pages published and format of the material submitted, we were not confident our estimates at the two time points were comparable. For this reason we decided not to include the Copernicus journals in the final results.

The list of publishers meeting these criteria includes:

Publisher	# Journals Original Study
BioMed Central	193 *
Hindawi Publishing Corporation	133 *
Dove Medical Press	81 *
Frontiers Research Foundation	26
MDPI AG	25
PAGEPress Publications	18
Springer	12
Co-Action Publishing	10
Public Library of Science (PLOS)	8

We retrieved at least partial data for 187 journals. A few journals were no longer published or we were unable to locate their web site and were dropped from the study. Fifteen of the journals were not charging APCs at the time of the second data collection. Some publishers such as Hindawi temporarily waive APCs on specific journals as a means of encouraging submissions. These 15 journals were not used in the APC analysis but were used in the analysis of the article counts.

⁷⁶ Solomon DJ, Björk B-C. A Study of Open Access Journals Using Article Processing Charges. *Journal of the American Society for Information Science and Technology* 63(8):1485-1495.

⁷⁷ Journals from single journal publishers were only sampled. All journals from larger publishers were included in the study.

Appendix F: Current and proposed mega journals

Mega journals launched to date:⁷⁸

AIP Advances – 973 articles – launched 2011
Biology Open (the Company of Biologists) – 252 articles – launched 2012
BMJ Open – 1,540 articles – launched 2011
CMAJ Open (Canadian Medical Association) – 15 articles – launched 2013
Cureus – 57 articles – launched 2012
Ecosphere (the Ecological Society of America) – 399 articles – launched 2010
EPJ-Plus (part of the European Physics Journal) – unknown articles – launched 2011
F1000 Research – 225 indexed articles – launched 2012
FEBS Open Bio (Federation of Eur. Biochemical Societies) – 129 articles – launched 2011
G3 (the Genetics Society of America) – 383 articles – launched 2011
mBio (the American Society of Microbiology) – 601 articles – launched 2010
Optics Express (the Optical Society of America) – unknown articles – launched 1997
PeerJ – 171 articles – launched 2013
PLOS ONE – 75,382 articles – launched 2006
QScience Connect – 53 articles – launched 2011
SAGE Open – 371 articles – launched 2011
SAGE Open Medicine – 12 articles – launched 2013
Scientific Reports (Nature) – 2,731 articles – launched 2011
Springer Plus – 548 articles – launched 2012
The Scientific World Journal (Hindawi) – 1,860 articles – (re)launched 2012

Mega journals ‘coming soon’:

BMJ Open Respiratory Research – 2013
BMJ Open Diabetes Research & Care – 2013
Open Heart (BMJ) – 2013
Elementa (BioONE) – 2013
IEEE Access – 2013
OpenLibHums – 2014
The Cogent Series (T&F) – 2014
The Winnower – 2014

⁷⁸ From “Open Access MegaJournals – Have They Changed Everything?” Blog post by Peter Binfield. Blog post on the Creative Commons Aotearoa New Zealand Web site. 23 October 2013. <http://creativecommons.org.nz/> (Used with permission.)

Appendix G: Effects of scenarios A and B on the APC expenditure of Wellcome Trust

Sampling procedures

We started from the number of publications in each journal that had an article authored by a Wellcome Trust funded researcher in 2012. The researchers published 4,711 articles in 1,064 journals. It was necessary to retrieve the ISSN for each journal used in the study to be able to merge with the journals' SNIP for one of the base scenarios and the Directory of Open Access Journals (DOAJ) metadata to determine if the journal was a subscription or OA. To make the process manageable we included all 51 journals with at least 15 articles and took a systematic random sample of the remaining journals. We selected 5% of the journals with between two and 14 articles and 2.5% of the journals with a single article.

We weighted the data for the ensuing analysis to account for sampling a portion of the journals and the number of articles in each journal in the sample. We were unable to match a small number of sampled journals with Scopus (SNIP) data. This along with sampling error resulted in the weighted number of articles equaling 4,368 while the actual number of articles was 4,711.

