



Reflections on dynamics of cumulative advantage and threats to equity in open environments

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The ON-MERRIT project

- H2020 project: October 2019 - March 2022
- Methods: Sociological, bibliometric and computational approaches

Objectives

- Ensure that Open Science & RRI interventions contribute to a more equitable scientific system
- Distribution of rewards based on merit rather than privilege





Open Science is an umbrella term for a bunch of practices

Opening up scientific processes and products from all levels to everyone ...

- Open Access to publications
- Open/FAIR data
- Open Source software
- Open methods, protocols & materials
- Citizen Science
- Open Evaluation / Open Peer Review

But its also a bunch of principles ...





Principles of Open Science

Transparency	Accountability	Inclusivity
Responsibility	Community & Collaboration	Visibility
Rigour	Equality	Public good
Reproducibility	Findability	Accessibility
Interoperability	Re-usability	Innovation





Equity, inclusivity, democratization are key goals of Open Science

- Foundational 2002 Budapest Open Access Initiative claimed Open Access could share learning between rich and poor and “lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge” (Chan et al. 2002).
- Chapter devoted to “democratization” in Nielsen’s *Reinventing Discovery* (Nielsen 2013)
- More recently, “increased equity” was listed as a “key success factor” for Open Science by a stakeholder-driven study (Ali-Khan et al. 2018).
- “Open science principles of openness and transparency provide opportunities to advance diversity, justice, and sustainability by promoting diverse, just, and sustainable outcomes” (Grahe et al. 2020).





Whose agenda?

- Open Science can be defined in different ways by different groups, whose agendas may not always converge
 - Researchers from all disciplines and regions
 - Research funders
 - Research institutions
 - Publishers ...
- How do these different agendas shape outcomes?





Uptake of Open Science practices also depends on:

- Infrastructure
- Resources
- Training
- Support
- Political will

And access to these advantages is obviously not equally distributed ...





Stating the obvious: Academia remains unequal

Structural inequalities persist across regions and demographics

For example:

- Global North dominates, pushing Global South research to the periphery
- Even within richer regions, a fetish for the poorly-defined goal of “excellence” breeds cumulative advantage in funding allocation for the highest-funded institutions
- Women occupy relatively fewer higher positions, tend to achieve senior positions at a later age, are awarded less grant funding and have fewer publications
- STEM privileged over SSH





The rich get richer

The Matthew Effect in Science



**The reward and communication systems
of science are considered.**

Robert K. Merton

- Matthew Effect first proposed Robert Merton in Science, 1968
- “For to every one who has will more be given, and he will have abundance; but from him who has not, even what he has will be taken away.” - Gospel of Matthew 25:29
- I.e.: Already successful scientists tend to receive disproportionately high recognition or rewards in comparison to their less-famous counterparts





Effects of cumulative advantage are at play throughout academia



At the levels of:

- journals, institutions, departments, and countries
- individual attributes of researchers including race and gender

Across a range of scientific activities:

- article citations, peer review, public engagement, and funding acquisition





Whose Open Science?

- Open Science is not a unified ideology but a diverse bunch of principles and practices
- Equity is often stated as a core aim, but just because things are “open” will not necessarily ensure equity
- Factors like region, gender, discipline and access to resources will continue to shape the possibilities of participation in an Open Science world
- There are various routes to implementation of Open Science; the “how” is crucially important





Q. Might Open Science be at risk in some cases of reinforcing existing privileges or creating new ones?

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OPEN SCIENCE

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Review



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Dynamics of cumulative advantage and threats to equity in open science: a scoping review

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Open Science holds the promise to make scientific endeavours more inclusive, participatory, understandable, accessible and re-usable for large audiences. However, making processes open will not *per se* drive wide reuse or participation unless

Scoping review synthesizing results from 268 relevant studies

Question:

“What evidence and discourse exists in the literature about the ways in which dynamics and structures of inequality could persist or be exacerbated in the transition to Open Science, across disciplines, regions and demographics?”



