



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

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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 it's 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





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





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



The ON-MERRIT project

- H2020 project: October 2019 - March 2022
- Methods: Sociological, bibliometric and computational approaches
- <https://on-merrit.eu>

Objectives

- Examine issues of equity in Open Science, including its interfaces with industry and policy
- Ensure that Open Science & RRI interventions contribute to a more equitable scientific system



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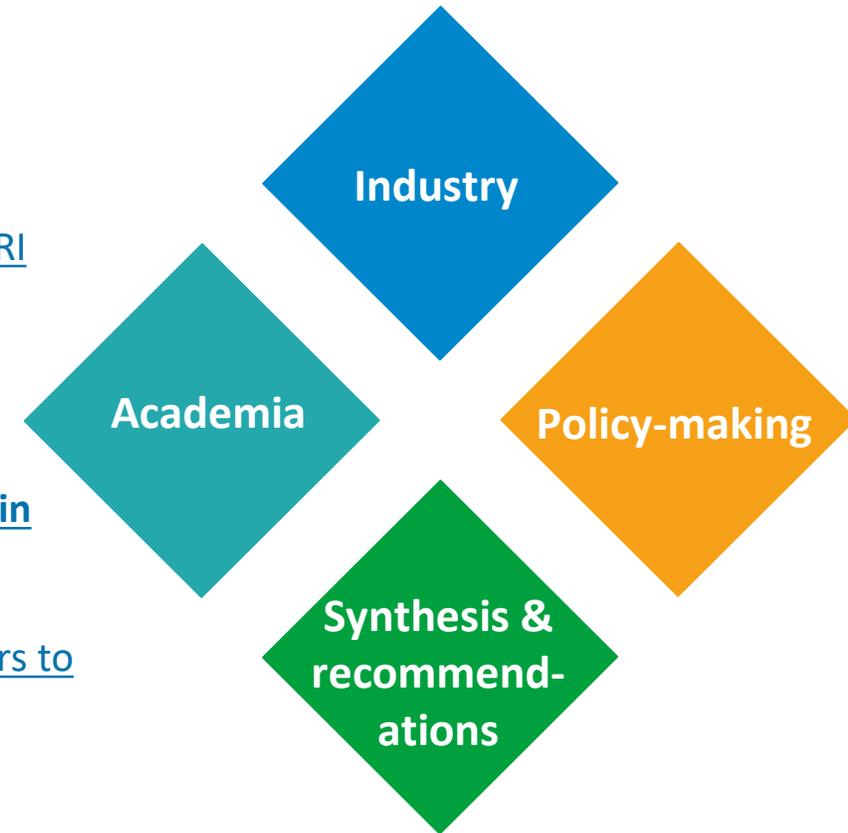
<https://on-merrit.eu/results/>

Hundreds of pages of primary research:

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

Leading into our recommendations:

[Global Thinking. ON-MERRIT recommendations for maximising equity in open and responsible research](#)





Scoping review

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?”

Synthesizing results from 268 relevant studies

ROYAL SOCIETY
OPEN SCIENCE

royalsocietypublishing.org/journal/rsos

Review



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

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Many (diverse) threats – for example:

- Costs of participation
- Discriminatory OA APC business-model
- Cumulative nature of data inequalities
- Platform-logic of Open Science
- Lack of reward structures
- Exclusion of societal voices





Example issue 1: The APC-Effect



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.

- In US, authors from higher-ranked institutions publish APC-OA more often, and pay higher APCs (Siler et al. 2018)
- Publishing OA with APCs is more likely for authors of male gender, from prestigious institutions, with previous federal (US) research funding, or an association with a STEM field (Olejniczak & Wilson 2020)
- OA involving APCs is associated with lower geographic diversity of authors (Smith et al. 2021)





New preprint!

We investigated:

- the relationship between proxies of institutional resourcing and average APCs on a global level.
- Differences between fields and countries
- Changes over time

- Sample: 1.5 million journal articles
- Data sources: *OpenAlex*, DOAJ, CWTS Leiden Ranking, World Bank

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The APC-Effect: Stratification in Open Access Publishing

AUTHORS
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AUTHOR ASSERTIONS
Conflict of Interest: No Public Data: Available Preregistration: No

Page: 1 of 50 Automatic Zoom

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The APC-Effect: Stratification in Open Access Publishing