Cost modeling procedures

Ten of the 83 sampled journals were identified using the DOAJ as fully OA journals. We went to each journal web site and retrieved the current APC. Where journals offered institutional membership or other discounts we used the full published APC. Given the research done by Wellcome Trust is focused in biomedicine we assumed under the base model that the hybrid APC charged by subscription journals was 3,000 USD. Two basic scenarios were created. The first used uncapped APCs which in the case of the fully OA journals was the actual current APC charged by the journal and 3,000 USD for hybrid APCs of subscription journals. All subscription journals were assumed to offer the hybrid option since it would have been very time consuming to check if a hybrid option was available for each journal and the number of journals offering a hybrid option is changing very rapidly.

The second was a capped APC based on the SNIP value of the journal. Journals without a SNIP or one under 1.0 were capped at 1,000 USD, those between 1.0 and 2.0 were capped at 2,000 USD and those over 2.0 were capped at 3,000 USD. The APCs of fully OA journals were in some cases below the cap. The actual APC was used in the capped scenario when the APC was below the cap.

The average APC at the article level for each SNIP range and the number of articles in that range was used as the base case for developing the scenarios after weighting by 1.0785 ($4,711/4,368$) to account for the difference in the weighted number of articles in the sample versus the true number published by Wellcome Trust researchers in 2012.

Models based on Wellcome Trust data

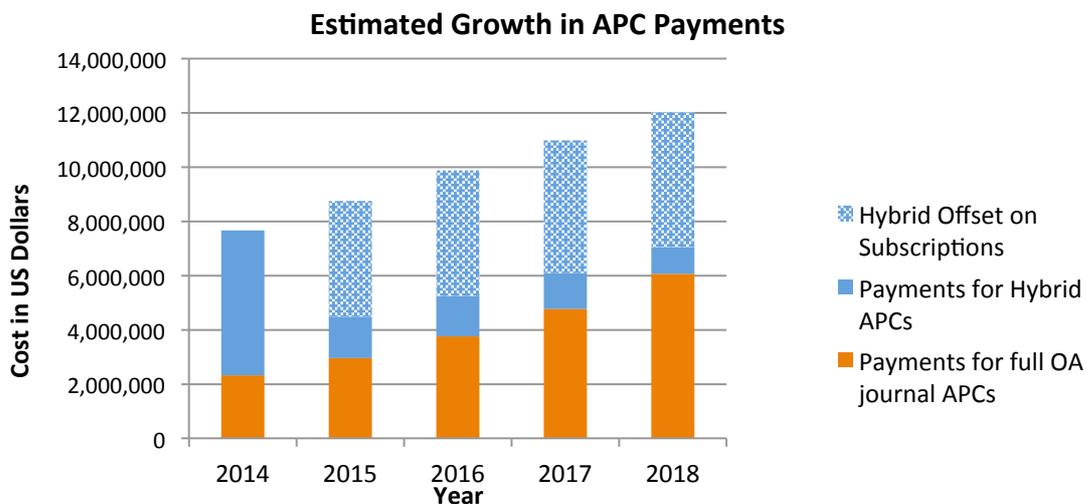
The Wellcome Trust author publishing data offers what we believe to be a reasonable approximation of researcher papers from other prestigious funding agencies in the biomedical field. For this reason we felt it could be used as baseline data for modeling the most promising scenarios. Scenario C, in which authors pay a portion of the APCs, is so straightforward that we do not believe modeling adds much insight to the impact of the scenario over what is presented in the models of the other scenarios.

For each scenario the estimated cost to the Wellcome Trust of APCs, the hybrid uptake as a percentage of all subscription publications and the percentage of articles published in full OA journals are modeled over a 5 year period from 2014 through 2018.