Answer: A lot

Many (diverse) threats – for example:

- Costs of participation
- Political agendas
- Discriminatory OA APC business-model
- Cumulative nature of data inequalities
- Platform-logic of Open Science
- Lack of reward structures
- Logics of participation
- Exclusion of societal voices
- Resource-intensive nature of translational work

Table 2. Summary of identified areas of concern for equity in Open Science.

aspect of Open Science	area for concern	group(s) most affected
general factors	costs of participation: Open Science is resource-intensive in terms of infrastructure, support, training	less well-resourced institutions and regions
	political agendas: Open Science requires political will, but political agendas shape Open Science implementation. Especially where economic growth is a stated ambition, this may be problematic	regions and institutions without such political backing, or where political goals promote inequitable Open Science implementations
	neoliberal logics: Open Science seen as potentially entrenching structures and ideologies of neoliberal commodification and marketization of research knowledge as an economic resource to be exploited rather than as a common good for the well-being of humanity	science per se, but especially those disciplines and researchers that do not fit this agenda
Open Access	discriminatory business model: APC-based OA is exclusionary and risks stratifying authorship patterns	less well-resourced researchers, institutions and regions. May also impact specific demographics, including women
	predatory publishing: limited issue which nonetheless primarily adversely affects non-dominant groups	authors from developing nations and early career researchers
Open Data and FAIR Data	situatedness of data practices: data practices are highly context-dependent, meaning one-size-fits-all policies risk privileging some disciplines	qualitative researchers and disciplines
	cumulative nature of data inequalities: creating and exploiting Open Data is strongly linked to access to infrastructure and data literacy	less well-resourced researchers, institutions and regions
	citation advantages of Open Data: Open Data seems linked to increased citations and hence early adopters benefit (Matthew effect)	less well-resourced researchers, institutions and regions
Open Methods and Open Infrastructure	transparency as a benchmark for quality: open methods require additional training, effort, infrastructure. Well-resourced and high-status actors may potentially have an advantage	less well-resourced researchers, institutions and regions
	reproducibility as a <i>sine qua non</i> for research: relatedly, meanings and limits of openness not uniform across disciplines. Uncritically extending quantitative standards methodologies may obscure necessary interpretive work or further devalue qualitative approaches	qualitative researchers and disciplines
	platform-logic of Open Science: reliance on privately owned platforms may frustrate the aims of Open Science and increase surveillance capitalism in academia	science as a whole
	lack of reward structures for contributions to open infrastructure: Open Science seems at risk if it relies on closed and proprietary systems; yet open infrastructures often rely on short-term project funding or volunteer labour which is not properly rewarded within current incentive structures	early career researchers
Open Evaluation	open identities peer review: peer review where reviewers are de-anonymized may either by discourage full and forthright opinion or opening especially early career reviewers to potential future reprisals from aggrieved authors later on	early career researchers, others from non-dominant groups
	suitability of altmetrics as a tool for measuring impact: altmetrics criticized for: lack of robustness and susceptibility to 'gaming'; disparities of social media use between disciplines and geographical regions; reliance on commercial entities for underlying data; indicating 'buzz' rather than quality; underrepresentation of data from languages outside English; exacerbating tyranny of metrics	all, especially non-English language research and areas where social media use is less pronounced
Citizen Science	logics of participation in Citizen Science: evidence of biased inclusion in populations invited to participate; potential for data extraction absent anything else to echo colonial exploitation	the public, especially marginalized groups
interfaces with society, industry, policy	resource-intensive nature of translational work making outputs open is not enough to ensue uptake and societal impact. The importance of (resource-intensive) translational work means richer institutions and regions may still dominate policy conversations	less well-resourced researchers, institutions and regions
	privileging of economic aims: the terms on which Open Science engages industry is asymmetrical, perhaps reflecting the importance of economic growth as a key aim. Industry is free to participate (or not) in open practices, as it suits them	science as a whole, but especially those domains not easily exploited by commerce
	exclusion of societal voices: Open Science's terms of inclusion of publics is accused of 'instrumentalism' and asymmetry (experts/public)	the public



Open Science improves the practice of research, but not automatically and not without new risks for inequality and other adverse effects. So we must not be naïve.