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Abstract

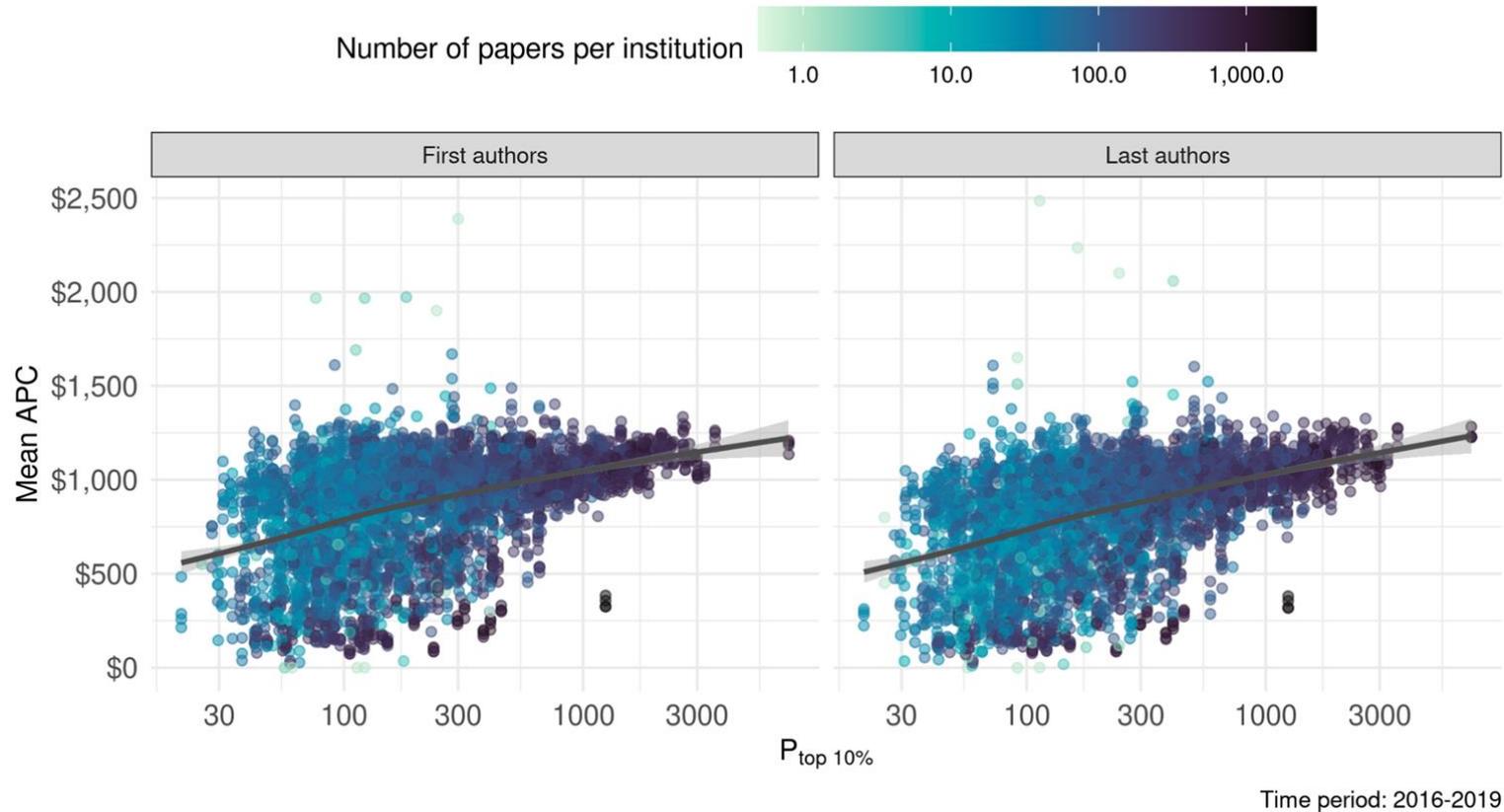
Current implementations of Open / involve Article Publishing Charges (/ emerges that APCs impede research

<https://osf.io/preprints/metaarxiv/w5szk/>





Institutional resources and APCs are linked



There is an association between institutional resources and average APCs

Equally strong for first and last authors

Might be explained by other factors (country, field)