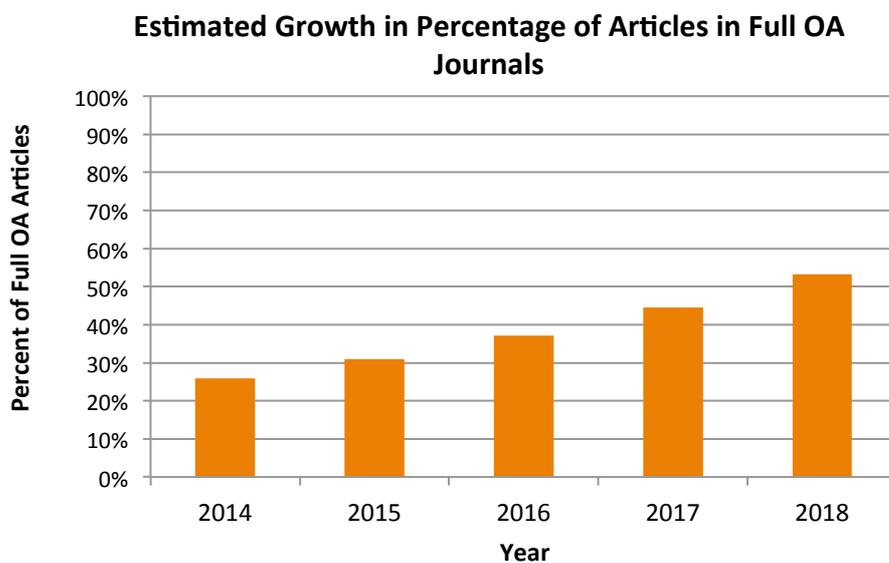
For each scenario, 2012 Wellcome Trust author data is used as a baseline. Actual APCs from the full OA journals in which these authors published is used and hybrid APC prices are estimated to be on average 2,750 USD. The other assumptions on which the models are based are listed below the spreadsheets for each scenario.

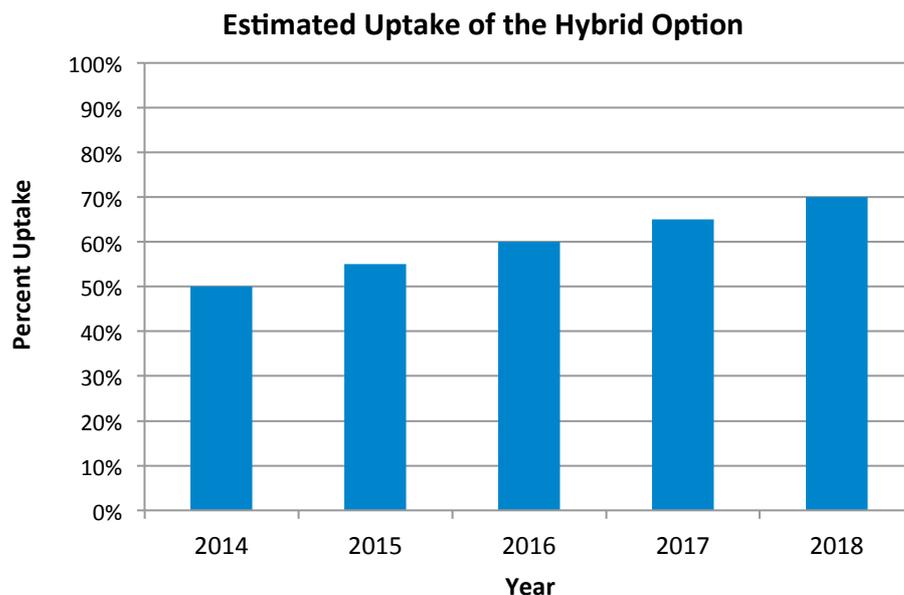
It should be noted the cost estimates would only apply to paying APCs for the publications by Wellcome Trust authors based on the assumptions and the models applied.