These issues all arise as a result of one or more of the following problematic aspects of Open Science:

- Ambiguity and politics
- Resource-intensity and network effects
- Narrow epistemologies
- Neoliberal logics

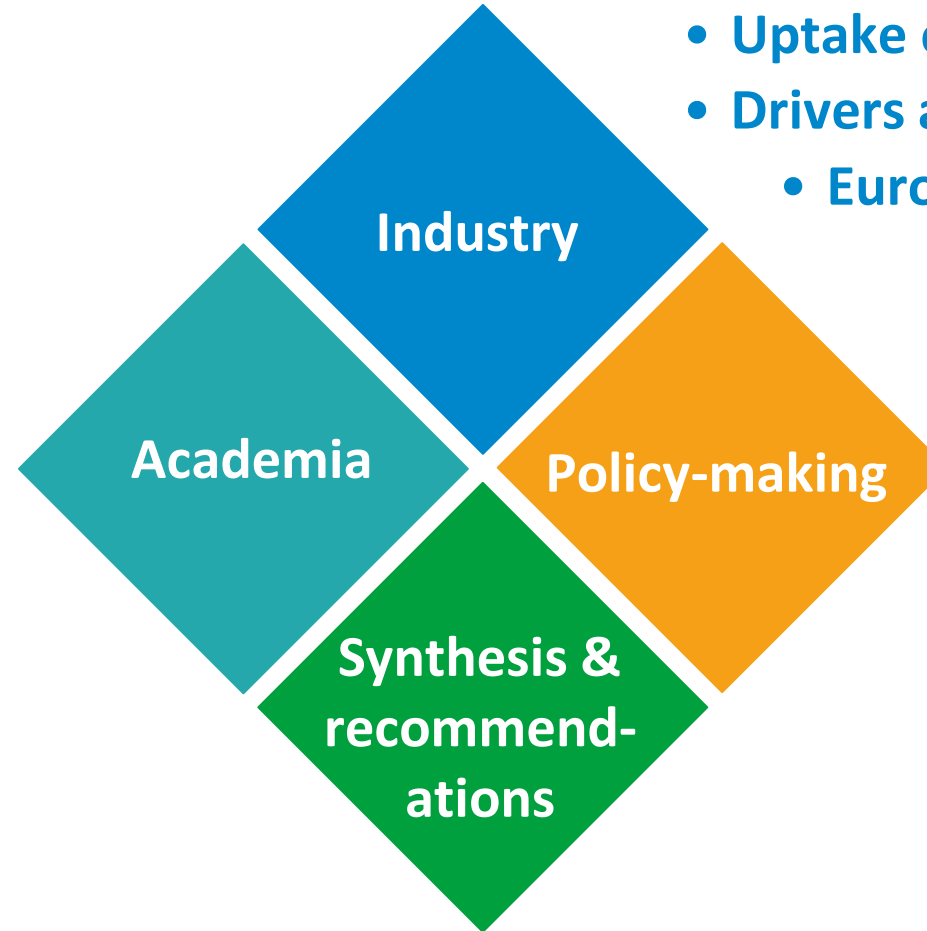




ON-MERRIT project key research questions

Effects of...

- barriers to accessing literature
- OS & RRI practices on career progression
- OS & RRI indicators in promotion policies
- OS & RRI training



- Uptake of OS resources
- Drivers and barriers
 - European patent literature

- Uptake of OS resources
- Drivers and barriers
- With RRI experts & citizen scientists: Reflect on barriers to participate in evidence-gathering

- Effects of traditional vs. potentially new OS & RRI indicators on research practices



<https://on-merrit.eu/results/>

Hundreds of pages of new primary research (publications coming):

- [Cumulative Advantage in Open Science and RRI: A Large-Scale Quantitative Study \(D3.2\)](#)
- [Investigating Institutional Structures of Reward & Recognition in Open Science & RRI \(D6.1\)](#)
- [Drivers and barriers to uptake of Open Science resources in industry \(D4.2\)](#)
- [Quantifying the influence of Open Access on innovation and patents \(D4.3\)](#)
- [Results of a survey on the uptake of Open Science in information seeking practices in policymaking \(D5.2\)](#)
- [Networks of engagement in deliberative policymaking: Expert reflections on barriers to participation \(D5.3\)](#)



Example: Open Access publishing patterns

“Results suggest that authors affiliated with high-ranked universities and well-funded institutions tend to have more resources to choose pay options with publishing. Our research suggests **new professional hierarchies developing in contemporary publishing**, where various OA publishing options are becoming increasingly prominent. Just as there is stratification in institutional representation between different types of publishing access, there is also inequality within access types.”