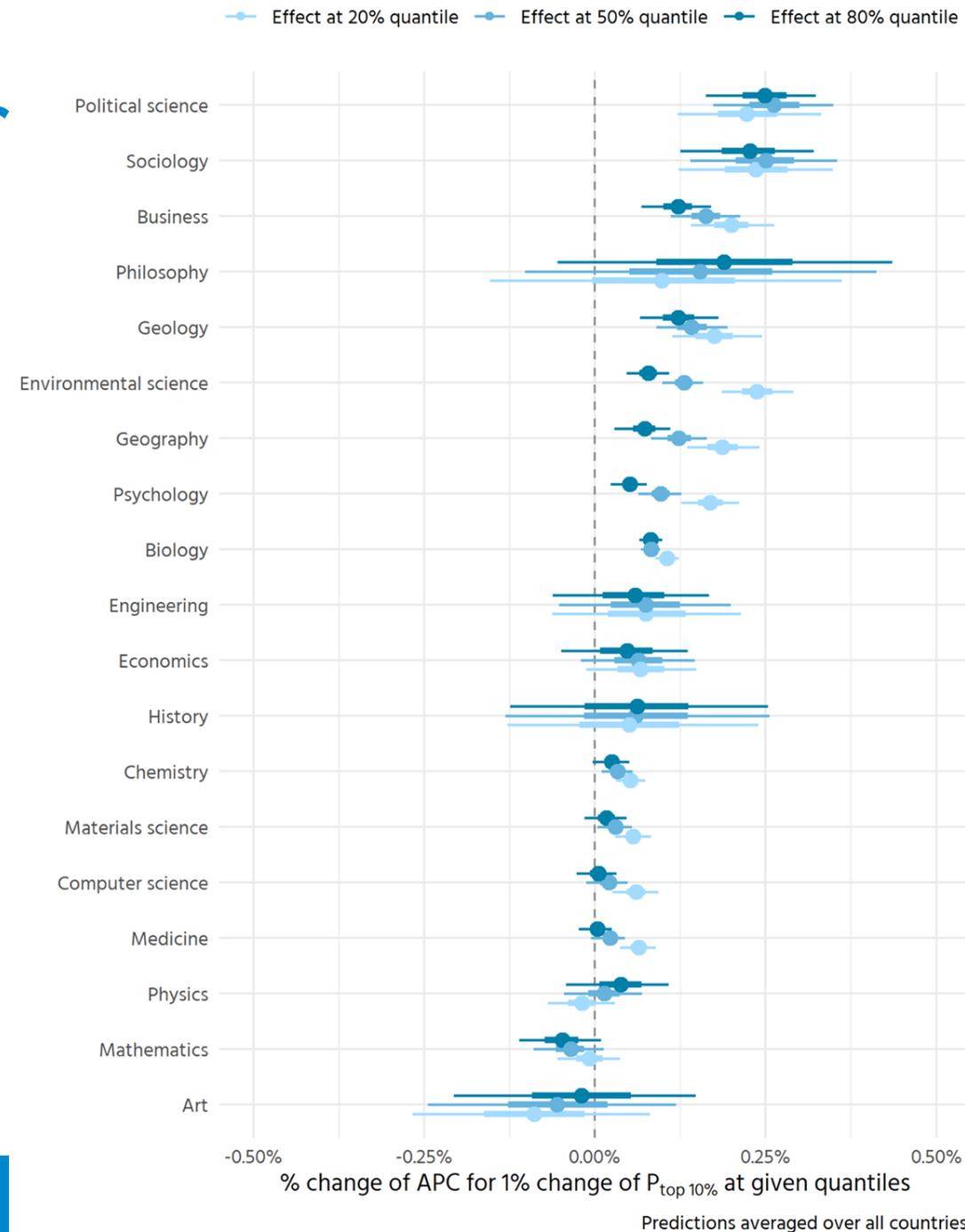


Multilevel mixing: fields differ

Bayesian multilevel hurdle model to control for field and country effects.

We find:

- Small to moderate effect of institutional resources on APCs in most fields
- Strongest effects in social sciences
- Inverse effect in „Mathematics“: better resourced institutions publish more in OA journals with *no APC*





Summary: Stratification in APC-based OA

Researchers from better resourced institutions publish more APC-based OA and pay higher APCs

OA publishing involving APCs is creating a new barrier for who can publish where

Implications

- Voices from societies and communities less embedded in global science are further marginalised
- Global issues need global perspectives, APC-OA is leading to the opposite
- Existing inequities are amplified (citation advantage, future reward structures)



Photo by [Joshua Hoehne](#) on [Unsplash](#)