Growth in payments and OA uptake for combined scenario A



Note: The “hybrid offset” in the graph above (blue textured bars) is the rebated amount from the hybrid APC payments from the previous year, which offsets part of the hybrid APC payment from the current year. There is no rebate in 2014, the first year the programme is implemented in the model. The “payment for hybrid APCs” (full blue area) is the portion of the hybrid APC not offset by the rebate from the previous year and which must be paid by the institution.



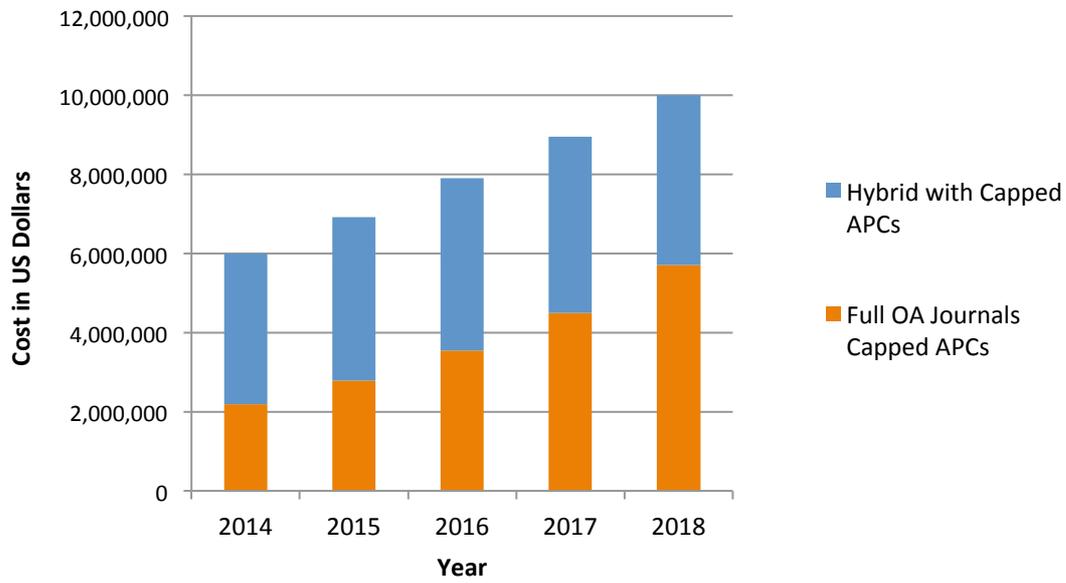


Assumptions on which these models are based:

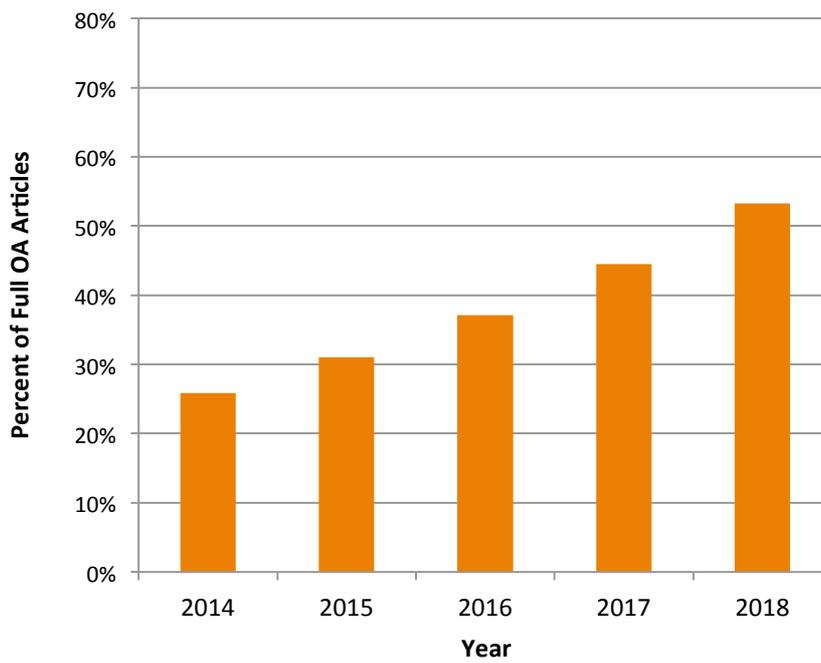
- Compound annual growth rate (CAGR) full OA: 20% (a little conservative compared with current APC growth world wide, but we felt appropriate given the relatively high existing uptake level).
- APC inflation rate: 5% (based on our study of established full OA publishers).
- CAGR total articles: 1% (based on assumption Wellcome Trust funding will be flat over this period).
- Base hybrid uptake: 50% (this is the estimate of initial hybrid uptake if the funder covered APC costs and mandated either self-archiving or OA publication).
- CAGR in hybrid uptake: 5% (growth in hybrid uptake).
- Average percentage full OA: 19% (from the 2012 Wellcome Trust data).
- Rebate percentage: 80% (percentage of the APCs for hybrid articles that are rebated the following year; this would be negotiated with the publisher and is just an estimate).