Authorial and institutional stratification in open access publishing: the case of global health research

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ABSTRACT

Using a database of recent articles published in the field of Global Health research, we examine institutional sources of stratification in publishing access outcomes. Traditionally, the focus on inequality in scientific publishing has focused on prestige hierarchies in established print journals. This project examines stratification in

Siler K, Haustein S, Smith E, Larivière V, Alperin JP. (2018) Authorial and institutional stratification in open access publishing: the case of global health research. *PeerJ*6:e4269 <https://doi.org/10.7717/peerj.4269>





APCs and the Stratification of OA Publishing

The article processing charge (APC) model within Open Access publishing seems to discriminate against those with limited resources (especially those from less resourced regions and institutions).

These facts seem to be having effects of stratification in terms of who publishes where.

Citation: Smith, A. C., Merz, L., Borden, J. B., Gulick, C. K., Kshirsagar, A. R., & Bruna, E. M. (2021). Assessing the effect of article processing charges on the geographic diversity of authors using Elsevier's "Mirror Journal" system. *Quantitative Science Studies*, 2(4), 1123–1143. https://doi.org/10.1162/qss_a_00157

DOI:
https://doi.org/10.1162/qss_a_00157

RESEARCH ARTICLE

Assessing the effect of article processing charges on the geographic diversity of authors using Elsevier's "Mirror Journal" system

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^{*}Audrey C. Smith and Leandra Merz contributed equally to this work.

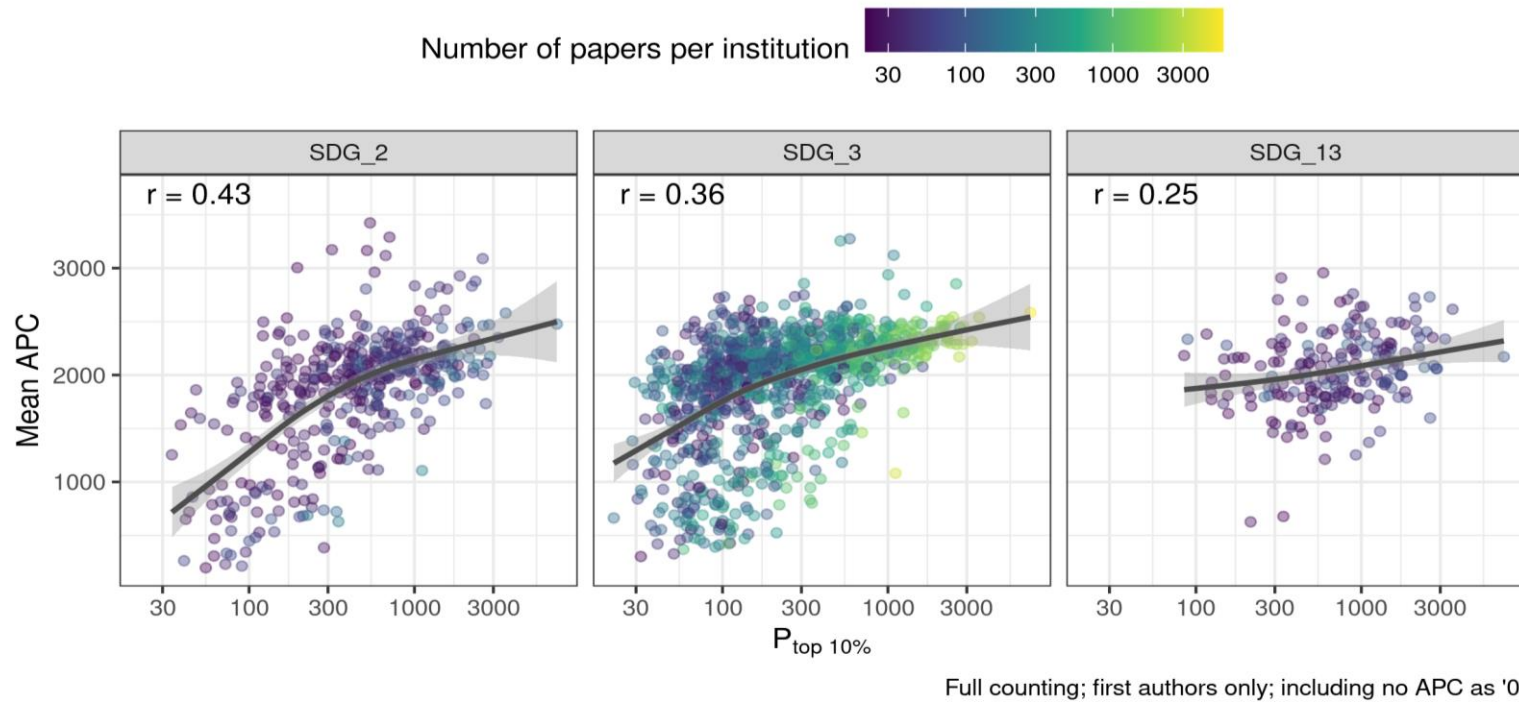
Keywords: Global North, Global South, Gold OA, hybrid journals, open access, parent journals, Simpson's index, waivers

