

## The consequences of paying to publish

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*Open Access publishing has been the most prolific aspect of the transition towards open science. In this transition, increasingly national governments, national and international funding agencies and institutional leadership have initiated policies to promote and stimulate the development to open access as the norm in scholarly publishing. However, this has not always led to the best outcomes.*

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### 1. Introduction

In the last part of the previous century, the world witnessed the rise of a movement aiming to organise access towards scientific knowledge in a more egalitarian manner. The initial aims of the Open Science movement, as it was coined, revolved around ensuring fair access to scientific, or scholarly, literature<sup>[1]</sup>. Exorbitant prices are often practised for this type of literature, making access impossible for many scholars in low- and middle-income countries.

Originating primarily from university librarians, this movement gained substantial momentum through subsequent engagement from research funders and science policymakers. This progression led to the design of national Open Access mandates, institutional Open Access policies, and specific requirements within research grants. This policy brief investigates the effectiveness of some of these policies, with a particular focus on paradoxical outcomes unforeseen during their development and implementation.

### 2. Policies

As countries started issuing national policies and mandates on Open Science, different approaches were taken to open access for scholarly publishing. Some policies induced publishing in journals that do not charge for access to the papers they publish, in what is referred to as Gold Open Access. Such openness is often made possible through the payment of often expensive Article Processing Charges (APCs) by authors. That was the road of choice for countries such as the United Kingdom and the Netherlands. Other countries, like Denmark, chose a different path, encouraging researchers to deposit a version of their manuscripts in a freely accessible online repository, such as an institutional repository or a subject-specific archive. National perspectives often resulted in likewise policies on the institutional level, although these often also covered other

aspects of Open Science, such as open data, open source code, etc.

In 2018, a consortium of international funders, known as cOAlition S, launched a plan outlining how to publish in Open Access (OA) format<sup>[2]</sup>. The so-called Plan S prioritized the Gold Open Access model over other types of OA, particularly over what is known as Hybrid Open Access. While in the Gold model all the journal's content is freely accessible for anyone interested without any costs or restrictions, Hybrid OA journals continue to charge for subscriptions, and they make only a share of the articles they publish open, through APC payments. The Hybrid model, designed to be a temporary resource to aid publishers in the transition to the Gold preferred standard, is still widespread five years after the launch of Plan S, and publishers continue to profit from both the subscription income and APC payments for many papers submitted to their Hybrid journals.

While Plan S has proposed to use a cap, a maximum cost acceptable for one single Open Access publication, it is still up to the publisher, often owners of highly prolific internationally oriented journals, to determine the value of APCs charged for either Gold or Hybrid OA publications. *Thus, the scholarly publishing system is moving from a pay-to-read to a very expensive pay-to-publish model, sometimes both.* As a result, inclusion in scientific publishing remains limited to those who can afford the persisting high costs.

### 3. Studies

A recent study<sup>[3]</sup> on open science policies and the phenomenon of APCs shows that the national open science policy of the Netherlands clashes with the actual development initiated by the Dutch universities. In 2013/2014, the national government issued an open access policy prioritizing Gold as the default open access format. However, universities have a high degree of autonomy in the country, being well organized in contexts such as university

library settings, evaluation cycles, and overall governance of the institutions. Based on such an autonomy, Dutch universities, together with the royal library in the so-called UKB, negotiated with the publishing industry specific deals that allowed the country's scholars to publish in journals within the subscriptions with these publishers. These deals are known as transformative agreements, and their development in the country started in 2016/2017, favouring publication in Hybrid open access format. The two contradictory initiatives have influenced publishing practices of scholars from various scholarly domains, and they have also sparked discussions about the benefits of the Hybrid and the Gold models.

One of the common elements between the two OA formats is that articles published are open, freely accessible without any paywalls. However, publishing is not free, and often authors pay article processing charges (APCs) to publish. These APCs were the object of a second study<sup>[4]</sup>, which investigates Gold OA publishing at a country level from a global comparative perspective. The study shows that, while the original motivation for the open science movement was a better access for the scholars of low- and middle-income countries to reading scholarly literature from the Northern hemisphere, the current development of Gold Open Access publishing is driving into the direct opposite direction.

Scholarly publishing in Gold Open Access journals via the payments of APCs is becoming more and more expensive. A direct translation of numbers of publications times APC-rates shows that publishing becomes more costly, but when normalization for national welfare situation is conducted, by applying the OECD based PPP index (Purchasing Power Parity), the situation even worsens<sup>[4]</sup>. In short, while the Gold OA contributed to making more scholarly literature available for scholars from the low- and middle-income countries, the high APCs are creating significant challenges for them to publish their work.