Growth in payments and OA uptake for combined scenario B

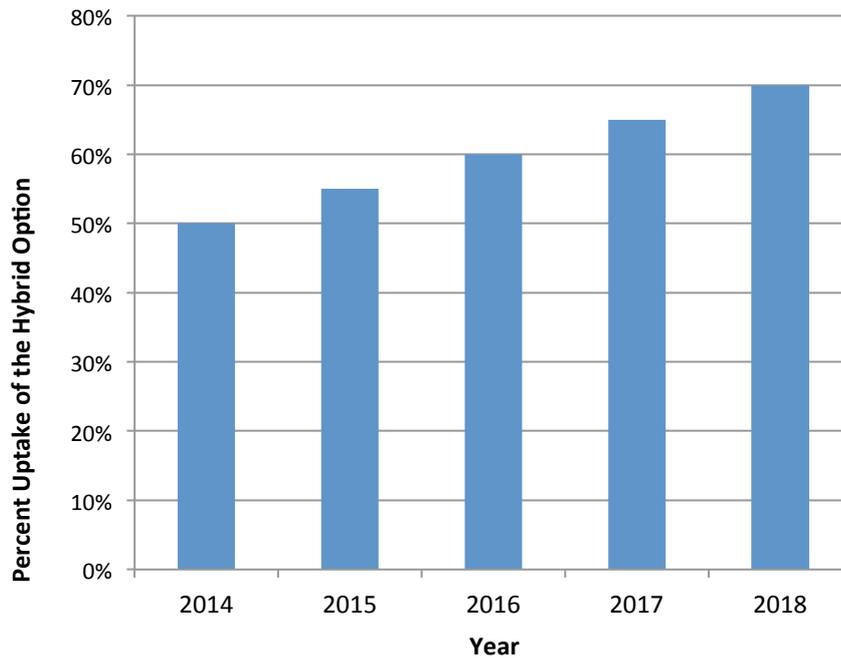
Estimated Growth in APC Payments (Caps)



Estimated Growth in Articles in Full OA Articles



Estimated Percent Uptake of the Hybrid Option



Assumptions of the model:

- Compound annual growth rate (CAGR) full OA: 20% (a little conservative compared with current APC growth world wide, but we felt appropriate given the relatively high existing uptake level).
- APC inflation rate: 5% (based on our study of established full OA publishers).
- CAGR total articles: 1% (based on assumption Wellcome Trust funding will be flat over this period).
- Base hybrid uptake: 50% (this is the estimate of initial hybrid uptake; with caps on many hybrid journals we anticipate the uptake would be lower than the other models).
- CAGR in hybrid uptake: 5% (growth in hybrid uptake).
- Average percentage full OA: 19% (from the 2012 Wellcome Trust data).

Appendix H: Current status of publishers' self-archiving OA policies

Developments in the pure OA and hybrid market are indirectly related to the developments concerning green self-archiving, since self-archiving in most cases is a direct alternative, in particular for hybrid OA. This section provides a short overview of what publishers allow authors and recent developments.