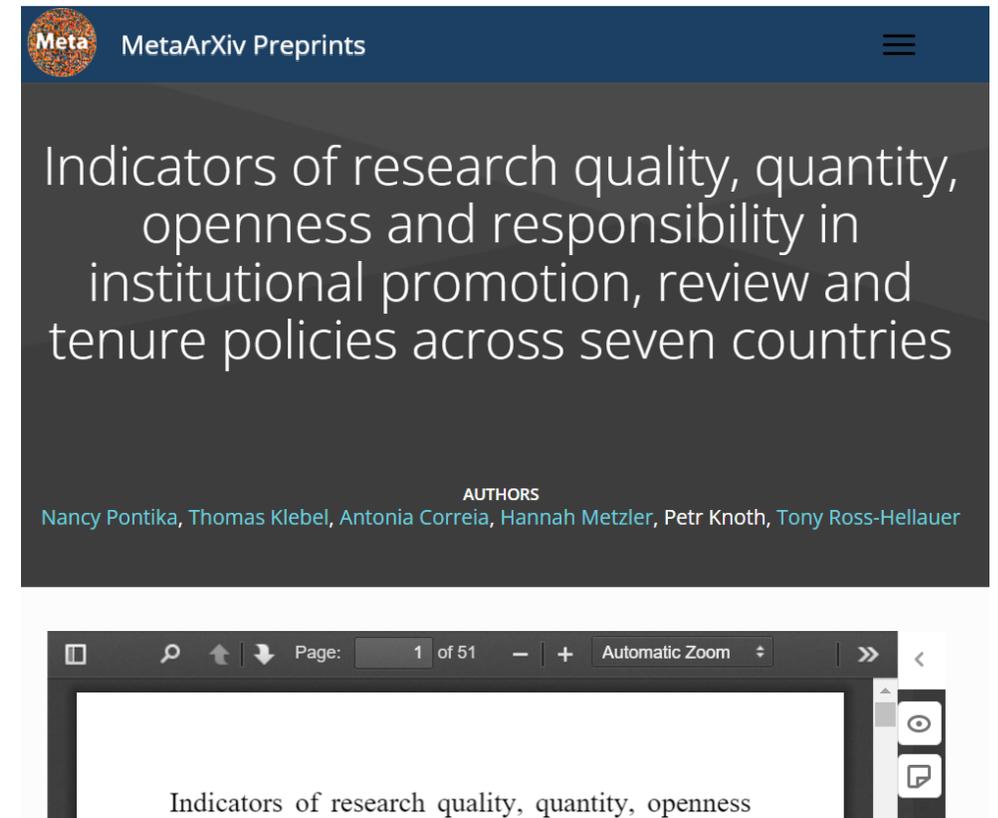


Example issue 2: Reward & Recognition



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

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Mismatch between researcher and institutional values





How can we improve?

ON-MERRIT Recommendations

- Co-creative, modified Delphi process (anonymous surveys combined with online consensus-building meetings) with diverse experts from three stakeholder groups: funders, research institutions, and 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



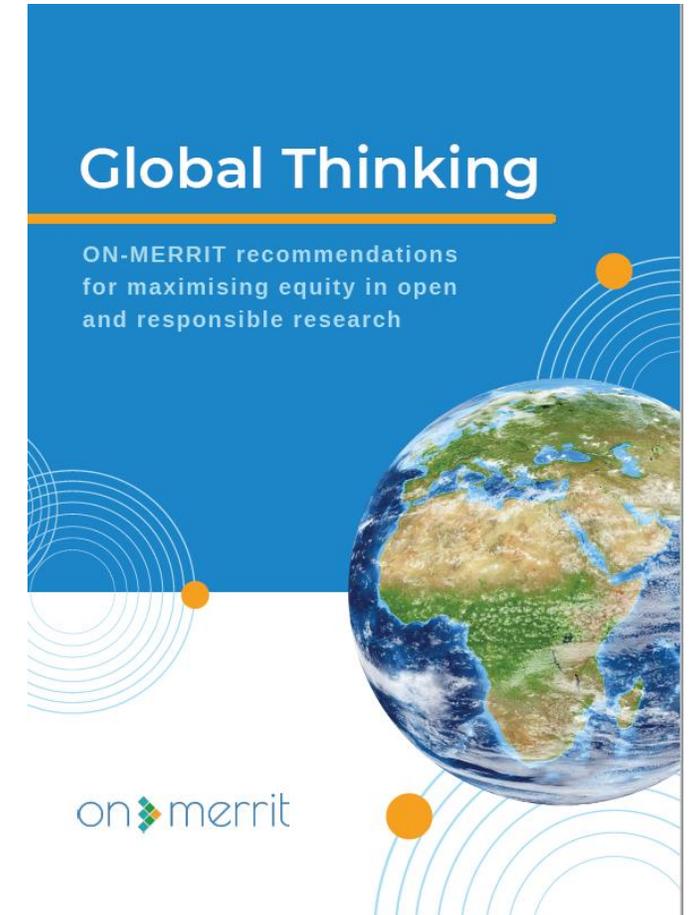
Funders



Institutions



Researchers



<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**.





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.





Coming soon ...

TIER2: ENHANCING TRUST, INTEGRITY AND EFFICIENCY IN RESEARCH THROUGH NEXT-LEVEL REPRODUCIBILITY IMPACT PATHWAYS

- New EC-funded project starting **Jan 2023**
- Centres **epistemic diversity**
 - Meanings/implications of reproducibility in life, social, computer sciences
- Co-creative approach to creating and evaluating new reproducibility tools and practices
- Please get in touch if interested in collaboration :)





Thank you!

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