For instance, figures 1 and 2 contrasts the spending of countries on Gold OA publishing with the impact measured through the mean normalised citation score (mncs). The difference between the visualizations is that the first figure shows spending based on a nominal conversion of the average amount of money spent on APCs to US Dollars. Figure 2

improves that perspective by normalizing spending according to the PPP index. The period covered is 2015-2018, PPP-rates are from 2022 OECD data.

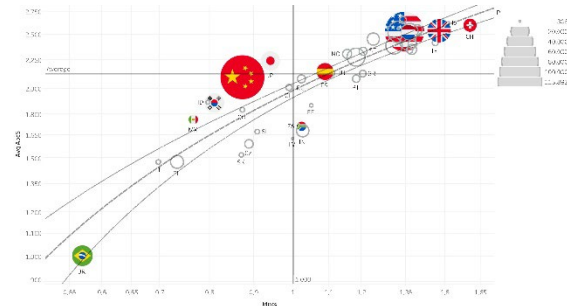


Fig. 1: Global spending on APCs per country, 2015-2018

Highlighting extremes, Brazil produces roughly some 25.000 APC based papers, of which the average APC amounts up to around \$1000, which was 5x minimum monthly wage in Brazil, while the Netherlands produces some 12,500 APC based papers, of which the average APC rate is around \$2500, which was 1,6 times minimum wage in the Netherlands!

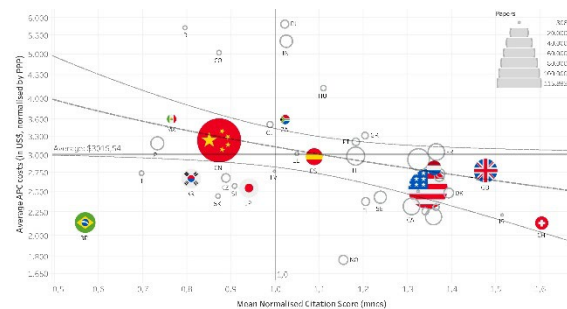


Fig. 2: Global spending on APCs per country, 2015-2018, corrected by PPP

After the correction for welfare level, by introducing PPP-corrected spending on APCs, the average APC-rates for Brazil amounts to US\$ 2139, while PPP-corrected APC-rate for the Netherlands amounts to US\$ 2818. Applying purchasing power parity (PPP) is applied, we observe that for Brazil, the average APC-rate has increases to 10x minimum monthly wage, while for the Netherlands this increased to 1,8x minimum monthly wage. This leads to the conclusion: for Brazilian academics it is much more difficult to live up to international academic-

economic standards, and to allow for publishing in journals with an international standing, often published in journals processed for internationally oriented bibliographic platforms such as Web of Science, Scopus, or Dimensions, since APCs are simply too high to afford.

Our analysis of the trend lines in Figures 1 and 2 has led us to some significant findings. Figure 1 shows that higher nominal spending on APCs is associated with a greater average impact of publications. In contrast, when we adjust the expenditures according to each country's PPP, Figure 2 demonstrates an inversely proportional relationship, indicating that the citation impact increases as the normalised cost, which we can see as the actual cost of the investment, decreases. *These findings underscore the importance of considering the real cost of APCs in relation to their impact on publications.*

Returning focus to the Dutch situation, the development of Hybrid OA published material has been made possible due to the increasing number of agreements between the scholarly system on the one hand, and the publishing industry on the other hand. The bulk subscription contracts have been the stepping stone to transformative agreements, leading to the *Read & Publish* deals that the universities now have with publishers. These deals opened the way to publish in journals that are still within the subscription situation, but with the possibility to allow Open Access exceptions, so a hybrid form of Open Access publishing. However, a national mandate states that Gold OA is the route for the Netherlands to reach full OA from 2024 onwards, and the conflict becomes clear in the following figures.

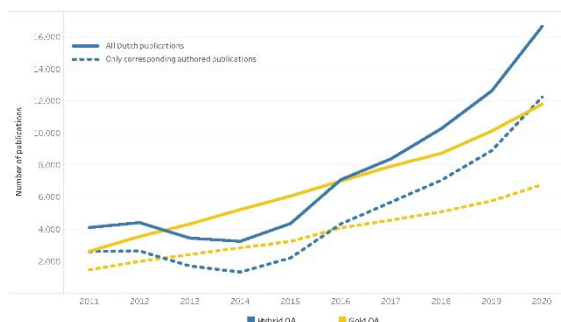


Fig. 3: Dutch output in Gold and Hybrid OA, 2011-2020, all publications

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In Figure 3 we clearly see how the development of Gold OA publishing has been continuous from 2011 onwards. With the launch of the national mandate in 2014 and the climate already prepared for the that in the years before, Hybrid OA publishing initially decreased, and only started to increase after the agreements with the publishers started to get form 2015/2026 onwards, with Hybrid OA becoming more important for Dutch academics, and overtaking Gold OA publishing.