A very recent study by Laakso⁷⁹ provides a very good overview of what publishers currently allow concerning green OA. The calculations are based on data for 100 of the biggest publishers and done on an article volume basis, rather than journal basis. The global results show that immediate self-archiving is allowed for half of the subscription articles and that the share rises to around 80% after 12 months. Home pages and institutional repositories are almost always allowed, whereas subject repositories are not allowed for about two thirds of the manuscripts. The situation differs between sciences, with physical science journals mostly allowing immediate posting (for the 80% that allow) compared to the longer embargoes common in biomedicine and the social sciences.

Despite the rather positive figures above, several leading publishers have recently started to tighten up their green rules, in particular lengthening embargo periods.⁸⁰ Now that universities and funders alike are starting to issue OA mandates, and publishers have started offering a hybrid option for the vast majority of their journals, combined with the rapid growth in full OA journals, the trend towards tightening self-archiving rules seems to have started.

There are three main ways in which subscription publishers are restricting self-archiving:

Requiring embargo periods or lengthening existing embargo periods.

This seems to be the solution adopted by Springer, which recently changed its policy from allowing immediate self-archiving to one which now imposes a 12 month embargo when archiving articles in repositories⁸¹. The author can still post immediately on his/her own website.

Separate policies for voluntary and mandated green OA.

Elsevier started this trend in 2011 by requiring explicit agreements with institutions that have issued a mandate⁸². This might mean bundling with the e-licence agreements which effectively would put a price tag on green archiving. Philippe Terheggen, Elsevier Director of STM journals, describes their green OA policy in an interview⁸³ with Richard Poynder:

We are discussing fair embargo periods with funders worldwide. The challenge is that in almost all fields, the majority of article usage happens beyond the requested embargo periods. So the granting of fair embargo periods is a bit like rope walking, balancing the

⁷⁹ Laakso M. (2014). Green open access policies of scholarly journal publishers: a study of what, when, and where self-archiving is allowed. *Scientometrics*. In press. <http://dx.doi.org/10.1007/s11192-013-1205-3>, self-archived version at www.openaccesspublishing.org/

⁸⁰ Blog of Danny Kingsley, <http://aoasg.org.au/2013/05/23/walking-in-quicksand-keeping-up-with-copyright-agreements/>

⁸¹ <http://www.springer.com/open+access/authors+rights?SGWID=0-176704-12-683201-0>

⁸² Hagerlid J. (2012) Elsevier tries to block institutional OA mandates, blog item, Open Access i Sverige, Swedish Royal Library, 31.1.2012. <http://openaccess.kb.se/2012/01/elsevier-tries-to-block-institutional-oa-mandates/>

⁸³ Elsevier's Philippe Terheggen on the state of Open Access: Where are we, what still needs to be done? <http://poynder.blogspot.fi/2013/10/elseviers-philippe-terheggen-on-state.html#more>

needs of authors and funders, with sustainability, and for the most part we're able to achieve fair compromises.

So although Elsevier has not yet imposed embargo periods for OA that has not been mandated, they also seem to be trying to negotiate such embargoes with funders and universities.

Emerald also recently decreed an embargo period of 24 months for mandated OA.

Having different embargo periods if the journal offers a hybrid option.

This is yet another variation, which Wiley is using for the specific case of RCUK funded authors:

If an author funded by RCUK chooses to publish in a Wiley journal but doesn't select and pay for Online Open the author will be able to self-archive the accepted version of the article after a 12 month embargo period (starting with first publication online), or after a 24 month embargo for authors funded by AHRC and ESRC. If a journal does not offer an open access option the embargo period is reduced to 6 months (RCUK's STM Councils) or 12 months for authors funded by AHRC and ESRC.⁸⁴

⁸⁴ <http://olabout.wiley.com/WileyCDA/Section/id-406074.html>

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