ABSTRACT

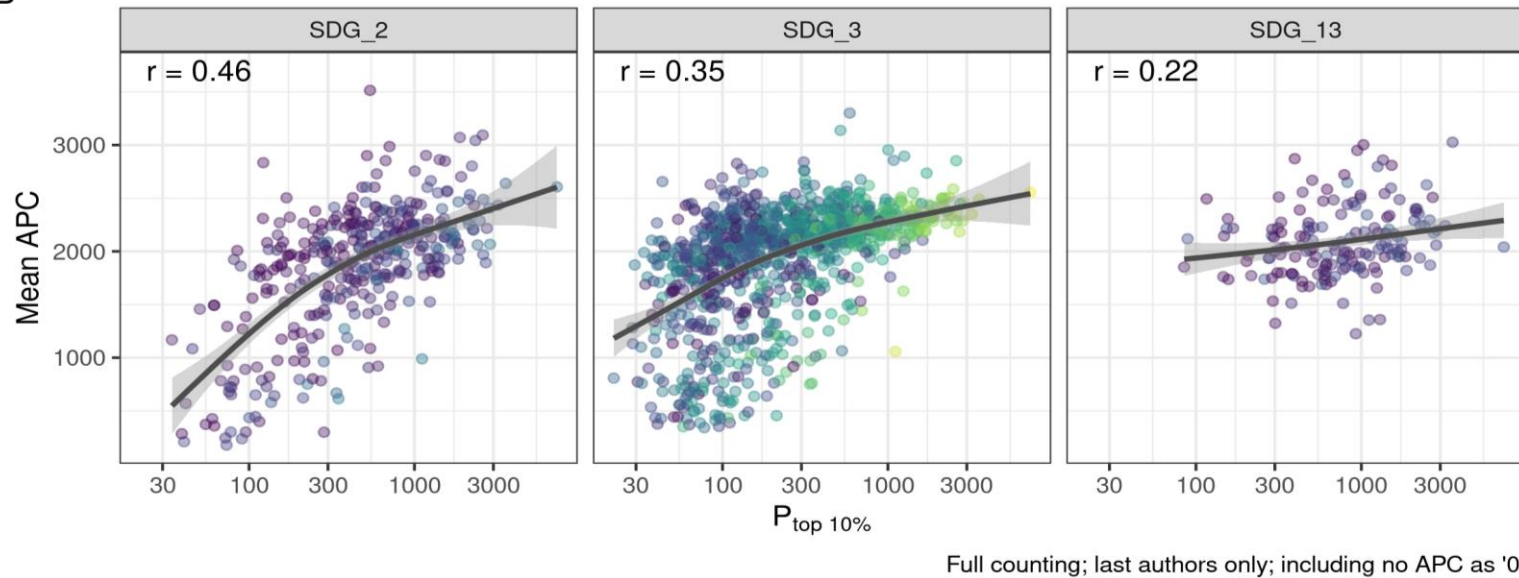
Journals publishing open access (OA) articles often require that authors pay article processing charges (APC). Researchers in the Global South often cite APCs as a major financial obstacle to OA publishing, especially in widely recognized or prestigious outlets. Consequently, it has been hypothesized that authors from the Global South will be underrepresented in journals charging APCs. We tested this hypothesis using more than 37,000 articles from Elsevier's