To analyse the attractiveness or strategic behaviour in scholarly publishing, the analysis also focused on the publication output in which Dutch authors were corresponding authors. In Figure 3 this is indicated with the dotted lines, showing a similar trend as for all Dutch output. Hence, we cannot conclude that due to the Read & Publish Deals, scholarly cooperation has led to an increase of papers coming from the Netherlands, with Dutch corresponding authors. However, we see that the gap between Gold and Hybrid OA is wider, indicating that Hybrid OA publishing has become more popular compared to Gold OA publishing, and on top of that, that the Dutch Hybrid OA corresponding authored output surpasses in numbers the numbers of Gold OA published output in 2020.

**4. Conclusions**

What we witnessed in the two studies conducted is a complex power structure, with a variety of actors, both supra-nationally and nationally, conflicting interests within the national context, funding agencies, and a variety of motivations (academic, commercial, individual). A clear issue in the debate around Plan S was the relationship of the consequences of Plan S with the existing reward & recognition systems, as well as career perspectives of early career researchers in an international context. This aspect also returns in the study on the Dutch system, whereby academic freedom to choose the journals that suit you best is conflicting

with prescribed ways of publishing in both the national mandate as well as in Plan S. Finally, the study on global Gold Open Access publishing reflects a development towards a more unequal access to scholarly publishing, along the line of available financial resources<sup>[5, 6]</sup>. All these outcomes clearly show unexpected consequences of the policies undertaken<sup>[7]</sup>. We do not have the same data as we have for the Dutch situation available for other countries, but assume that wherever these Transformative Agreements have been introduced, similar issues have popped up, as often no actions have been taken to also implement accompanying policies regarding recognition & reward policies, career policies, etc.

The Open Science movement started as an initiative to create more read access to the international serial literature, which was obstructed by sky high subscription rates. We now witness that due to the increasing price rates of Open Access publishing, in particular regarding the mandated Gold OA format, access to publishing in the international serial literature by the research communities from Low & Middle Income countries has decreased. In contrast, read access is no longer a problem, since an increasing number of publications becomes automatically available through the open access development. An important question in the background of this analysis is to what extent the transformative agreements, as these deals were named, did fail in the end, as no transformation is taking place at all.

In the meantime, cOAlitionS accepted Hybrid OA publishing as a transition model towards the intended Gold OA. However, the recent launch of their new program, "Towards Responsible Publishing", indicates a Plan S 2.0 that moves away from traditional publishers to further promote pre-print publishing as the preferred form of scholarly communication. And this happens against a background in which yet another model of Open Access publishing is becoming increasingly popular, namely the Diamond Model. Diamond Open Access is the form of Open Access publishing in which the direct costs of publishing are not taken care of by the publishing author(s), but by a consortium supplying the money for scholarly open access publishing. A prominent example of this new way of organizing open access publishing is the Open Library of Humanities<sup>[8]</sup>. This development should be much better prepared and supported from policy

making on different levels. Embedding publishing in Diamond OA journals would incentivize publishing there, while now the majority of academics is hesitant about both publishing in the journals, or do editorial and peer review work for such journals.

Currently developments are taking place globally around the Open Science agenda, both internationally, national, as well as institutionally. International developments initiated by the EU, UNESCO, as well as funding actors like Science Europe and cOAlition S have a strong effect on national and institutional actions. And apart from the unexpected and unintended consequences described in this policy brief, the upswing of predatory publishing and ghost conferencing are in itself examples of unintended and unexpected negative consequences of the Open Science development.<sup>[9]</sup>

So, summarizing, the push for Gold OA publishing has created a lot of fuzz, as well as created a situation in which new players appeared up, old players have reinforced their market positions, and sketchy journals and publishers have popped in the scenery, all of this being unforeseen effects of a myriad of science and funding policies implemented at supra-national, national, and institutional levels.

**Policy implications**

- Science policy should be more aware of the potential risk of unintended consequences occurring after policies have been initiated and implemented.
- Gold OA publishing has proven to not be the solution in the transition towards open science and open access publishing, as the publishing industry has increased its grip on scholarly publishing.
- The fact that openness is closely connected to other aspects of research management is reflected in the choice by Dutch academics to publish in hybrid OA journals rather than in Gold OA journals, as that is where the highly prestigious journals are located.

**Further reading**

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