A



B

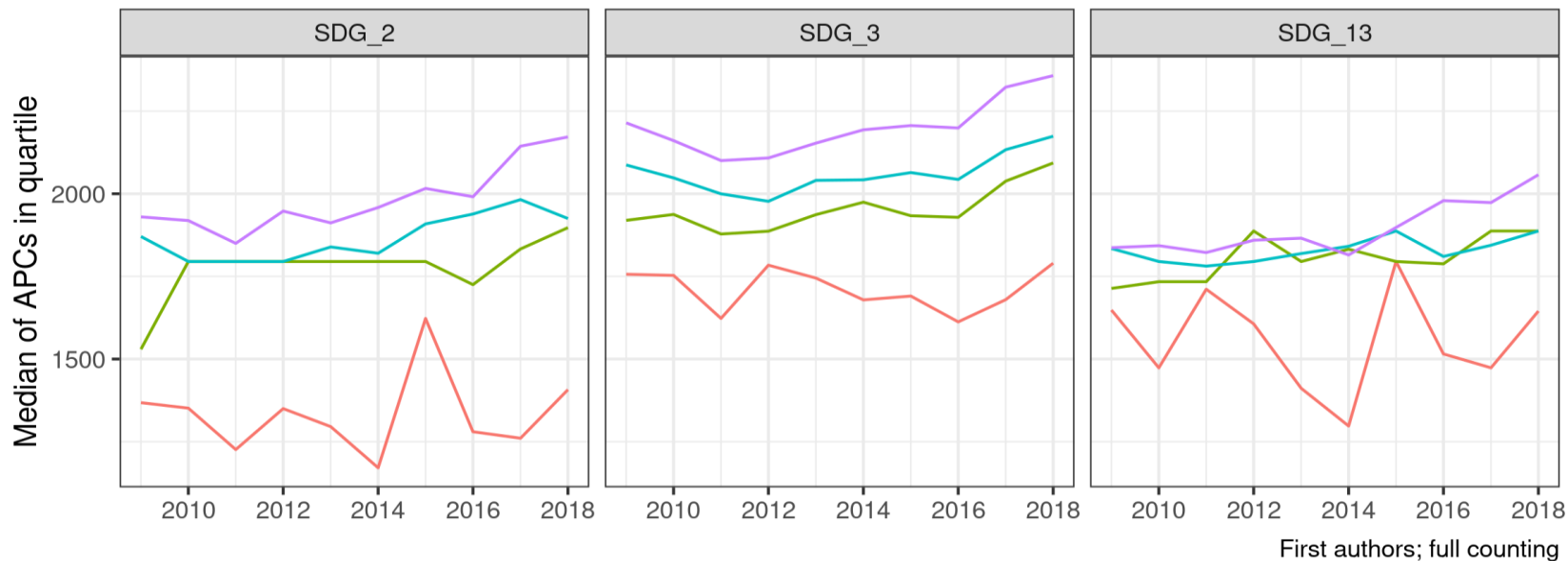


Stratification effects of APCs on publishing

More prestigious institutions tend to publish in higher APC journals

A

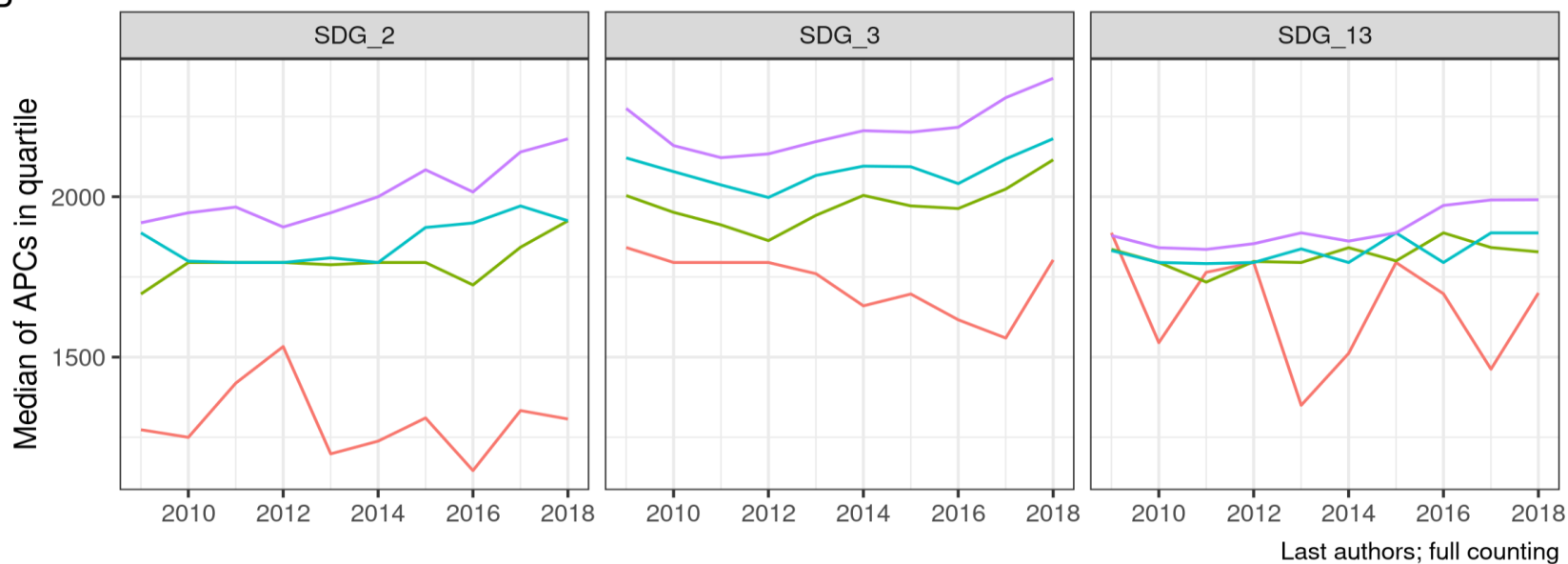
Quartiles within $P_{top\ 10\%}$ — p-0-25 — p-25-50 — p-50-75 — p-75-100



Stratification effects of APCs on publishing

Over time, the gap seems to be increasing

B



ON-MERRIT Recommendations

- Co-created with funders, research institutions, and researchers



Funders



Institutions



Researchers

- Four priority areas for action:
 - Resource-intensity of Open Research
 - Article processing charges and the stratification of Open Access publishing
 - Societal inclusion in research and policy-making
 - Reform of reward and recognition



<https://zenodo.org/record/6276753>

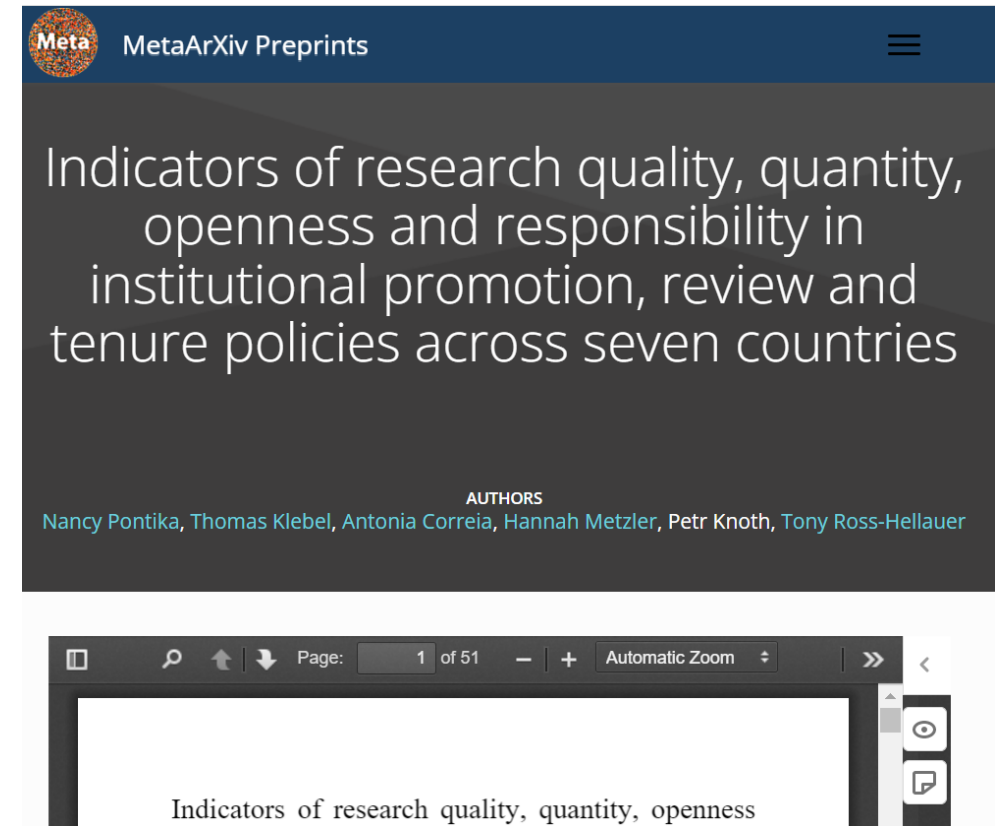


Recommendations on APCs

1. Funders, institutions and researchers should collectively demand greater transparency from publishers on publication costs, regarding prices and services, and (where possible) support open infrastructures to collect this information.
2. Funders, institutions and researchers should support alternative publishing models where those show potential to be more inclusive, including consortial funding models for open publishing infrastructures which support Open Access publishing with no author-facing charges.
3. Funders, institutions and researchers should encourage and support the use and maintenance of sustainable, shared and open source publishing infrastructure, to reduce costs and promote open standards.
4. Institutions and researchers should ensure the accepted version (or later) of peer-reviewed works are deposited in an open repository.
5. Funders and institutions should consider supporting authors' right to self-archive publications by implementing rights retention strategies.

Reform of reward and recognition

- Institutional processes for reward and recognition not only do not sufficiently support the uptake of open and responsible research, but often get in the way of them.
- This disadvantages those who wish to take up these practices (putting early-career researchers especially at risk).



Pontika et al. 2022. Indicators of research quality, quantity, openness and responsibility in institutional promotion, review and tenure policies across seven countries. <https://doi.org/10.31222/osf.io/b9qaw>



- Surveyed researcher assessment policies from 107 institutions across 7 countries
- Factors related to Open Science and Responsible Research and Innovation still very rare

Service to profession	50%	100%	33%	58%	83%	100%	63%
Patents	33%	75%	67%	67%	67%	4%	34%
Review & editorial activities	17%	75%	75%	0%	50%	58%	40%
Engagement with industry	33%	33%	33%	25%	83%	62%	20%
Engagement with the public	17%	42%	25%	8%	100%	62%	17%
Publication quality	33%	0%	58%	33%	17%	79%	40%
Journal metrics	50%	42%	25%	67%	17%	12%	14%
Number of publications	67%	25%	25%	8%	33%	4%	17%
Engagement with policy makers	17%	33%	8%	0%	0%	54%	14%
Gender of reviewers	50%	0%	58%	0%	0%	0%	0%
Gender equality	67%	0%	42%	0%	0%	0%	0%
Citations	17%	0%	33%	8%	0%	17%	26%
Software	0%	75%	8%	0%	0%	0%	11%
Gender balance of reviewers	33%	0%	33%	0%	0%	0%	0%
Citizen science	0%	8%	8%	0%	0%	0%	6%
Open access	0%	0%	0%	0%	0%	0%	0%
Data	0%	0%	0%	0%	0%	0%	0%
	Austria	Brazil	Germany	India	Portugal	United Kingdom	United States

Pontika et al. 2022. Indicators of research quality, quantity, openness and responsibility in institutional promotion, review and tenure policies across seven countries.
<https://doi.org/10.31222/osf.io/b9qaw>



Mismatch between researcher and institutional values





Recommendations on Rewards/Recognition

Areas of focus include: changing assessment culture and practices, flexible assessment, collaborative multi-stakeholder redefinition of assessment, sharing of best practices, sustainable career pathways.



1. Funders and institutions should support a change in assessment culture, moving beyond narrow quantitative indicators (e.g., of publication and funding acquisition) to value quality, openness (where appropriate), collaboration and responsibility in research, and recognise the full range of academic tasks.

Reform of research assessment to value open practices must come as part of a broader conversation about cultures of assessment, including a shift of focus from research outputs (i.e., publications) to broader research behaviours. The aim should not be to perform open practices per se, but to institutionalise these as part of standard research practice where appropriate. In addition, research as a collaborative activity could be better recognised if rewards were focused less on the performance of individuals and more on research teams.





Closing words

“We hope that the wider Open Research community will take these recommendations in the constructive spirit in which they are meant, as a springboard to help recognize and further address such issues. None of this is meant to diminish the aims of Open Research per se, or negate the good that it has the potential to bring. However, given its commonly held aim of increasing equity, any potential for Open Research to actually drive inequalities must be taken seriously by the academic community in order to realise the aim of making research truly open and collaborative, and ensuring success in research is based, in the end, on merit.”



Thank you!



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